Supplement to Official Gazette Extraordinary Vol. 76, No. 72, 13th December 1989—Part A

NATIONAL MATHEMATICAL CENTRE DECREE 1989

Section ARRANGEMENT OF SECTIONS

Decree No. 40

[*See section* 16]

Commencement.

THE FEDERAL MILITARY GOVERNMENT hereby decrees as follows :

PART I—ESTABLISHMENT OF THE NATIONAL MATHEMATICAL CENTRE, ETC.

Establishment of the National Mathematical Centre.

1.—(1) There is hereby established, in the Federal Capital Territory, Abuja, a body to be known as the National Mathematical Centre (hereafter in this Decree referred to as "the Centre") which shall have the functions assigned to it by this Decree.

(2) The Centre shall be a body corporate with perpetual succession and a common seal and may sue and be sued in its corporate name.

Establishment and membership of the Governing Council of the Centre.

2.—(1) There is hereby established for the Centre a Governing Council (hereafter in this Decree referred to as "the Council") which shall be responsible for directing the affairs of the Centre.

(2) Without prejudice to the generality of subsection (1) of this section, it shall be the responsibility of the Council to exercise general control and superintendence of the policy, finances and property of the Centre, including its public relations.

(3) The Council shall consist of—

(*a*) a Chairman ;

(*b*) one representative of the Federal Ministry of Education ;

(*c*) one representative of the National Universities Commission ;

(*d*) one representative of the Federal Ministry of Science and Technology ;

(*e*) one representative of the Nigerian Academy of Science ;

(*f*) two representatives of the Nigerian Universities appointed in rotation for two years at a time ;

(*g*) one representative of the Polytechnics ;

(*h*) one representative of the Colleges of Education ;

(*i*) three members to represent professional and other interests in mathematical sciences, statistics, computer science and theoretical physics ; and

(*j*) the Director of the Centre.

(4) The Chairman and the other members of the Council who are not representing Ministries shall be appointed by the President, Commander-in-Chief of the Armed Forces on the recommendation of the Minister.

(5) The supplementary provisions set out in the Schedule to this Decree shall have effect with respect to the proceedings of the Council and the other matters mentioned therein.

Tenure of office, etc

3.—(1) Subject to the provisions of this Decree, a member of the Council, not being a public officer, shall hold office for a period of four years from the date of his appointment and shall be eligible for re-appointment for one further period of four years ; thereafter, he shall no longer be eligible for re-appointment.

(2) Any member of the Council, not being a public officer, may resign his office by a letter addressed to the Minister and the resignation shall have effect from the date of the receipt of the letter by the Minister.

(3) The Minister may, with the approval of the President, Commander-in-Chief of the Armed Forces, terminate the appointment of a member of the Council (not being an *ex-officio* member) if he is satisfied that it is not in the interest of the Centre that the person concerned should continue in office.

(4) Members of the Council, not being public officers, shall be paid such remuneration and allowances as the Minister may, with the approval of the President, Commander-in-Chief of the Armed Forces, determine.

Power of the Minister to give directives

4. Subject to the provisions of this Decree, the Minister may give to the Council directives of a general character or relating generally to particular matters with regard to the exercise by the Council of its functions under this Decree and it shall be the duty of the Council to complye with such directives

PART II—FUNCTIONS AND POWERS OF THE CENTRE

5. The Centre shall— Functions of the Centre

(*a*) train and develop high level personnel in mathematical sciences, including mathematics, statistics, computer science and theoretical physics, for Nigerian and African institutions ;

(*b*) create a resource centre to serve national and international communities as a focal point for advanced research and training in mathematical sciences and applications ;

(*c*) enhance collaboration among mathematical scientists especially between young Nigerian scientists, and other advanced and experienced scientists from within and outside Nigeria ;

(*d*) identify and encourage young talents in mathematical sciences ;

(*e*) stimulate enthusiasm for the physical sciences in young Nigerian students and scholars ;

(*f*) prepare Nigeria for a leading role in mathematical sciences ;

(*g*) attract good mathematical scientists from all over the world into the service of Nigeria ;

(*h*) encourage and support activities leading to the improvement of the teaching and learning of mathematical sciences at all levels ;

(*i*) provide facilities for scientific conferences and the publication of the proceedings arising therefrom ;

(*j*) tackle national set goals in the development of mathematical sciences ;

(*k*) conduct series of specialised lectures or courses for the purpose of up-grading post-graduate students in the field of mathematical sciences to a level where they can begin to understand research papers and seminars ;

(*l*) conduct series of research lectures for advanced post-graduate as well as post-doctoral and other participants based on a set of pre-assigned research papers, with the objective of generating questions that would be collated, discussed and used to determine new research directions for the participants ;

(*m*) conduct seminars, workshops and symposia in such areas as the Academic Board of the Centre may, from time to time, determine or plan ;

(*n*) establish and execute a visiting programme for mathematical scientists, under which mathematical scientists can visit the Centre for short periods to work on their individual research problems using the library, computing and other facilities of the Centre ; and

(*o*) perform such other functions that are related to those set out in this section and do such other things as are, in the opinion of the Council, necessary or expedient for carrying out the functions of the Centre under this Decree.

6. The Centre shall have power to— Powers of the Centre

(*a*) award certificates of attendance and of full participation at lectures and courses conducted under this Decree ;

(*b*) establish and maintain a library comprising such books, journals, records, reports and other publications and information systems as may be required for the discharge of the functions conferred on the Centre by this Decree ;

(*c*) accept gifts of land, money or other property upon such terms and conditions if any as may be specified by the person or organisation making the gift : Provided that the conditions attached by the person or organisation making the gift are not inconsistent with the functions of the Centre or its position as a non-partisan institution free from undue external influence.

PART III—STAFF OF THE CENTRE

Director and other staff of the Centre.

7.—(1) There shall be for the Centre a Director who shall possess appropriate qualifications and be appointed by the President, Commander-in-Chief of the Armed Forces on the recommendation of the Minister.

(2) The Director shall—

(*a*) hold office for a period of five years and shall be eligible for re-appointment ; and

(*b*) enjoy conditions of service equivalent to those of the Vice-Chancellor of a Federal University.

(3) The Director shall be the Chief Executive and Academic Officer of the Centre and shall be charged with general responsibility for matters relating to the day-to-day management and operations of the Centre.

(4) There shall be for the Centre a Deputy Director who shall be appointed by the Council and act in place of the Director when the office of the Director is vacant or the Director is for any reason (including absence from the precincts of the Centre) unable to perform his functions as the Director.

(5) There shall be for the Centre a Librarian who shall be appointed by the Council and be responsible to the Director for the development and administration of the library services of the Centre.

(6) There may be appointed, from time to time, by the Council, such other employees as may be required for the purposes of the efficient performance of the functions conferred on the Centre by this Decree.

Staff regulations.

8.—(1) The Council may, subject to the provisions of this Decree, make staff regulations relating generally to the conditions of service of the employees of the Centre and, without prejudice to the generality of the foregoing, such regulations may provide for—

(*a*) the appointment, promotion and discipline (including dismissal) of employees of the Centre ; and

(*b*) appeals by such employees against dismissal or other disciplinary measures,

and until such regulations are made, any instruments relating to the conditions of service of public officers in the university system shall be applicable, with such modifications as may be necessary, to employees of the Centre.

(2) Staff regulations made under subsection (1) of this section shall not have effect until approved by the National Council of Ministers ; and when so approved they need not be published in the *Gazette* but the Council shall cause them to be brought to the notice of all affected persons in such manner as it may, from time to time, determine.

Pensions. 1979 No. 102.

9.—(1) Service in the Centre shall be approved service for the purposes of the Pensions Act 1979,

(2) Officers and other persons employed in the Centre shall be entitled to pensions, gratuities and other retirement benefits as are prescribed in the Act, so however that nothing in this Decree shall prevent the appointment of a person to any office on terms which preclude the grant of a pension, gratuity or other retirement benefit in respect of that office.

(3) For the purposes of the application of the provisions of the Pensions Act 1979, any power exercisable thereunder by a Minister or other authority of the Government of the Federation, other than the power to make regulations under section 23 thereof, is hereby vested in and shall be exercisable by the Council and not by any other person or authority.

Part IV—Academic Board

Establishment of an Academic Board for the Centre.

10.—(1) There is hereby established as an integral part of the Centre an Academic Board which shall consist of—

(*a*) the Director of the Centre ;

(*b*) the Deputy Director ;

(*c*) the Librarian ;

(*d*) four representatives drawn in rotation from among the Universities in Nigeria in the discipline of mathematical sciences ; and

(*e*) five other persons, for the time being holding such appointments on the staff of the Centre, as the Director of the Centre may, with the approval of the Council, specify.

(2) A person other than an *ex-officio* member shall hold an appointment on the Academic Board under paragraphs (*d*) and (*e*) of subsection (1) of this section for a period of two years and shall be eligible for re-appointment for one further period of two years.

(3) The Academic Board shall—

(*a*) formulate and continuously evaluate the academic programme of the Centre ; and

(*b*) perform such other functions as are traditional to such bodies as the Council may, from time to time, direct.

(4) The Director shall be the chairman at the meeting of the Academic Board and in his absence the Deputy Director shall preside at such meeting but in the absence of both, the members present at the meeting shall appoint one of their number to preside at the meeting.

(5) Subject to subsection (4) of this section, the Academic Board shall have power to regulate its own procedure.

Part V—Financial Provisions

Fund of the Centre.

11.—(1) The Centre shall establish and maintain a fund from which shall be defrayed all expenditure incurred by the Centre in the performance of its functions under this Decree.

(2) There shall be paid and credited to the fund established pursuant to subsection (1) of this section—

(*a*) such sums as may, from time to time, be granted to the Centre by the Federal Military Government ;

(*b*) fees charged for services rendered by the Centre ; and

(*c*) subject to section 6 (*c*) of this Decree, all sums accruing to the Centre by way of gifts, grants-in-aid, testamentary disposition and endowments or contribution from philanthropic persons or organisations or otherwise howsoever.

Annual estimate, accounts and audit.

12.—(1) The Council shall cause to be prepared not later than 30th September in each year an estimate of the expenditure and income of the Centre during the next succeeding year, and when prepared, they shall be submitted to the National Council of Ministers.

(2) The Council shall cause to be kept proper accounts of the Centre and proper records in relation thereto and when certified by the Council such accounts shall be audited as provided in subsection (3) of this section.

(3) The accounts of the Centre shall be audited within 6 months after the end of each year by auditors appointed by the Council from the list and in accordance with the guidelines supplied by the Auditor-General of the Federation ; and the fees of the auditors and the expenses of the auditors generally shall be paid from the funds of the Centre.

Annual report.

13. The Council shall, not later than 31st December in each year, submit to the National Council of Ministers a report, in such form as the Minister may, from time to time, direct, on the activities of the Centre during the preceding year and shall include in such report the audited accounts of the Centre.

PART VI—MISCELLANEOUS

Regulations.

14. The Minister may make regulations for the purpose of giving effect to the provisions of this Decree.

Interpretation.

15. In this Decree, unless the context otherwise requires—

"Centre" means the National Mathematical Centre established by section 1 (1) of this Decree ;

"Chairman" means the Chairman of the Council ;

"Council" means the Governing Council of the Centre established by section 2 of this Decree ;

"Director" means the Director of the Centre appointed under section 7 of this Decree ;

"member" means a member of the Council and includes the Chairman ;

"Minister" means the Minister charged with responsibility for matters relating to higher education.

Citation and commencement.

16. This Decree may be cited as the National Mathematical Centre Decree 1989 and shall be deemed to have come into force on 1st January 1988.

SCHEDULE *Section* 2 (5)

Proceedings of the Council

1.—(1) Subject to this Decree and to section 26 of the Interpretation Act 1964 (which provides for the decisions of a statutory body to be taken by a majority of the members of the body and for the person presiding to have a second or casting vote), the Council may make standing orders regulating the proceedings of the Council or of any committee thereof.

(2) The quorum of the Council shall be seven and the quorum of any committee of the Council shall be as determined by the Council.

2.—(1) The Council shall meet not less than three times in each year and, subject thereto, the Council shall meet whenever it is summoned by the Chairman ; and if the Chairman is required to do so by notice given to him by not less than three other members, he shall summon a meeting of the Council to be held within fourteen days from the date on which the notice is given.

(2) At any meeting of the Council the Chairman shall preside, but if he is absent, the members present at the meeting shall appoint one of their number to preside at that meeting.

(3) Where the Council desires to obtain the advice of any person on a particular matter, the Council may co-opt him as a member for such period as it thinks fit, but a person who is a member by virtue of this sub-paragraph shall not be entitled to vote at any meeting of the Council and shall not count towards the quorum.

(4) Notwithstanding anything in the foregoing provisions of this paragraph, the first meeting of the Council shall be summoned by the Minister.

Committees

3.—(1) The Council may appoint one or more committees to carry out, on its behalf, such of its functions as the Council may determine.

(2) A committee appointed under this paragraph shall consist of such number of persons (not necessarily members of the Council) as may be determined by the Council ; and a person other than a member of the Council shall hold office on the committee in accordance with the terms of his appointment.

(3) A decision of a committee of the Council shall be of no effect until it is confirmed by the Council.

Miscellaneous

4.—(1) The fixing of the seal of the Centre shall be authenticated by the signature of the Chairman or of some other members authorised generally or specially to act for that purpose by the Council.

(2) Any contract or instrument which, if made or executed by a person not being a body corporate, would not be required to be under seal may be made or executed on behalf of the Centre by the Director or any person generally or specially authorised to act for that purpose by the Council.

(3) Any document purporting to be a document duly executed under the seal of the Centre shall be received in evidence and shall, unless the contrary is proved, be presumed to be so executed.

(4) Members of the Council who are not public officers shall be paid out of moneys at the disposal of the Council such remunerations, fees or allowances in accordance with such scales as may be approved, from time to time, by the National Council of Ministers.

(5) The validity of any proceeding of the Council or of a committee thereof shall not be affected by any vacancy in the membership of the Council or a committee or by any defect in the appointment of any member of the Council or a committee, or by reason that a person not entitled to do so took part in the proceedings.

(6) Any member of the Council or any person holding office on a committee of the Council who has a personal interest in any contract or arrangement entered into or proposed to be considered by the Council or a committee thereof shall forthwith disclose his interest to the Council and shall not vote on any question relating to the contract or arrangement.

MADE at Lagos this 12th day of December 1989.

GENERAL I. B. BABANGIDA
President, Commander-in-Chief
of the Armed Forces
Federal Republic of Nigeria

EXPLANATORY NOTE

(*This note does not form part of the above Decree but is intended to explain its purport*)

The Decree establishes the National Mathematical Centre with functions, amongst other things, for—

(*a*) the training and development of high level personnel in mathematical sciences ; and

(*b*) the creation of a resource centre to serve national and international communities.

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NATIONAL COMMISSION FOR NOMADIC EDUCATION DECREE 1989

ARRANGEMENT OF SECTIONS

Decree No. 41

[12*th December* 1989] Commencement.

THE FEDERAL MILITARY GOVERNMENT hereby decrees as follows :

PART I—ESTABLISHMENT OF THE NATIONAL COMMISSION FOR NOMADIC EDUCATION, ETC.

Establishment of the National Commission for Nomadic Education.

1.—(1) There is hereby established a body to be known as the National Commission for Nomadic Education (hereafter in this Decree referred to as "the Commission") which shall have the functions assigned to it by this Decree.

(2) The Commission shall be a body corporate with perpetual succession and a common seal and may sue or be sued in its corporate name.

Governing Board of the Commission.

2.—(1) There is hereby established for the Commission a Governing Board (hereafter in this Decree referred to as "the Board") which shall administer and direct the affairs of the Commission.

(2) Without prejudice to the generality of subsection (1) of this section, it shall be the responsibility of the Board to exercise general control and superintendence over the policy, finances and property of the Commission, including its public relations.

(3) The Board shall consist of a Chairman and person each to represent each of the following Ministries and bodies, that is—

(*a*) Education ;

(*b*) Information and Culture ;

(*c*) Internal Affairs ;

(*d*) Agriculture, Water Resources and Rural Development ;

(*e*) the Armed Forces of the Federation ;

(*f*) the Directorate of Food, Roads and Rural Infrastructures ;

(*g*) one person each to represent the States of the Federation having nomadic influence or to represent such other States as the Minister may consider necessary for the effective implementation of this Decree ;

(*h*) five persons to represent other diverse interests to be appointed on individual merit ; and

(*i*) the Executive Secretary of the Commission.

(4) The Chairman and members of the Board who are not representing Ministries and other statutory bodies shall be appointed by the President, Commander-in-Chief of the Armed Forces on the recommendation of the Minister.

(5) A member of the Board, other than an *ex officio* member, shall hold office for a term of four years renewable for another term of four years only.

(6) The Minister may, with the approval of the President, Commander-in-Chief of the Armed Forces, and in writing, remove any member of the Board if he is satisfied that it is not in the interest of the Commission that the person concerned should continue in office.

(7) The supplementary provisions set out in the Schedule to this Decree shall have effect with respect to the proceedings of the Board and the other matters mentioned therein.

PART II—OBJECTIVES AND FUNCTIONS OF THE COMMISSION, ETC.

Objectives of the Commission.

3. The objectives of the Commission are to—

(*a*) formulate policy and issue guidelines in all matters relating to nomadic education in Nigeria ;

(*b*) provide funds for—

(*i*) the research and personnel development for the improvement of nomadic education in Nigeria ;

(*ii*) the development of programmes on nomadic education ;

(*iii*) equipment, other instructional materials (including teaching aids and amenities), construction of classrooms and other facilities relating to nomadic education ;

(*c*) arrange effective monitoring and evaluation of the activities of agencies concerned with nomadic education ;

(*d*) establish, manage and maintain primary schools for nomadic children.

Functions of the Commission.

4.—In addition to the objectives set out in section 3 of this Decree, the Commission shall—

(*a*) implement guidelines and ensure geographical spread of nomadic education activities and targets for the nomadic people who cross State boundaries ;

(*b*) liaise with the Livestock Department of the Ministry of Agriculture, Water Resources and Rural Development, the Directorate of Food, Roads and Rural Infrastructures and with the State Governments, to form an effective Inter-Ministerial Committee that will carve out reserves, settlements, grazing areas and dams for the nomadic people ;

(*c*) establish schools in the settlements carved out for nomadic people ;

(*d*) co-operate with other participating Ministries and agencies, including—

(*i*) the Ministry of Health ;

(*ii*) the Ministry of Agriculture, Water Resources and Rural Development ;

(*iii*) the Ministry of Information and Culture ; and

(*iv*) the Ministry of Internal Affairs ;

(*e*) ensure effective inspection of nomadic education activities in Nigeria, through the sections in Federal and State Ministries of Education performing duties relating to nomadic education ;

(*f*) collate, analyse and publish information relating to nomadic education in Nigeria and obtain from the States and from other sources, such information as are relevant to the discharge of its functions under this Decree;

(*g*) determine standards of skills to be attained in nomadic schools established by the Commission, and review such standards from time to time ;

(*h*) prepare reliable statistics of nomads and their children of school age ;

(*i*) act as the agency for channelling all external aid to nomadic schools in Nigeria ;

(*j*) subject to the provisions of sections 11 and 12 of Part V of this Decree, receive block grants and funds from the Federal Military Government or any agency authorised in that behalf, particularly the National Primary Education Commission and allocate them to all nomadic schools in accordance with such formulas as may be laid down by the National Council of Ministers ;

(*k*) ensure effective and equitable management of funds accruing to the Commission under this Decree;

(*l*) disburse funds for all authorised expenditure, including—

(*i*) payment of emoluments and overheads ;

(*ii*) procurement of equipment and all other materials required by the Commission ;

(*iii*) contribution towards provision of settled or mobile classrooms and instructional materials ;

(*iv*) contribution towards the acquisition of sites for the establishment of schools and supporting grazing reserves ;

(*v*) all other payments relating to the performance of its functions under this Decree; and

(*m*) undertake any other action desirable for the promotion of its responsibilities for nomadic education, including soliciting for funds and other support activities, organising activities to promote peaceful co-existence between the nomadic people and settled farmers and formation of inter-disciplinary and sectoral committees with Ministries, agencies and communities.

Powers of the Commission.

5. The Commission shall, subject to any direction of the Minister, have power to do anything which in its opinion is calculated to facilitate the carrying on of its objectives and functions under this Decree.

Power of Minister to give directives to the Commission.

6. Subject to the provisions of this Decree, the Minister may give to the Commission directives of a general character or relating generally to matters of policy with regard to the exercise by the Commission of its functions under this Decree and it shall be the duty of the Commission to comply with such directives.

PART III—STAFF OF THE COMMISSION

Executive Secretary of the Commission.

7.—(1) There shall be appointed by the President, Commander-in-Chief of the Armed Forces, on the recommendation of the Minister, an Executive Secretary for the Commission who shall have appropriate qualification and experience in education and teaching.

(2) The Executive Secretary shall be the Chief Executive of the Commission and shall be responsible for the execution of the policies of the Commission and the day-to-day running of the affairs of the Commission.

(3) The Executive Secretary shall hold office in the first instance for a period of five years and shall be eligible for re-appointment for such further terms of five years as the President, Commander-in-Chief of the Armed Forces may, from time to time, determine.

Other staff of the Commission.

8.—(1) The Commission may appoint such other employees of the Commission as it may require to assist the Executive Secretary in the exercise of the functions of the Commission under this Decree.

(2) The remuneration and tenure of office of the other employees of the Commission shall be determined by the Commission after consultation with the Minister.

(3) Notwithstanding the provisions of subsection (1) of this section, employees of the Commission may be appointed by the Commission by way of transfer or secondment from any of the public services in the Federation.

Pensions. 1979 No. 102.

9.—(1) Service in the Commission shall be pensionable under the Pensions Act 1979, and accordingly, employees of the Commission shall, in respect of their services in the Commission, be entitled to pensions, gratuities and other retirement benefits as are prescribed thereunder.

(2) Notwithstanding the provisions of subsection (1) of this section, nothing in this Decree shall prevent the appointment of a person to any office on terms which preclude the grant of a pension and gratuity in respect of that office.

(3) For the purposes of the application of the Pensions Act 1979, any power exercisable thereunder by the Minister or authority of the Federal Military Government (not being the power to make regulations under section 23 thereof) is hereby vested in and shall be exercisable by the Commission and not by any other person or authority.

(4) Subject to subsection (2) of this section, the Pensions Act 1979 shall in its application by virtue of the provisions of subsection (1) of this section to any office, have effect as if the office were in the civil service of the Federation within the meaning of the Constitution of the Federal Republic of Nigeria 1979, as amended.

PART IV—NOMADIC EDUCATION CENTRES

Establishment of Nomadic Education Centres.

10.—(1) The Commission shall establish four Nomadic Education Centres, that is—

(*a*) one at the University of Jos ;

(*b*) one at the Usman Danfodio University, Sokoto ;

(*c*) one at the University of Maiduguri ; and

(*d*) one at such other place as the National Council of Ministers may determine.

(2) Every Nomadic Education Centre (hereafter in this Decree referred to as "the Centre") shall be responsible to the Commission.

(3) The Centre at the University of Jos shall conduct research into nomadic life-styles including their occupations, the role of women, economic activities, migratory patterns and their demographic distribution, relationship with sedentary community populations and attitudes to education, experimental educational methodologies and evaluate programmes relating to nomads.

(4) The Centre at the Usman Danfodio University, Sokoto shall receive from the Centre at the University of Jos and from any other sources, such data as may be required by it to develop—

(*a*) the curriculum for nomadic education ;

(*b*) reading and teaching materials ;

(*c*) teacher training programmes ;

(*d*) outreach programmes, including electronic ; and

(*e*) resource materials.

(5) The Centre at the University of Maiduguri shall receive from the Centre at the University of Jos and from any other sources, such data as may be required by it to—

(*a*) develop and maintain nomadic education teacher training programmes ; and

(*b*) to develop and maintain nomadic education outreach programmes, including electronically mediated ones, and to do this in collaboration with other Centres as well as other institutions such as the National Teachers Institute and the National Educational Technology Centre.

PART V—FUNDS AND OTHER FINANCIAL PROVISIONS OF THE COMMISSION

The National Nomadic Education Fund.

11.—(1) The Commission shall establish a National Nomadic Education Fund (hereafter in this Decree referred to as "the Fund") into which shall be paid all moneys received from the Federal Government, particularly

through the National Primary Education Commission, State Governments and other sources, including gifts, endowment and profits.

(2) The Fund shall be disbursed in accordance with the accepted rules and procedures and in pursuit of the objectives of nomadic education as may be directed, from time to time, by the National Council of Ministers, including the making of appropriate grants to State Governments, Local Governments, Universities and other agencies and communities.

Maintenance of separate fund by the Commission.

12.—(1) The Commission shall establish and maintain a separate fund from which shall be defrayed all expenditure incurred by the Commission.

(2) There shall be paid and credited to the fund established in pursuance of subsection (1) of this section such payments as may be made to the Commission by the Federal Ministry of Education for the running expenses of the Commission and all other payments or moneys, from time to time, accruing to the Commission.

Expenditure of the Commission.

13. The Commission shall, from time to time, apply the proceeds of the fund established in pursuance of section 12 (1) of this Decree—

(*a*) to the cost of administration of the Commission ;

(*b*) to the payment of the salaries, fees or other remuneration or allowances and pensions, superannuation, allowances and gratuities payable to members of the Board and employees of the Commission, so however that no payment of any kind under this paragraph shall be made to any person who is in receipt of emoluments from the Government of the Federation or of a State ;

(*c*) for the maintenance of any property vested in the Commission ; and

(*d*) for and in connection with any of its functions under this Decree.

Annual estimates and accounts.

14.—(1) The Board shall submit to the Minister not later than 30th September in each year an estimate of its expenditure and income during the next succeeding year.

(2) The Board shall keep proper accounts in respect of each year and proper records in relation thereto and shall cause the accounts to be audited by an auditor appointed from the list and in accordance with the guidelines supplied by the Auditor-General of the Federation.

Annual reports.

15. The Board shall prepare and submit to the National Council of Ministers through the Minister not later than 30th June in each year a report, in such form as he may direct, on the activities of the Commission during the immediately preceding year, and shall include in such report a copy of the audited accounts of the Commission for that year and the Auditor-General's report thereon.

PART VI—MISCELLANEOUS

Power to obtain information.

16.—(1) For the purposes of carrying out the functions conferred on the Commission under this Decree, the Executive Secretary or any other officer authorised in that behalf—

(*a*) shall have a right of access to all the records of any institution to which this Decree applies ; and

(*b*) may by notice in writing served on any person in charge of such institution require that person to furnish information on such matters as may be specified in that notice.

(2) It shall be the duty of any person required to furnish information pursuant to subsection (1) of this section to comply with the notice within a reasonable period of time.

(3) In this section, the reference to an institution to which this Decree applies is a reference to any regular school established for nomadic people.

17. In this Decree, unless the context otherwise requires— Interpretation.

"Chairman" means the Chairman of the Commission ;

"Commission" means the National Commission for Nomadic Education established by section 1 of this Decree ;

"member" means a member of the Board and includes the Chairman ;

"Executive Secretary" means the person appointed as the Executive Secretary of the Commission in pursuance of section 7 (1) of this Decree ;

"Minister" means the Minister charged with responsibility for matters relating to education.

18. This Decree may be cited as the National Commission for Nomadic Education Decree 1989. Citation.

SCHEDULE *Section* 2 (5)

Supplementary Provisions Relating to the Board

Proceedings of the Board

1. Subject to this Decree and section 26 of the Interpretation Act 1964 (which provides for decisions of a statutory body to be taken by a majority of its members and for the Chairman to have a second or casting vote), the Board may make standing orders regulating the proceedings of the Board and any committee thereof.

2. Every meeting of the Board shall be presided over by the Chairman or if the Chairman is unable to attend a particular meeting, the members present at the meeting shall elect one of their number to preside at that meeting.

3. The quorum at a meeting of the Board shall consist of the Chairman (or, in an appropriate case, the person presiding at the meeting pursuant to paragraph 2 of this Schedule) and six other members.

4. Where upon any special occasion, the Board desires to obtain the advice of any person on any particular matter, the Board may co-opt that person to be member for as many meetings as may be necessary, and that person while so co-opted shall have all the rights and privileges of a member, except that he shall not be entitled to vote or count towards a quorum.

Committees

5.—(1) Subject to its standing orders, the Board may appoint such number of standing and *ad-hoc* committees as it thinks fit to consider and report on any matter with which the Board is concerned.

(2) Every committee appointed under the provisions of sub-paragraph (1) of this paragraph shall be presided over by a member of the Board and shall be made up of such number of persons, not necessarily members of the Board, as the Board may determine in each case.

6. The decision of a committee shall be of no effect until it is confirmed by the Board.

Miscellaneous

7. The fixing of the seal of the Commission shall be authenticated by the signature of the Chairman and of the Executive Secretary of the Commission or such other member authorised generally or specially by the Board to act for that purpose.

8. Any contract or instrument which if made by a person not being a body corporate, would not be required to be under seal, may be made or executed on behalf of the Commission by the Executive Secretary or by any other person generally or specifically authorised by the Board to act for that purpose.

9. Any document purporting to be a contract, instrument or other document signed or sealed on behalf of the Commission shall be received in evidence and, unless the contrary is proved, be presumed, without further proof, to have been so signed or sealed.

10. The validity of any proceedings of the Board or a committee thereof shall not be adversely affected—

(*a*) by any vacancy in the membership of the Board ; or

(*b*) by any defect in the appointment of a member of the Board or committee ; or

(*c*) by reason that a person not entitled to do so took part in the proceedings.

11. Any member of the Board or a committee thereof who has a personal interest in any contract or arrangement entered into or proposed to be considered by the Board or committee shall forthwith disclose his interest to the Board or committee and shall not vote on any question relating to the contract or arrangement.

MADE at Lagos this 12th day of December 1989.

GENERAL I. B. BABANGIDA,
President, Commander-in-Chief
of the Armed Forces,
Federal Republic of Nigeria

EXPLANATORY NOTE

(*This note does not form part of the above Decree but is intended to explain its purport*)

The Decree establishes the National Commission for Nomadic Education which will, amongst other things, establish, manage and maintain primary schools for nomadic children.

PUBLISHED BY AUTHORITY OF THE FEDERAL MILITARY GOVERNMENT OF NIGERIA AND PRINTED BY THE MINISTRY OF INFORMATION AND CULTURE, PRINTING DIVISION, LAGOS

FEDERAL CAPITAL TERRITORY, ABUJA (APPEAL FROM AREA COURT) DECREE 1989

Decree No. 42

[13*th December*, 1989] Commencement.

THE FEDERAL MILITARY GOVERNMENT hereby decrees as follows—

1. Notwithstanding anything to the contrary contained in the Area Court Edict 1967 and the Sharia Court of Appeal Law made applicable to the Federal Capital Territory by the Federal Capital Territory (Applicable Laws) Decree 1984, any party aggrieved by a decision of an order of an Upper Area Court or any Area Court Grade I or II— Appeals from decisions of Upper Area Court. LL of NW State 1967. Cap. 122 of LNN 1963. 1984 No. 12.

(*a*) on any matter involving a question of Islamic Law, may appeal therefrom to the Sharia Court of Appeal ;

(*b*) in a criminal matter, may appeal therefrom to the High Court ;

(*c*) in a civil matter, other than a matter involving a question of Islamic Law, may appeal therefrom to the High Court.

2. Section 45 of the High Court Law made applicable to the Federal Capital Territory, Abuja by the Federal Capital Territory (Applicable Laws) Decree 1984 shall apply to appeals from an Upper Area Court or any Area Court. Application of High Court Law of Northern Nigeria Cap. 49 of LL of NN 1963.

3. This Decree may be cited as the Federal Capital Territory, Abuja (Appeal From Area Court) Decree 1989 and shall be read as one with the enactments mentioned in sections 1 and 2 of this Decree. Citation and application.

MADE at Lagos this 13th day of December, 1989.

GENERAL I. B. BABANGIDA,
President, Commander-in-Chief of the Armed Forces,
Federal Republic of Nigeria

EXPLANATORY NOTE

(This note does not form part of this Decree but intended to explain its purport)

The Decree gives effect to the recommendations of the Area Court Reform Committee as accepted by Federal Government by providing that—

(*a*) appeals in criminal matters from Area Courts Grade I and II shall go directly to the High Court instead of first going to Upper Area Courts ;

(*b*) the Sharia Court of Appeal is now empowered to hear appeals on questions of Islamic Law from Area Court Grade I and II as appeals from Area Courts Grade I and II to Upper Area Courts in matters involving Islamic Law have been abolished ;

(*c*) the provisions of section 45 of the High Court Law (relating to summary dismissal of appeals), in criminal matters, shall apply to appeals from Area Courts.

PUBLISHED BY AUTHORITY OF THE FEDERAL MILITARY GOVERNMENT OF NIGERIA AND PRINTED BY THE MINISTRY OF INFORMATION AND CULTURE, PRINTING DIVISION LAGOS

NATIONAL DRUG FORMULARY AND ESSENTIAL DRUGS LIST DECREE 1989

Decree No. 43

[13*th December* 1989]

Commencement.

THE FEDERAL MILITARY GOVERNMENT hereby decrees as follows—

National Drug Formulary and Essential Drug List.

1. There is hereby prescribed for the Federal Republic of Nigeria a National Drug Formulary and Essential Drugs List as specified in the Schedule I to this Decree (hereinafter referred to as "the List").

Prohibition on importation, etc. of drugs not in List.

2. No person shall import into, advertise, display for sale, sell or manufacture in Nigeria any drug which is not contained in the List.

Importation etc. of drugs not in the List.

3.—(1) Notwithstanding the provisions of section 1 of this Decree, where the Minister is satisfied that it is necessary to import or manufacture any drug not in the List on the following grounds that—

(*a*) the drug is a cure for—

(*i*) any uncommon disease ; or

(*ii*) a disease requiring highly specialised skill for diagnosis and treatment ; or

(*b*) there is intolerance or lack of response to the common drugs listed ;

(*c*) a drug of greater activity than the one in the List was not included in the list due to insufficient experience with it under local conditions,

he may, on the recommendation of the appropriate body, permit the importation or manufacture of such drug and the inclusion of such drug in the List.

Establishment of Review Committee and membership.

4.—(1) For the purposes of the implementation of the List, there is hereby established the National Drug Formulary and Essential Drug List Review Committee (hereinafter referred to as "the Review Committeee").

(2) The Review Committee shall consist of the following members to be appointed by the Minister that is—

(*a*) two Clinical Pharmacologists, one of who shall be the Chairman ;

(*b*) the Director of Food and Drugs Administration and Control in the Federal Ministry of Health ;

(*c*) the Director of Hospital Services and Training in the Federal Ministry of Health ;

(*d*) the Director of Primary Health Care programme in the Federal Ministry of Health ;

(*e*) four heads of pharmacy departments appointed from State Ministries of Health so however that not more than one shall be appointed from any one particular State on zonal rotation ;

(*f*) one representative of the Pharmaceutical Society of Nigeria ;

(*g*) one representative of the Nigerian Medical Association ;

(*h*) one representative of the Pharmaceutical Manufacturers Association of Nigeria ; and

(*i*) two medical practitioners appointed by the Minister.

Functions of Review Committee.

5. The Review Committee shall, from time to time, review the List and advise the Minister on any addition to or deletion from the List, as may be necessary.

Tenure of office of members of Review Committee.

6.—(1) The tenure of office of members of the Review Committee, other than those appointed from the Federal Ministry of Health, shall be three years.

(2) A member of the Review Committee shall be eligible for re-appointment for a further period of three years.

Pharmaceutical companies, etc.

7. A Pharmaceutical company or firm or any other body (corporate or unincorporate) may make representation to the Review Committee on any drug or formulation not in the List which it considers to be necessary for essential health care and it shall be expedient for the Review Committee to consider such representation.

Offences and penalties.

8.—(1) Any person who contravenes the provisions of section 2 of this Decree shall be guilty of an offence and liable, on conviction, to a fine of ₦100,000 or to imprisonment for a term not exceeding 5 years.

(2) Where an offence under this Decree is committed by a body corporate, every director or person in authority in that body corporate shall be held liable.

Monitoring of the List.

9. There shall be established in the Department of Food and Drugs Administration and Control in the Ministry, a Secretariat, which shall be responsible for the monitoring and implementation of the List.

Removal of drug from the List.

10. Notwithstanding the provisions of section 5 of this Decree, the Minister may remove any drug from the List where it has been established to his satisfaction that the drug in question is no longer safe for use.

Information for guidance of medical practitioners, etc.

11. The Drug Formulary contains in Schedule 2 to this Decree shall serve as information guidance to medical practitioners, pharmacists and other users of the information specified therein.

Interpretation.

12. In this Decree, unless the context otherwise requires—

"appropriate body" means the National Drug Formulary and Essential Drug List Review Committee established by section 4 of this Decree ;

"essential drugs" means drugs that satisfy the health care needs of the majority of the population ;

"Minister" means the Minister charged with responsibility for health matters and "Ministry" shall be construed accordingly.

Citation.

13. This Decree may be cited as the National Drug Formulary and Essential Drugs List Decree 1989.

SCHEDULES

Page

CONTENTS

SCHEDULE 1

THE ESSENTIAL DRUGS LIST

SCHEDULE 2

THE DRUG FORMULARY

SCHEDULE 1 (*Section* 1)

GENERAL INFORMATION FOR USE OF THE FORMULARY

A Arrangement of Information

This National Drug Formulary and Essential Drugs List is divided into two parts. Part I, is the Essential Drugs List and Part II, is the Drug Formulary.

Part I, the Essential Drugs List, is divided into two sections : The first section main section contains the general list of essential drugs, numbering 204 different drug entities. The second section contains a small list of 31 drugs for the primary health care level.

Part II is divided into 4 chapters Chapter 3, the Classified Notes on Drugs and Preparations, is divided into 19 Sections according to main pharmacological divisions or to main drug treatment areas. Chapter 4, the Formulary Section, is an extension of Chapter 3 contanings the different dosage form presentations, strengths and the compositions of drug preparations described in Chapter 3. It also covers the formulations of extemporaneous preparations which are in common use and can be readily prepared in pharmacies.

An Index of names of drugs and preparations is included for quick reference in the book.

B Classified Notes on Drug

1. The formulary provides drug information for the drugs selected in the only Essential Drugs List. However, other drugs in common use but not included in the Essential Drugs list are mentioned.

2. The pharmaco-therapeutic notes included under the main pharmacological divisions, therapeutic and sub-therapeutic groups, are intended to provide a quick reference guide to doctors, pharmacists, nurses, etc., on the use of the various groups of drugs in the Essential Drugs List. These short notes are not meant to replace the consultation of appropriate textbooks, etc., for more broad-based information.

3. The notes are followed by the selected drugs and their relevant drug information (dosage forms, pharmacological properties, uses, adverse effects dosage, etc.) Again, these prescribing and dispensing information are considered to be very important, concise, and by no means inclusive of all possible information relating to the indications, adverse and side effects, etc. of many drugs.

C Drug Titles

Drug titles are given in their pharmacopoeial or non-proprietary (generic) names in both the Formulary and the Essential Drugs List, except in the case of Diagnostic Agents (Chapter 3 Section 19) where, for practical purposes, the proprietary names of certain products have also been included. Details of the drug dosage formulations and common extemporaneous preparations are given in Chapter 4, the Formulary section.

PART I

INTRODUCTION

THE SELECTION OF ESSENTIAL DRUGS

Definition

'Essential drugs' have been defined by The World Health Organization (WHO) as those drugs that satisfy the health care needs of the majority of the population. They should therefore be available at all times in adequate amounts and in the appropriate dosage forms at all levels of the health care delivery system of the country. Their selection is based on the most common local diseases. The concept of essential drugs was approved by the World Health Assembly in 1975 and, in 1977, the World Health Organization produced its first model list of essential drugs. Since then more than 80 countries, practically all in the Third World, have adopted lists of essential drugs based on the WHO model list.

As emphasised by the World Health Organization an essential drugs list only indicates priorities in drug needs. It does not mean that no other drugs are useful and exclusion does not necessarily imply rejection.

The Need for an Essential Drugs List

In recent years there has been a big increase in the number of drugs marketed, but this increase has not been matched by a proportional improvement in health. If anything, the indiscriminate use of multiple drugs in treatment has led to a big increase in the frequency of drug-induced diseases.

The present situation is that drugs are procured with little regard to the needs and priorities of health care in the country. Availability of drugs in the health care system is largely a response to the sales promotional activities of manufacturers and distributors. Such pressures lead to a proliferation of available drugs which bear little relation to the actual needs of the population. The result is the present situation in which the basic drug needs of a large percentage of the population cannot be satisfactorily met by the available drugs. There is therefore need, for a change to a system in which, as far as the public sector of the health care system is concerned, priority is given to drugs proven to be therapeutically effective, to be reasonably safe and to satisfy the health needs of the population. These are the so called 'essential' drugs.

Having accepted the Alma Ata declaration of health for all by the year 2,000 making health care accessible to the entire population has become a major concern of the Government, and the primary health care programme is designed to make the attainment of the goal of health for all possible. One of the essential elements of primary health care is the provision of essential drugs. Drugs occupy a unique position in health care. They make health care credible because they can cure diseases, relieve symptoms and alleviate suffering. The psychological satisfaction produced by drugs creates a favourable environment on which the preventive and educational elements of health care can be built with consequent further improvement in health. It is obvious, therefore, that the present situation in which regular availability of the most needed drugs cannot be ensured is not conducive to the attainment of the goal of health for all. On the other hand, the successful application of the essential drugs concept will go a long way towards improving the availability of the most needed drugs in Nigerian healthcare delivery system.

Criteria for selection

In selecting this list of essential drugs the Federal Ministry of Health was guided by the following principles :

1. The drugs in an essential drugs list should satisfy the health care needs of the great majority of the people at all levels of health care delivery.

2. They should be drugs for which there is sufficient evidence of efficacy and safety from controlled clinical studies and from experience in general use.

3. The preferred dosage forms are those which have a reasonable shelf-life and are able to withstand adverse environmental conditions unavoidable in the distribution chain. For example, tablets and capsules are probably more stable under our prevailing ambient temperatures than mixtures, syrups and elixirs. Except in infants where specific paediatric formulations are indispensable, convenient paediatric doses can be achieved from the use of a wide range of dosage strengths of tablets (e.g. aspirin tablets, 75mg, 100mg, 300mg 500mg, 600mg) or of scored tablets.

4. They should be drugs for which quality certification can be readily obtained from local institutions, or from the country of origin or through the auspices of the World Health Organization.

5. They should be drugs that can either be manufactured locally using locally produced or imported raw materials or that can be imported in bulk, cheaply.

6. The drugs have been selected, as much as possible, in their generic names.

7. Where there is a large number of drugs in a particular therapeutic group (e.g. anti-hypertensives), preference is given to the drugs for which there is local experience with regard to efficacy and safety.

8. When one drug has been named in a particular chemical group containing a veriety of structural analogues (e.g. thiazide diuretics), other members of the group can be substituted for the named drug. Factors which may determine the choice of product in this instance include, comparative cost, frequency of administration, ease of procurement and availability of desired dosage forms.

9. Selection of one member of a pharmacodynamic group (e. g. beta-adrenoceptor blockers, direct vasodilators, non-steroidal anti-inflammatory drugs) does not preclude the use of other drugs in the same group provided they satisfy the requirements for safety and efficacy.

10. Single component drug formations are, as a rule, preferred to fixed-dosage drug combinations since individualisation of dosage in therapy is often difficult or impossible with the latter. However, in some instances, a fixed-dosage drug combination meets the requirements of a given clinical situation and has clearly-defined advantages in efficacy, safety and compliance, over separately administered single drugs. Such fixed-dosage combinations have been included in the list.

11. Drugs and preparations with unproven or doubtful therapeutic effect even when hallowed by long usage have not been selected. For this reason remedies like throat lozenges, expectorants, tonics, gripe water and enzyme mixtures are not in the list.

12. Drugs with known serious side effects but with acceptable risk/benefit ratio because of the severity of the conditions for which they are used, have been included in the expectation that their procurement, storage, distribution and use would be subject to the usual medico-legal and ethical constraints associated with such drugs.

Deficiencies of an Essential Drugs List

Although, if carefully selected, an essential drugs list should satisfy the needs of the vast majority of the population, it is clear that it will not provide the needs of every person. Situations which the essential drugs list may not cover include :

1. Uncommon diseases, especially where the drug treatment is still subject to frequent changes.

2. Diseases requiring highly specialised skills and facilities for diagnosis and treatment. These, as a rule, will be encountered only in tertiary health care institutions.

3. Instances where less popular drugs may need to be used due either to lack of response or intolerance to the commoner drugs listed. Patients in this kind of situation often need to be evaluated in tertiary health care centres.

4. Drugs of probably greater activity than the ones selected but for which experience in the field and particularly under local conditions is not sufficiently convincing to be listed. The high cost of a drug still under patent may make its selection untenable even when there is local evidence of its comparability with or even, advantage over selected ones.

Expected Advantages of an Essential Drugs List

Experience from other countries which have operated an essential drugs policy over the past few years has demonstrated a number of advantages :

1. There will be a reduction in the number of drugs deployed in the health care system. This will make easier the administrative processes involved in procurement, storage and distribution.

2. With the limited number of drugs and the use of generic rather than proprietary names, it would be easy to provide concise, accurate and comprehensive information in the form of a national formulary on all the drugs in the essential drugs list.

3. It should be a lot easier for prescribers to familiarise themselves with the pharmcological properties of the prescribed drugs, thus improving the quality of drug treatment.

4. Drug utilisation in the various sectors of the health care system can be easily monitored. True quantitative requirements can therefore be determined. Knowledge of this should stimulate local pharmaceutical industries in the production of needed drugs in the right amounts.

5. It should be easier for the Federal Ministry of Health to formulate strategies for the evaluation of the quality of drugs and for the inspection of factories for compliance with the guidelines for good manufacturing practices.

6. It should be relatively easy for local drug committees especially in the tertiary health care institutions to meet the needs of the various specialities and unusual clinical situations not covered by the national Drug Formulary and Essential Drugs List.

Finally, this Essential Drugs List contains 205 different drugs including a few fixed combination products. Drugs which are useful in more than one therapeutic area have recurred in the list, but counted only once. The drugs are shown with their pharmaceutical dosage forms and strengths in which they should be available. An Index of the drugs is included for easy reference.

This Essential Drugs List should be reviewed and up-dated biennially.

PART I

THE MAIN (GENERAL) LIST

Name of Drug	*Route of Administration Dosage Forms and Strengths*
1. ANAESTHETICS	
1.1. *General Anaesthetics and Oxygen*	
Ether, Anaesthetic	Inhalation, liquid in bottle of 500ml
Halothane	Inhalation, liquid in bottle of 250ml
Nitrous Oxide	Inhalation, Medicinal gas
Oxygen	Inhalation, Medicinal gas
Thiopentone Sodium	Powder for I.V. Injection 0.5g and 1.0g. in ampoules.
1.2. *Premedication Drugs*	
Atropine	Injection 1mg (Sulphate) in 1ml ampoule
Diazepam	Injection, 10mg in 2ml ampoule.
1.3. *Adjuncts to General Anaesthesia*	
Neostigmine	Injection, 2.5mg (Methylsulphate)/ml in 1ml ampoule
Suxamethonium	Injection, 50mg (Chloride)/ml in 2ml ampoule
*Pancuronium	Injection, 2mg (Bromide)/ml in 2ml ampoule.
1.4. *Local Anaesthetics*	
Lignocaine	Injection, 1% and 2% (Hydrochloride) in via Injection, 1% and 2% (Hydrochloride) plus Adrenaline 1 : 200,000 in vial Topical, 2-4% (Hydrochloride) Dental Cartridges, 2% plus Adrenaline 1 in 80,000.
2. ANALGESICS, ANTIPYRETICS AND NON-STEROIDAL ANTI-INFLAMATORY DRUGS	
2.1. *Narcotic Analgesics*	
Morphine	Injection, 10mg (Sulphate or Hydrochloride) in 1ml ampoule
Pethidine	Injection, 50mg and 100mg (Hydrochloride) in 1ml and 2ml ampoules respectively
Pethilorfan	Injection, Pethidine 50 mg (Hydrochloride) plus Levallorphan 0.625mg (Tartrate per ml in 1 or 2ml ampotile.
2.2. *Narcotic Antagonists*	
Naloxone	Injection, 0.4mg (Hydrochloride) in 1ml ampoule
2.3. *Non-Narcotic Analgesics and Antipyretics*	
Acetylsalicylic Acid	Tablets, 75mg and 300mg
Paracetamol	Tablet, 500 mg Syrup, 125mg per 5ml.

*Representing the therapeutic group.

Name of Drug	Route of Administration Dosage Forms and Strengths
2.4. *Non-Steroidal Anti-inflammatory Drugs*	
Allopurinol	Tablet, 100 mg
Colchicine	Tablet, 0.5 mg
*Ibuprofen	Tablet, 200 mg
3. ANTI-ALLERGICS	
3.1. *Anti-histamines*	
Chlorpheniramine	Injection, 10mg (Maleate) in 1ml ampoule Tablet, 4mg (Maleate) Syrup, 2mg per 5ml
Promethazine	Injection, 25mg and 50mg (Hydrochloride) in and 2ml ampoules respectively Tablet, 25mg (Hydrochloride) Syrup, 5mg per 5ml
3.2. *Anti-Anaphylactics*	
Adrenaline	Injection, 1mg (Bitarattre) in 1ml ampoule
4. ANTIDOTES	
4.1. *Non-Specific (General) Antidote*	
Charcoal, Activated	Powder
4.2. *Specific Antidotes*	
Atropine	Injection, 1mg (Sulphate) in 1ml ampoule
Desferrioxamine	Injection, 500mg (Mesylate) in vial
Dimercaprol	Injection, 50mg/ml in 2ml ampoules
Naloxone	Injection, 40.mg (Hydrochloride) in 1ml ampoule
Protamine Sulphate	Injection, 10mg/ml in 5ml ampoule
Vitamin K1 (Phytomenadione)	Injection, 10mg/ml in 0ml ampoule.
5. ANTI-CONVULSANTS (ANTI-EPILEPTICS)	
Diazepam	Injection, 5 mg/ml in 2ml ampoules
Ethosuximide	Tablet or Capsule, 250mg
Phenobarbitone	Tablets, 30mg and 60mg Syrup, 15mg
Phenytoin Sodium	Tablets or Capsules 50mg and 100mg.
6. ANTI-INFECTIVE DRUGS	
6.1. *Amoebicide*	
Metronidazole	Tablet, 200mg
6.2. *Anthelmintics*	
Mebendazole	Tablet, 100mg
Niclosamide	Tablet, Chewable, 500mg
Piperazine	Tablet, 500mg (Adipate or Citrate) Elixir or Syrup, 500mg/5ml

*Representing theirapetentic group.

Name of Drug	*Route of Administration Dosage Forms and Strengths*
Pyrantel	Tablet, 125mg Syrup, 125mg/5ml
Thiabendazole	Tablet, Chewable, 500mg Syrup, 100mg/5ml
6.3. *Anti-filarial Drugs*	
Diethylcarbamazine	Tablet, 50mg (Citrate) Injection, powder in 1g vial
6.4. *Anti-schistosomal Drugs*	
Metrifonate	Tablet, 100mg
Oxamniquine	Capsule, 250mg
Praziquantel	Tablet, 600mg
6.5. *Anti-trypanosomal Drugs*	
Melarsoprol	Injection, 3.6 *per cent* solution
Pontamidine	Injection, powder, 200mg
Suramin	Injection, powder in 1g vial
6.6. *Anti-malarial Drugs*	
Chloroquine	Tablet, 150mg base (Phosphate or Sulphate) Syrup, 50mg base/5ml (Phosphate or Sulphate) Injection, 200mg in 5ml ampoules
Pyrimethamine	Tablet, 12.5mg and 25mg.
Pyrimethamine plus Sulphadoxine ..	Tablet, 25mg Pyrimethamine plus 500mg Sulphadoxine Syrup, 25mg Pyrimethamine plus 500mg Sulphadoxine/5ml Injection, 10mg Pyrimethamine plus 200mg Sulphadoxine in 2.5ml ampoules.
6.7. *Anti-flagellate Drugs*	
Metronidazole	Tablet, 200mg
Tinidazole	Tablet, 500mg
6.8. *Anti-bacterial Drugs*	
*Ampicillin	Capsules, 250mg and 500mg Powder for Oral suspension, 125mg/5ml Injection, powder in 250mg and 500mg vials (Sodium salt)
Benzyl Penicillin	Injection, powder in 0.6g (1 million units) vial.
**Chloramphenicol	Capsule, 250mg Syrup, 125mg/5ml Injection, powder in 1g vial
Cloxacillin	Capsule, 250mg Syrup, 125mg/5ml Injection, powder in 250mg and 500mg vials.
Fortified Procaine Penicillin ..	Injection, powder in 400,000 units vial, containing : Procaine Penicillin 300,000 units (300mg) and Benzyl Penicillin 100,000 units (60mg)
*Phthalylsulphathiazole	Tablet, 500mg

*Representing the therapeutic group.

Name of Drug	Route of Administration Dosage Forms and Strengths
*Sulphadimidine	Tablet, 500mg Syrup, 500mg/5ml.
Co-trimoxazole	Tablets, 400mg Sulphamethoxazole plus 80mg Trimethoprim, and 100mg Sulphamethoxazole plus 20 mg Trimethoprim Syrup, 200mg Sulphamethoxazole plus 40mg Trimethoprim in 5ml
*Tetracycline	Tablet or Capsule, 250mg (Hydrochloride)
Gentamicin	Injection, 80mg in 2ml vial, 10mg in 2ml vial.
Metronidazole	Injection, 500mg/100ml
Nitrofurantoin	Tablets, 50mg and 100mg
6.9. *Anti-Leprosy Drugs*	
Clofazimine	Capsule, 100mg
**Dapsone	Tablets, 50mg and 100mg
Rifampicin	Capsule, 300mg
6.10. *Anti-tuberculosis Drugs*	
Isoniazid	Tablet, 100mg
Rifampicin	Capsules, 150mg and 300mg
Streptomycin	Injection in 1g and 5g (sulphate) vials.
Thiacetazone plus Isoniazid ..	Tablets Thiacetazone 50mg plus Isoniazid 100mg, and Thiacetazone 150mg plus Isoniazid 300mg.
6.11. *Systemic Anti-fungal Drugs*	
Griseofulvin	Tablet, 125mg
7. Anti-Migraine Drug	
Ergotamine	Tablet, 2mg (Tartrate)
8. Anti-Neoplastic and Immunosuppressive Drugs	
Actinomycin D	Injection, powder in 0.5mg vial
Adriamycin (Doxorubicin)	Injection, powder in 10mg and 50mg vials (as Hydrochloride).
Bleomycin	Injection, powder in 15mg vial (as Sulphate).
Busulphan	Tablet, 2mg
Chlorambucil	Tablets, 2mg and 5mg
Cyclophosphamide	Injection, powder in 100mg and 500mg vials.
6—Mercaptopurine	Tablets, 25mg and 50mg. Tablet, 50mg
Methotrexate	Injection, powder in 50mg vial. Tablet, 2.5mg.
*Prednisolone	Tablet, 5mg
*Stilboestrol	Tablets, 1mg and 5mg.

*Representing the therapeutic group.
**Restricted Use.

Name of Drug	*Route of Administration Dosage Forms and Strengths*
9. ANTI-PARKINSONISM DRUG	
Benzhexol	Tablets, 2mg and 5mg
Biperiden	Injection, 5mg/ml (Lactate) in 1ml ampoule Tablet, 2mg (Hydrochloride)
Levodopa	Tablet, or Capsule, 250mg.
Levobopa plus Carbiopa	Tablets, Levodopa 100mg plus Carbidopa 10mg, and Levodopa 250mg plus Carbidopa 25mg
10. BLOOD, DRUG	
10.1. *Anti-Anaemia Drugs*	
Ferrous Salts	Tablet, equivalent to 60mg iron as fumarate, gluconate or stipuphate Mixresulphate.
	Mixture, 400mg/5ml of Ferric Ammonium Citrate
Folic acid	Tablet, 5mg
10.2. *Anti-Coagulants*	
Heparin	Injection, 1000 units/ml and 25,000 units/ml in 5ml ampoules.
Warfarin Sodium	Tablet, 5mg
10.3. *Plasma Substitute*	
Dextran 70	Injection, solution 6 per cent
10.4. *Plasma Fraction for Specific Use*	
Human Albumin	Injection, solution 20 per cent.
11. CARDIOVASCULAR DRUG	
11.1. *Anti-Anginal Drugs*	
*Glyceryl Trinitrate	Tablet, Sublingual, 0.5mg
*Propranolol	Tablets, 10mg and 40mg (Hydrochloride) Injection 1mg (Hydrochloride) in 1ml ampoule.
11.2. *Anti-arrhythmic Drugs*	
Lignocaine	Injection, 20mg/ml (Hydrochloride) in 5ml ampoule
*Propranolol	Tablets, 10mg and 40mg (Hydrochloride) Injection 1mg Hydrochloride) in 1m ampoule
11.3. *Anti-hypertensive Drugs*	
*Bendrofluazide	Tablet, 5mg
*Hydralazine	Injection, 20mg in 1ml ampoule
Methyldopa	Tablet, 250mg and 500mg
*Prazosin	Tablet, 1mg, 2mg and 5mg
*Propranolol	Tablet, 40mg and 80mg
11.4. *Cardiac Glycoside*	
Digoxin	Tablet, 0.25mg Oral Solution, 0.05mg/ml Injection, 0.25mg/ml in 2ml ampoule

*Representing the therapeutic group.

Name of Drug	Route of Administration Dosage Forms and Strengths
12. DERMATOLOGICAL DRUG	
12.1. *Anti-infective Drugs*	
Neomycin plus Bacitracin ..	Ointment and Cream, 5mg Neomycin sulphate plus 500 units Bacitracin zinc per g of ointment in 5g and 30g tubes.
	Dusting Powder, 0.5 per cent Neomycin sulphate plus 250 units Bacitracin zinc per g.
12.2. *Anti-inflammatory Drug*	
Betamethasone	Ointment or Cream, 0.1 per cent (Valerate)
12.3. *Astringent*	
Calamine plus Zinc oxide ..	Lotion
12.4. *Dusting Powder*	
Zinc, Starch and Talc.	Dusting Powder, containing zinc oxide 25 per cent Starch 25 per cent and Purified Talc. (Sterilised) 50 per cent.
12.5. *Fungicides*	
Benzoic Acid plus Salicylic Acid	Ointment or Cream, 6 per cent plus 3 per cent respectively.
*Clotrimazole	Ointment or Cream, 1 per cent Spray, 1 per cent in aerosol. Pessary, 100mg.
*Nystatin	Oral Suspension, 100,000 units/ml Pessary, 100,000 units/pessary.
12.6. *Keratolytic Drug*	
Salicylic Acid	Solution, topical, 12 per cent in flexible collodion.
12.7. *Scabicide and Pediculicide*	
Benzyl Benzoate	Emulsion, 25 per cent.
13. DIURETICS	
*Bendrofluazide	Tablet, 2.5mg
Frusemide	Tablet, 40mg Injection, 10mg/ml
14. GASTRO-INTESTINAL DRUG	
14.1. *Antacids*	
Aluminium Hydroxide	Tablet, 500mg Mixture, 320mg/5ml
Magnesium Hydroxide	Tablet, 500mg Mixture, 250mg/5ml
Magnesium Trisilicate	Tablet, 500mg Mixture, 250mg/5ml
14.2. *Anti-emetics*	
*Chlorpromazine	Tablets, 25mg and 50mg Injection, 25mg/ml in 2ml ampoule
Promethazine	Tablets, 10mg and 25mg (Hydrochloride) Syrup, 5mg (Hydrochloride)/5ml Injection, 25mg (Hydrochloride)/ml in 2ml ampoule.

*Representing the therapeutic group.

Name of Drug	*Route of Administration Dosage Forms and Strengths*
14.3. *Anti-haemorrhoidals*	
Lignocaine plus Betamesthasone	Ointment, Cream, Suppository
14.4. *Anti-Spasmodic*	
Hyoscine N-butylbromide	Tablet, 10mg Injection, 20mg/ml in 1ml ampoule
+See Formulary section for composition.	
14.5. *Purgatives*	
Bisacodyl	Tablet, 5mg Suppository, 10mg
Magnesium Hydroxide	Mixture
14.6. *Antidiarrhoeals*	
14.6.1. *Symptomatic Relief*	
Kaolin with or without morphine	mixture
14.6.2. *Replacement Fluid*	
Oral Rehydration Salts	Contained in Sachets, for 1 litre of water—
	Glucose (Dextrose) 20g Potassium Chloride 1.5g Sodium Bicarbonate/Citrate 2.5g Sodium Chloride 3.5g
14.7. *Gastric and Peptic Ulcer Drugs*	
Cimetidine	Tablet, 200mg
Ranitidine	Tablet, 150mg
15. HORMONES AND SYNTHETIC SUBSTITUTES	
15.1. *Adrenal Hormones and Synthetic Substitutes*	
Dexamethasone	Tablets, 0.5mg and 4mg
Hydrocortisone	Injection, 2ml/ml in 2ml ampoule Injection, powder in 100mg vial, (as Sodium Succinate).
Prednisolone	Tablets, 1mg and 5mg
15.2. *Androgen*	
Testosterone	Injection, 200mg (Enantate) in 1ml ampoule, and 25mg (Propionate) in 1ml ampoule
15.3. *Oestrogen*	
15.4. *Antidiabetics*	
15.4.1. *Insulins*	
Insulin Zinc Suspension (Lente)	Injection, 40 and 80 units/ml
*Representing the therapeutic group.	
*Ethinyloestradiol	Tablets, 0.01mg and 0.02mg
*See Formulary section for composition.	

Name of Drug	Route of Administration Dosage Forms and Strengths
Soluble Insulin	Injection, 40 and 80 units/ml.
15.4.2. *Oral Antidiabetics*	
*Chlorpropamide	Tablet, 250mg.
Metformin	Tablet, 500mg.
15.5. *Thyroid Hormones and Antagonists*	
15.5.1. *Thyroid Hormone*	
Laevothyroxine	Tablets, 0.05mg and 0.1mg (Sodium salt).
15.5.2. *Antithyroid Drugs*	
Carbimazole	Tablet, 5mg
Iodine plus Potassium Iodide ..	Solution, containing 5% Iodine and 10% Potassium, Iodide in purified water.
15.6. *Oral Contraceptives*	
Ethinyloestradiol plus Laevonorgestrel	Tablet, 0.03mg Ethinyloestradiol plus 0.15mg Laevonorgestrel.
Ethinyloestradiol plus Norethisterone	Tablet, 0.05mg Ethinyloestradiol plus 1mg Norethisterone.
15.7. *Ovulation Inducer*	
Clomiphene	Tablet, 50mg (Citrate).
15.8. *Progestogen*	
*Norethisterone	Tablet, 5mg.
16. Ophthalmological Drugs	
16.1. *Anti-infective Drugs*	
Chloramphenicol	Eye Drops, 0.5% Ointment, 1%
Sulphacetamide	Eye Drops, 30%, 10% Ointment, 10%
Chlortetracycline	Eye Ointment, 1%
16.2. *Anti-inflammatory Drugs*	
*Betamethasone	Eye Drops and Ointment, 0.1%
Oxyphenbutazone	Eye Ointment, 10%
Tetrahydrozoline	Eye Drops, 0.05%
16.3. *Local Anaesthetic*	
Amethocaine	Eye Drops, 0.5% and 1% (Hydrochloride)
16.4. *Miotics and Anti-glaucoma Drugs*	
Pilocarpine	Eye Drops, 1%, 2%, 3% and 4%
Physostigmine	Eye Drops, 0.25% and 0.5%
16.5. *Mydriatics*	
Homatropine	Eye Drops, 1% and 2%
Tropicamide	Eye Drops, 0.5% and 1%

*Representing the therapeutic group.

Name of Drug	Route of Administration Dosage Forms and Strengths
16.6. *Systemic Drug*	
Acetazolamide	Tablet, 250mg.
17. Oxytocics	
Ergometrine	Tablet, 0.5mg.
Oxytocin	Injection, 0.5mg/ml in 1ml ampoule. Injection, 5 and 10 units/ml.
18. Psychotherapeutic Drugs	
*Amitriptyline	Tablets, 25mg and 50mg (Hydrochloride).
*Chlorpromazine	Tablets, 25mg, 50mg and 100mg (Hydrochloride). Syrup, 25mg/5ml (Hydrochloride). Injection, 25mg/ml (Hydrochloride) in 2ml ampoule.
*Diazepam	Tablets, 2mg and 5mg. Syrup, 2mg/5ml. Injection, 5mg/ml in 2ml ampoule.
Fluphenazine	Injection, 25mg (Deoanoate or Enantate) in 1ml ampoule.
Haloperiodol	Tablets, 1.5mg and 5mg. Injection, 2mg/ml and 5mg/ml.
*Nitrazepam	Tablet or Capsule, 5mg.
19. Respiratory Tract, Drugs	
19.1. *Anti-asthmatic Drugs*	
Andrenalin	Injection, S. C., lmg/ml in lml ampoules.
Aminophylline	Injection, 25mg/ml in 10ml ampoules.
Beclomethasone	Oral inhalation, Aerosol, 0.05 mg (Dipropionate) per dose.
Hydrocortisone	Injection, 100 mg vial.
Ketotifen	Tablet or Capsule, lmg, Syrup, lmg5/ml
*Salbutamol	Tablets, 2mg and 4 mg Syrup, 2 mg/5ml, Inhalation, metered aerosol 0.1mg per dose.
Ephedrine plus Hydroxyzine plus Theophylline	Tablet or Syrup, containing : Ephedrine 25mg, Hydroxyzine 10 mg, Theophylline 30mg per tablet or per 5 ml syrup.
19.2. *Anti-Tussive*	
*Codeine	Tablet, 10 mg (Phosphate) Syrup, 5 mg (Phosphate) /5ml.
20. Preparations for Correcting Water, Electrolyte and Acid-Base Disturbances	
20.1. *Oral Rehydration Salts*	
Oral Rehydration Salts	Contained in Sachets, for 1 litre of water : Glucose (Dextrose) .. .. 20g Potassium Chloride .. .. 1.5g Sodium Bicarbonate/Citrate 2.5g Sodium Chloride 3.5g
Potassium Chloride	Tablet, slow release, 600mg Oral Solution.

*Representing the therapeutic group.

Name of Drug	*Route of Administration Dosage Forms and Strengths*
20.2. *Parenteral Preparations*	
Glucose	Injection, 5% isotonic ; 50% hypertonic.
Glucose with Sodium Chloride	Injection, 4.3% Glucose with 0.18% Sodium Chloride.
Potassium Chloride	Injection, 10% in 10 ml ampoules.
Sodium Bicarbonate	Injection, 1.4% isotonic.
Sodium Chloride	Injection, 0.9% (Normal Strength) 0.45% (Half Normal Strength).
Sodium Lactate Compound Solution	Injection, solution.
Water for Injection	Injection, 2ml, 5ml and 10ml ampoules.
21. IMMUNOLOGICALS	
21.1 *Sera and Immunoglobulins*	
Anti-D-Immunoglobulin (Human)	Injection, 0.25 mg/ml.
Anti-rabies Hyper-immune (Serum)	Injection, 1000 units in 5ml ampoule.
Anti-snake Venom	Injection, Polyvalent, in 10 and 20ml ampoules.
Tetanus Antitoxin	Injection, 50,000 units in vial and 1,500 units/ml in 1ml ampoules.
21.2 *Vaccines*	(All vaccines should comply with the WHO Requirements for Biological Substances).
21.2.1. *For Universal Immunization*	
B. C. G. vaccine (dried) ..	Injection.
Diphtheria-Pertussis—Tetanus vaccine	Injection.
Measles vaccine	Injection.
Poliomyelitis (live attenuated) vaccine	Oral Solution.
Tetanus vaccine	Injection.
21.2.2. *Vaccines for Specific Indications*	
Cholera vaccine ..	Injection.
Meningococcal vaccine	Injection.
Rabies vaccine	Injection.
Yellow fever vaccine	Injection.
22. ANTISEPTICS	
+Benzoin	Compound Tincture of :
Chlorhexidine	Solution, 5% (Gluconate), for dilution.
Chloroxylenol	Solution, 5%.
+Iodine	Solution, Different preparations.
23. VITAMINS AND MINERALS	
Retinol (Vitamin A)	Tablets or Capsules, 1.5 mg (5,000 units) 7.5 mg (25,000 units)
Thiamine (Vitamin B1) ..	Tablets, 25 mg and 50 mg Injection, 25mg/ml in 1ml ampoule.

+*See* Formulary section for composition.

Name of Drug	Route of Administration Dosage Forms and Strengths
Pyridoxine (Vitamin B6)	Tablet, 10 mg
Vitamin B Complex	Tablet, containing : Nicotinamide, 20 mg Thiamine, 5 mg Riboflavine, 2 mg Pyridoxine, 2 mg
Ascorbic Acid (Vitamin C)	Tablets, 100 mg and 500 mg
Ergocalciferol (Vitamin D)	Tablets or Capsules. 0.25 mg (10,000 units) 1.25mg (50,000 units)
24. Ear, Nose and Throat Drugs	
24.1. *Ear Anti-infective*	
Chloramphenicol	Ear Drops, 5%
24.2. *Combined Anti-infective and Anti-inflammatory Drugs*	
Hydrocortisone plus Neomycin	Ear Drops, Hydrocortisone 1.5 per cent (Acetate) plus Neomycin 0.5 per cent (Sulphate)
Hydrocortisone plus Oxytetracycline plus Polymyxin B	Ear Drops, Hydrocortisone 1.5 per cent (Acetate) plus Oxytetracycline 0.5 per cent (Hydrochloride) plus Polymyxin B 0.119 per cent (Sulphate)
24.3. *Removal of Ear Wax*	
Glycerol plus Sodium Bicarbonate	Ear Drops, Containing : 5g Sodium Bicarbonate and 30 ml Glycerol in 100 ml solution
24.4. *NOSE-Antiallergic and Nasal Decongestants*	
Antazoline plus Naphazoline	Nasal Drops or Spray, containing 0.5 per cent Antazoline plus 0.025 per cent Naphazoline.
25. Dental Drugs	
+Benzocaine	Lozenges, 10 mg
Lignocaine	Dental Cartridges, 2 per cent with 1 : 80,000 Adrenaline
+Glycerol	Mouth wash
+Phenol	Mouth wash
+ Thymol	Mouth wash
26. Peritoneal Dialysis Solutions	
Intraperitoneal Dialysis Solution of appropriate composition	Parenteral Solution
27. Diagnostic Agents	
27.1. *Diabetes mellitus*	
Glucose Oxidase Reagent	Cellulose Strips Clinistix (R) Dextrostix (R)

+*See* Formulary section for composition.

Name of Drug	Route of Administration: Dosage Forms and Strengths
27.2. *Gastric Function*	
Histamine Phosphate	Injection, 2.75mg (Phosphate) per ml in 1 ml ampoule
Pentagastrin	Injection, 0.25mg per ml in 2 ml ampoule.
27.3. *Myastheniagravis*	
Edrophonium	Injection, 10mg (Chloride) in 1ml ampoule. Tensilon (R)
27.4. *Opthalmology*	Eye drops, 2 per cent (Sodium salt).
27.5. *Radio-contrast Media*	
27.5.1. *Alimentary tract*	
+Barium Sulphate	Suspension, 75-100 per cent w/v
27.5.2. *Oral Cholecystography*	
*Iopanoic Acid	Tablet, 500mg Telepaque (R)
27.5.3. *Intravenous Cholecystography*	
Meglumine Iodipamide ..	Injection, 52 per cent in 20 ml ampoule. Biligrafin (R) Cholografin (R)
7.5.4. *Urography*	
Meglumine Diatrizoate ..	Injection, 60 per cent in 20 ml ampoule. Urografin (R)
Sodium Diatrizoate	Injection, 50 per cent in 20 ml ampoule. Hypaque (R)
27.5.5. *Angiography*	
Meglumine Iothalamate ..	Injection, 60 per cent in 20 ml ampoule. Conray (R)
Sodium Iothalamate	Injection, 80 per cent in 20 ml ampoule. Angio-Conray (R)
27.5.6. *Myelography*	
Iophendylate	Injection, 1 ml and 3 ml ampoules. Myodil (R)

+ *See* Formulary section for compositions.
*Representing the therapeutic gronp.

Section II

ESSENTIAL DRUGS FOR PRIMARY HEALTH CARE

INTRODUCTION

For many patients in Nigeria particularly those living in rural areas, but also, to some extent, those living in urban areas, the health care centre of first contact is usually staffed by health workers other than doctors. These so-called primary health workers have a responsibility for treating a wide variety of endemic diseases and managing acute symptoms and emergencies without immediate recourse to specialist medical advice. These health workers are also sometimes involved in the implementation of nationally organised health care programmes in the fields of immunization, family planning, material and child health, and control of communicable and endemic diseases.

Most primary health workers are authorised to dispense a limited range of drugs at their own discretion for common, self-limiting conditions or common endemic diseases, and to provide maintenance treatment to chronically ill patients under the remote control of a doctor. It is important that these workers are able to appreciate the significance of serious acute symptoms and able to make informed intervention when necessary, or arrange for a referral to hospital as safely as possible. It is also important that these workers keep strictly within the limits of their competence.

A subsidiary list of Essential Drugs for Primary Health Care has been compiled with the above consideration in mind. The selected drugs would vary from one health centre to another depending on the competence of available personnel and the local disease pattern, but within the entire list it should be possible to satisfy the requirements of most primary health centres.

In the case of nationally organised health care programmes like the Expanded Programme on Immunization, Family Planning, etc. both the selection of the drugs and the criteria for their administration would be determined within the context of the centrally-directed programme, and the personnel involved should be given adequate instructions on how to use them on a safe and rational basis.

Part II

THE PRIMARY HEALTH CARE LIST

Anaesthetics Local	Lignocaine, topical, injections.
Analgesics	Acetylsalicylic acid, tablet, Paracetamol tablet.
Anti-Allergics	Chlorpheniramine, tablet, syrup, Promethazine, tablet.
Antidote	Charcoal, Activated, powder.
Anti-Convulsant Drug	Diazepam, injection.
Anti-Infective Drugs	Chloroquine, tablet, syrup, injection. Metronidazole, tablet Piperazine, tablet syrup Pyrontel tablet, syrup Sulphadimidine tablet, syrup.
Drugs Affecting Blood	Iron, tablets, mixtures. Folic acid, tablet.
Dermatological Drugs	Neomycin plus Bacitracin, dusting powder. Calamine Lotion. Benzoic acid plus Salicylic acid, ointment cream.
Gastrointestinal Drugs	Magnesium Trisilicate Compound, tablet, mixture. Lignocaine plus Betamethasone, ointment, cream suppository. Hyoscine N-buytlbromide, tablet.
Hormones	Oral Contraceptives.
Ophthalmological Drug	Chlortetracycline, eye ointment.
Oxytocic	Ergometrine, tablet, injection.
Respiratory Tract Drug	Ephedrine plus Hydroxyzine plus Theophylline, tablet.

Water/Electrolyte Balance	Oral Rehydration Salts.
Immunologicals	Anti-snake Venom, injection. Tetanus Antitoxin, (ATS), injection. Tetanus Vaccine, injection. BCG Vaccine, injection. DPT Vaccine, injection. Poliomyelitis Vaccine, oral solution.
Antiseptics	Chlorhexidine, solution. Iodine, solution.

*The types of oral contraceptives distributed under primary health care programme will be determined by the prevailing National Family Planning Policy.

SCHEDULE 2

(*Section* 11)

THE DRUG FORMULARY

CHAPTER 1

GUIDANCE ON PRESCRIBING

1. Prescription Writing

A medical prescription should contain essentially the following :

1.1. Name, sex and address of patient.

1.2. Age of patient.

1.3. The name and dosage form of the drug.

1.4. The dose, frequency and duration of administration.

1.5. The date of prescription. If a prescription is presented for dispensing several weeks after it was written, the prescriber should be consulted for advice before dispensing. The clinical situation might have changed in the interval and the prescription might no longer be appropriate.

1.6. Name, signature and address of the prescriber.

Names of drugs are best written out in full and quantities should be stated in the Metric System. Accepted abbreviations are :

gram	g
milligram	mg
microgram	mg
litre	l
millilitre	ml

To avoid unnecessary errors in dispensing, when the dose is less than one gram, it should be written in milligram, e.g. 100 mg and not 0.1g

For household measures, a drop is about 0.05 ml, a teaspoonful about 5 ml and a standard drinking glass about 250 ml. In order to avoid confusion, especially to the illiterate, Doctors and Pharmacists are advised to demonstrate normal size models of a teaspoon and drinking glass to patients requiring these measures. "Tablespoonful" should be avoided altogether since it is usually confused with "desertspoonful".

2. Quantities of Preparations

The following list is a useful guide to quantities to be dispensed when not specified :

2.1. *Liquid Preparations*

Adult mixtures (10 ml dose)	200 ml (20 doses)
	300 ml (30 doses)
Paediatric mixtures (5 ml dose)	50 ml (10 doses)
Elixirs and Linctuses (5 ml dose)	50 ml (10 doses)
	100 ml (20 doses)
	150 ml (30 doses)
Ear, eye and nasal drops (0.05 ml per drop)	10 ml
Gargles, mouth washes and eye lotions	200 ml
Inhalations and sprays	25 ml
Liniments	100 ml

2.2. *Dermatological Preparations*

	Creams and Ointments	*Lotions*
Face	5-15g	100 ml
Both hands and feet	25-50g	200 ml
Both arms or both legs	100-200g	200 ml
Body	200g	500 ml
Groins and genitalia	15-25g	100 ml
Dusting powders	50-100g	
Paints		10-25 ml

Hydrocortisone, prednisolone and other corticosteroid preparations should be applied sparingly. Their ointments are usually available in 5 and 15g containers, and lotions in 20 ml containers.

3. Prescribing for Children

In their response to drugs, children very often differ from adults, and this fact should be borne in mind when prescribing for children. The doses of liquid preparations and pleasantly tasting mixtures that are particularly appealing to children are given in the formulary, whenever possible, for different age groups, for example : up to 1 year ; 1 to 5 years and 6 and 12 years. In other instances, it is advisable to take the weight into consideration when determining doses for children. *GENERAL WARNING*: Parents should be warned to keep all medicines out of the reach of children in order to avoid accidental poisoning.

4. Prescribing for the Elderly

Particular care should be taken in prescribing for the elderly. As a rule treatment should be initiated at a lower dosage level than in younger patients and side effects should be carefully looked for and not misinterpreted as new manifestations of the disease.

Elderly patients in general tend to be forgetful and this may result in inadvertent overdosage by the patient. Drug with low therapeutic index, e.g. digoxin, should therefore be prescribed with caution ; doses should be as low as possible and the quantity of drugs supplied at a time should be small.

5. Supplying Schedule 1, Part III Poisons

The Schedule 1, Part III poisons are available to patients on prescription only. The group includes such classes of drugs as antibiotics, sulphonamides, harbiturates, hormones, steroids, and arsenicals. The law requires that prescriptions for these classes of drugs shall be in writing, signed by the prescriber and must include his name and address as well as those of the patient. In addition, the total amount of medicine supplied and the dose to be taken must be stated. If the prescriber is a dentist, the prescription must also bear the words "For Dental Treatment Only".

The prescription must not be dispensed more than once unless so indicated by the prescriber. There must be noted on the prescription, the name and address of the pharmacist and the date on which the prescription is dispensed. The dispensed prescription must be retained for a period of two years and kept on the premises of which it was dispensed in such a manner as to be readily available for inspection.

6. Prescribing Dangerous Drugs and Other Controlled Substances

The law requires that :

(*i*) The prescription must be written by hand, in ink or otherwise so as to be indelible, dated and signed by a registered medical practitioner or dentist with his usual signature and address.

(*ii*) The name and address of the patient must be specified and the total quantity of drugs to be supplied indicated.

(*iii*) The prescription must not be for the use of the prescriber.

(*iv*) Dentists must mark their prescriptions "For Dental Treatment Only".

(*v*) The Federal Ministry of Health may authorise and issue an official form for use in giving prescriptions for dangerous drugs. In that case a prescription for these drugs shall only be given on such forms.

7. Emergency Supply of Dangerous Drugs and Poisons Towards, Theatres and Out-Patients Departments

The pharmacist must supply these only upon a written order signed by a doctor, dentist or the nursing sister in-charge of the ward, theatre or out-patient department.

A requisition shall be marked in the dispensary to show that the supply has been made and shall be filed by the pharmacist and a copy or note of the requisition shall be kept by the nursing sister in-charge.

The containers must be labelled with a distinguishing mark indicating that the drugs are to be stored in a cupboard reserved solely for the storage of Dangerous Drugs and Poisons.

A record must be kept by the nursing sister in-charge, from which there can be traced during the two years after the date of the supply, the names and quantities of the poisons, the names and addresses of the patients and the names of the prescribers.

Special record books to be used for this purpose are obtainable from the Federal Medical Stores, Federal Ministry of Health, Oshodi, Lagos.

8. Drugs of Dependence Addiction

Narcotic analgestics sedatives, hypnotics, tranquillizers, antidepressants and almost all drugs prescribed for their action on the central nervous system are capable of producing a state of dependence in subjects to whom they are administered repeatedly in sufficient dosage. The type of dependence, its severity, symptoms and the presence or absence of withdrawal symptoms will be characteristic of the drug being used.

All substances controlled under the Dangerous Drugs Act (DDA; Cap. 48—Laws of Nigeria) are capable of causing dependence. Similarly, all powerful new analgestics should, be prescribed with care even though they are not on the DDA list. The risk of dependence, varies with the personality of the patient concerned, and as there is no really reliable way to determine such individual risks, it is best to be circumspect about these drugs and patients to whom they are given.

The prescriber should be aware of the patient who :

(*i*) demands "his usual prescription".

(*ii*) claims to obtain better relief from self-increased dosage, and who has found it necessary to buy more drugs, in between visit.

The prescribing of all such drugs calls for caution. It must be ensured that the amount obtained by the patient at any one time and the frequency of renewal of supplies are in agreement with the prescriber's good clinical judgment, especially where medical, dental and other health care workers are involved.

Dependent patients are usually insistent and coercive. They resort to all sorts of methods to obtain supply, e.g. consulting more than one doctor, fabricating stories to substantiate demands and forging prescriptions. They may even resort to stealing the drugs. To guard against these risks :

(*i*) Lock up all prescription forms.

(*ii*) Draw a diagonal line across the blank part of the Form under the prescription.

(*iii*) Write the quantity in words when prescribing drugs prone to abuse.

(*iv*) Add initials against altered items on prescriptions.

(*v*) Double check by writing on both the prescription card and in the clinical notes. Appropriate records should also be kept where necessary, e.g. in the pharmacy, Wards, Casualty, etc.

8.1. *Prevention and Treatment.*—Treatment of drug dependence is extremely difficult and frustrating. It is essential, for success, that the patient be motivated to desire treatment which usually requires special skills and facilities. It is therefore THE DUTY OF THE DOCTOR TO AVOID, SO FAR AS IS POSSIBLE, THE PRODUCTION OF NEW CASES OF DRUG DEPENDENCE. This he can do by paying rigorous attention to the points above, and by only prescribing dependence—producing drugs when essential, (e.g. not prescribing pethidine just to induce sleep in the absence of pain or merely to keep a psychotic patient quiet). In incurable and terminal conditions associated with considerable pain, morphine and similar analgesics should, of course, not be withheld. On the other hand in hypochondriasis, neurosis, etc. prolonged treatment with these centrally active drugs should not be regarded as a substitute for psychiatric care.

CHAPTER 2

EMERGENCY TREATMENT OF POISONING

1. General Measures

In the treatment of acute poisoning, success depends largely on a combination of speed and commonsense as well as on the poison, the amount taken and the time which has elapsed. The principles of treatment may be outlined as follows :

1.1. *Identification of the Poison.*—This will help if it is immediately possible, but if not, no time should be wasted as successful treatment may not depend on specific antidotes.

1.2. *Removal of the Poison* :

1.2.1. *External.*—Skin contamination by chemicals can lead to systemic poisoning. Contaminated clothes should be stripped off and the skin washed with soap and water, sodium bicarbonate, vinegar or alcohol as appropriate.

1.2.2. *Internal.*—If poison has been swallowed, removal should be by (*i*) emesis ; in conscious patients only ; this is induced by inserting two fingers into the back of the throat or if this fails, by giving a cup of tepid water in which two teaspoonfuls of salt have been dissolved or by administration of an emetic ;

(*ii*) gastric aspiration or lavage especially if patient will not vomit. The fluid obtained should be kept for analysis. Special care should be exercised in patients with corrosive poisoning, in alcoholics, in patients who have had gastric surgery, and in the elderly.

Warning.—If patient has swallowed paraffin (kerosene) or other petroleum distillates, emetics and lavage should not be used since attempts to remove them are likely to introduce some into the lungs where they are more damaging than in the gut. In the deeply unconscious patient, lavage should only be undertaken after protecting the lungs by insertion of a cuffed endotracheal tube.

1.3. *Prevention of further absorption of the poison that cannot be removed.*

(*a*) *From puncture site.*—Use of tourniquet is recommended ; e.g. for snake bites.

(*b*) *From the gut.*

(*i*) Specific antidotes which combine chemically with the poison are useful, e.g. use of alkalis to neutralize acid.

(*ii*) Non-specific antidotes, mostly demulcents, e.g. raw eggs, milk, kaolin, flour and activated charcoal are useful.

1.4. *Promotion of excretion of the poison.*—Elimination of drugs that are excreted by the kidney is promoted by good urine volume which can be achieved by giving maximum safe amounts of fluid and a diuretic. Sometimes, alteration of urinary pH can be particularly helpful, as in the excretion of acidic drugs, e.g. Sulphonamides, barbiturates, salicylates (alkaline urinary pH enhances), and excretion of basic drugs, e.g. chloroquine, ephedrine, pethidine (acidic urinary pH enhances).

2. Notes on some Common Poisonings

2.1. *Acetylsalicylic acid.*—The main features of poisoning are nausea with or without vomiting, epigastric pain, dizziness, mental confusion, visual disturbances profuse perspiration, rapid and feeble pulse, hyperventilation.

Treatment consists of early and repeated gastric lavage with water, and forced alkaline diuresis. In children with every severe poisoning, exchange transfusion may be performed.

2.2. *Corrosive Acids.*—(Including hydrochloric acid, nitric acid, sulphuric acid). There is corrosion of the lips, mouth and tongue, pain in the disgestive tract, intense thirst, dysphagia, nausea and vomiting, rapid and feeble pulse, clammy skin, shallow and difficult respiration, collapse and convulsions.

Treatment consists of administration of milk of magnesia, lime water, or soap solution, followed by milk, egg albumen or olive oil, and morphine (for pain). Alkaline carbonaest (chalk, magnesium carbonate, sodium carbonate, etc). May be used in emergency but are better avoided in poisoning by concentrated acids since they liberate carbon dioxide which, may cause gastric distension and perhaps perforation. Stomach tube or emetics should also be avoided.

2.3. *Alkalis.*—(Including caustic potash, caustic soda, strong ammonia, etc). There is pain in the mouth, throat and abdomen, swollen lips and tongue, vomiting, diarrhoea, cold and clammy skin, rapid and weak pulse, and shock.

Treatment.—Consists of administration of vinegar or lemon juice or solutions of citric or tartaric acid to neutralize the alkali ; followed with milk, olive oil, or egg albumen and morphine for pain. Emetics and gastric lavage are best avoided.

2.4. *Amphetamines and allied drugs.*—Patient is flushed and excitable and may become delirious and violent, there may also be convulsions and coma.

Treatment consists of gastric lavage followed by chlorpromazine 25-100 mg intramuscularly. In severe cases, forced chorid diuresis is required.

2.5. *Tricyclic antidepressants.*—(e.g. imipramine, nortriptyline, and amitriptyline). Symptoms of poisoning include dry mouth, mydriasis, hypotensive collapse, convulsions, tachycardia, bradycardia and cardiac arrest.

Treatment.—Consists of gastric lavage and saline catharsis if there is not coma. ECG monitoring is essential. Acidosis is treated with *M*/6 sodium lactate, 20 ml per kg body weight administered by slow intravenous infusion. The convulsion is treated with diazepam 10 mg i.v. or i.m. repeated four hourly. Cardiac effects may be controlled by pyridostigmine 1 mg intravenously or propranolol 1 mg intravenously repeated several times. Reduced doses are necessary for children.

2.6. *Barbiturates and other sedatives.*—There is giddiness, mental confusion, ataxia, delirium, coma, marked fall in blood pressure, depression of respiration, increase or decrease in body temperature, moderately dilated pupils, absence of corneal reflex, cyanosis and renal failure.

Treatment.—Consists of emesis, gastric lavage, artificial respiration, administration of oxygen and dextrose saline (i.v.).

Forced diuresis may be considered especially in severe poisoning due to long-acting barbiturates.

2.7. *Bleaching solution.*—(Including sodium hypochlorite solution and hypochlorous acid). Inhalation of the fumes causes severe pulmonary irritation with coughing and choking followed by pulmonary oedema. Ingestion causes irritation and corrosion of mucous surfaces oedema of the pharynx and larynx, nausea and vomiting.

Treatment.—Involves removing the bleaching solutions from the skin by washing with water. Ingested solution is removed by gastric lavage or emesis using sodium bicarbonate solution (1 in 40). This is followed by sodium sulphate 30 G and sodium bicarbonate 8 G in 25 ml of water and a cathartic. Acid antidotes should not be used.

2.8. *Boric Acid.*—In acute poisoning, the symptoms which develop slowly, beginning about eight hours after ingestion, are nausea and vomiting, diarrhoea and prostration leading, to convulsions. Increasing shock, accompanied by subnormal temperature and cold sweat eventually leads to collapse.

Absorption of boric acid through continual use as ointment, lotion or powder, produces slight but cummulative effects.

Infants are particularly susceptible and even the cleansing of the nipples of nursing mothers with solutions of boric acid can have disastrous results. Boric acid powder should never be applied undiluted to infants and the proportion in dusting powders should not exceed 5%.

Treatment.—Poisoning with boric acid is treated by the administration of oxygen and artificial respiration to relieve respiratory difficulty. Emergency treatment of acute poisoning as a result of ingestion is by emesis or gastric lavage. The patient should be kept warm and quiet and given hot coffee or milk.

2.9. *Carbolic acid.*—(Including other phenols, lysol, creosote, etc.). Symptoms are whitened lips and mouth burning pain occurring from the mouth to the stomach, constricted pupils, cold and clammy skin, subnormal temperature, feeble pulse, contracted and rigid abdomen and urine which turns black on standing. Accidental poisoning may occur also by skin absorption.

Treatment.—Consists of gastric lavage with a copious quantity of water to which lime water is added. Milk, egg albumin or other demulcent are given later ; artificial respiration may be necessary.

If contamination is external, it is advisable to remove clothing and to wash the skin immediately with glycerine or alcohol.

2.10. *Kerosene and petroleum products.*—These cause restlessness with ataxia, coughing and choking of rapid onset with nausea, vomiting and diarrhoea. Drowsiness may develop. In severe cases, dyspnoea, cyanosis and pyrexia may occur especially if inhalation and ingestion have taken place together.

Treatment.—It is advisable not to induce vomiting as the aspiration of even 1.0 ml of any of these products into the lungs can lead to pneumonitis. Their absorption can be slowed down by giving 250 ml of liquid paraffin orally. Antibiotics are indicated in full doses for prophylaxis against pheumonia.

2.11. *Iron Salts.*—Iron poisoning occurs mainly among children who swallow the tablets that have been left within their reach. The symptoms of poisoning are gastrointestinal irritational pallor, a feeling of cold, retching, vomiting, drowsiness and restlessness.

Treatment—There must be intensive and specific therapy as mortality is always high. The effective antidote is desferrioxamine which produces an inactive chelate with iron. Emesis is induced as soon as possible and the stomach washed out with sodium bicarbonate solution 1 per cent. A solution of 10 g desferrioxamine in 50 ml water should be left in the stomach. Where treatment has been delayed for severe poisoning, desferrioxamine should be infused intravenously at the rate of 15 mg per kg body weight per hour to a maximum of 80 mg per kg body weight in 24 hours.

2.12. *Snakes Bites*—Venomous snakes are included in four families, the *Hydrophidae* (sea snakes), the *Elapidae*, the *Colubridae* and the *Viperidae*. The venom of sea snakes is predominantly myotoxic, that of colubrides is neurotoxic and that of viperides are haemotoxic and neurotoxic. The venoms contain proteolytic, haemolytic and cytolytic, enzymes. The most poisonous African snakes are *Viperidae : Bitis* (*arientis, gabonica, nasicornis*), *Echis carinatus* and *Causus rhombeatus* ; and *Elapidae* : *Naja* (*melanoleuca nigricollis, haje*), *Dendraspis* (*angusticeps, jamesoni, viridis*) and *Sepedon haemachates*—spitting cobra.

The effects of snakes bite on man depend on the variety of snake, the site of the bite, the state of health of the snake and the efficiency and duration of bite. Fortunately, most bites do not allow the venomous snake enough time to discharge a full dose of its poison and so victims have minimal or no poisoning. If instead of the venom being injected subcutaneously as usually occurs, the fang penetrates a vein, so that the injection is intravenous, very severe poisoning or instant death usually results.

Anti-snake venom.—Due to the variety of poisonous snakes with individual venoms in Africa, and in the usual circumstances where the offending snake cannot be caught for identification, polyvalent anti-venom sera are preferred to specific antisera.

Medical treatment of snake bite.—It is necessary to give firm reassurance to the victim. Tourniquet should be applied to the site of bite to delay absorption and spread of venom. The site of the bite should be wiped and covered with cloth or dressing.

Only symptomatic treatment is required for victims who show little or no clinical evidence of poisoning. It is however advisable to give anti-venom because there may be delayed reaction. Dosage : 20-100 ml Polyvalent anti-snake venom i.v.

A subcutaneous trial dose of 0.2 ml anti-venom should be given and the patient observed for signs of anaphylaxis for 30 minutes before the therapeutic dose is injected. If this is not practicable, the administration of ml 1 of 1 :1000 adrenaline instranmuscularly given at the same time, to lessen the risk of anaphylaxis is strongly recommended.

It is however best to check the manufacturer's literature before use.

CHAPTER 3

CLASSIFIED NOTES ON DRUGS AND PREPARATIONS

1. CENTRAL NERVOUS SYSTEM DRUGS

Drugs acting on the Central Nervous System are discussed under the following headings :

1.1. Analgesics.
1.2. Anti-migraine Drugs.
1.3. Hypnotics and Sedatives.
1.4. Anti-convulsants (Antiepileptics).
1'5. Anti-depressants.
1.6. Anti-psychotics (Major Tranquillisers).
1.7. Anti-parkinsonism Drugs.

1.1. *Analgesics.*—There are two main types of analgesics, namely narcotic and non-narcotic analgesics. Drugs in this sub-section are discussed under the following headings—

1.1.1. Narcotic Analgesics.
1.1.2. Narcotic Antagonists.
1.1.3. Non-narcotic Analgesics.

1.1.1. *Narcotic Analgesics.*—These are powerful drugs which act on the opioid receptors in the brain and they are used for severe pain from any site including the viscera. They include the following—

MORPHINE

Dosage form.—Injection 10mg/ml, usually as sulphate or hydrochloride.

Pharmacological properties.—Binds to opioid receptors and its main actions are in the C.N.S. Its analgesic effect is usually accompanied by sedation and mental detachment or euphoria. After subcutaneous injection analgesia starts within fifteen minutes and lasts for about six hours. It depresses respiration and causes nausea and vomiting. It increases the tone of intestinal muscles.

Uses.—Most valuable narcotic analgesic against severe pain, e.g. post-surgery and post-trauma, 10-20mg s.c. or i.m. 6 hourly.
Preoperative medication, 10-20 mgs.c.
Left ventricular failure and pulmonary oedema, 4-10mg i.v. slowly.
Terminal pain of cancer, 10-20mg 4 hourly.
Cough and Diarrhoea.

Precautions and Contraindications.—Avoid in labour because it causes respiratory depression in the new-born ; in ast hma and chronic bronchitis. Do not give i.v. unless a narcotic antagonist is readily available.

Adverse Reactions.—Nausea, vomiting, constipation, respiratory depression, apnoea, hypotension, peripheral circulatory collapse, allergic reactions, tolerance and addiction.

Dosage—By subcutaneous or intramuscular injection, 10-20mg Children's dose must be reduced proportionately.

Doses may be repeated 4 to 6 hourly.

Overdosage.—Symptoms and Signs : Acute overdosage leads to respiratory depression with pin-point pupils, coma and death. Treat with 0.4mg naloxone given i.v. every 3 minutes for 3 doses after establishing a patent airway. Chronic abuse leads to addiction. Tolerance does not usually develop to its miotic and constipating effects. Withdrawal symptoms include lacrimation, rhinorrhoea, yawning, and sweating, occurring within 8-12 hours of the last dose. After about 12-14 hours the addict falls into a "yen" sleep from which he wakes, becoming more restless. Then there is mydriasis, anorexia, goose flesh, irritability and tremor. After about 48-72 hours there is insomnia, coryza, depression, sweating, tachycardia, vomiting, goose flesh, abdominal cramps, pains in bones and muscles and kicking movements with ejaculation in men and orgasm in women. Terminally there is dehydration, ketosis and shock. Treatment is by methadone substitution after rehydration.

PETHIDINE

Dosage form.—Injection, 50mg and 100mg in 1ml and 2ml ampoules respectively.

Mode of Action.—Narcotic analgesic.

Pharmacological properties.—Binds to opioid receptors and its main actions are in the CNS. After oral administration the onset of analgesic effect is within 10 minutes and peak effect is reached in about 1 hour. Duration of analgesic effect is shorter than that of morphine, being about 2 to 4 hours. It is less spasmogenic than morphine.

Uses.—Deep seated pain, e.g. post-surgery, trauma, and labour pain ; preoperative medication.

Precautions.—Use cautiously during labour because it crosses the placental barrier and may produce respiratory depression in the newborn. Often used as pethilorfan (pethidine and levallorphan) in obstetric analgesia. In head injury respiratory depression and elevation of CSF pressure may be masked.

Adverse Reactions.—Nausea, vomiting, respiratory depression, sedation, hypotension especially when given intravenously, drug dependence and addiction.

Drug Interactions.—With MAO inhibitors it produces excitation, delirium, hyperpyrexia and convulsions. Chlorpromazine and tricyclic antidepressants potentiate its respiratory depression. Promethazine and chlorpromazine increase pethidine induced sedation. Amphetamine enhances its analgesic effect.

Dosage.—50-100mg intramuscularly, every 3-4 hours; oral dose is 50-100mg; children's dose must be reduced proportionately.

Overdosage.—Acute overdosage leads to respiratory depression with dilated pupils Treat with 0.4mg naloxone intravenously, given every 3 minutes for 3 doses. Chronic drug abuse leads to addiction. There is tolerance to respiratory depression but excitatory effects including hallucinations and convulsions may occur. Withdrawal symptoms develop more rapidly and are of shorter duration than those of morphine. They consist of yawning, lacrimation, sweating, restlessness, diarrhoea and vomiting.

PETHILORFAN

It is a combination of pethidine and levallorphan tartrate—a narcotic antagonist. The combination reduces the respiratory depression produced by pethidine whose analgesic effect is enhaneed.

Uses.—Analgesic during labour, to reduce the risk of respiratory depression in the newborn;

Minor surgery as an adjunct to nitrous oxide anaesthesia;
Post-operative pain especially in chronic bronchitis.

Dosage.—Injection, 50mg pethidine hydrochloride plus 0.625mg levallorphan tartrate per ml., i.m., 2-4ml every 3-4 hours.

Others.—Other narcotic analgesics in common use are : Codeine, Dihydrocodeine, Leverphanol and pentazocine.

1.1.2. *Narcotic Antagonists*

NALOXONE

Dosage form.—Injection, 0.4mg/ml in 1ml ampoules.
Mode of action.—Narcotic antagonist.

Pharmacological properties.—Antagonises all three sub-types of opioid receptors, but it is more potent in antagonising supraspinal analgesia, respiratory depression, euphoria, and physical dependence than sedation, miosis, dysphoria, hallucination and vasomotor stimulation.

Uses.—Opioid induced respiratory depression.
Diagnosis of physical dependence.

Precautions.—May precipitates withdrawal symptoms from opioids, pentazocine, butorphanol and nalbuphine.

Dosage.—0.4-0.8mg intravenously or intramuscularly. In neonates with respiratory depression, 0.01mg/kg into umbilical vein.

Other.—Other commonly used narcotic antagonists are:
Levallorphan and Nalorphine.

1.1.3. *Non-narcotic Analgesics*

ACETYLSALICYLIC ACID

Dosage form.—Tablets, 300mg, 75mg.
Mode of action.—Inhibitor of prostaglandin synthetase.

Pharmacological properties.—Analgesic, antipyretic and anti-inflammatory. It is useful for pain of low intensity which it relieves by both a peripheral and a CNS effect. It may cause gastric ulceration or exacerbate peptic ulcer. It reduces platelet aggregation and prolongs bleeding time. Small doses decrease and large doses increase urate excretion.

Uses.—Analgesie of choice for headache and mild musculo-skeletal pain ;
Dysmenorrhoea, neuralgia, myalgia, Antipyretic;
Acute rheumatic fever;

Rheumatoid arthritis ;
Bartter's syndrome ;
Prophylaxis of coronary artery disease, myocardial infarction, and post-operative deep vein thrombosis ;
Patent ductus arteriosus in neonates.

Precautions.—Contraindicated in peptic ulcer. Caution in asthma and in impaired renal or hepatic function.

Adverse Reactions.—Gastrointestinal irritation, peptic ulcer ; gastrointestinal blood loss may be asymptomatic ; increased bleeding time, bronchospasm, tinnitus, vertigo, mental confusion, rashes, angioneurotic oedema, myocarditis, blood dyscrasias particularly thrombocytopenia.

Dosage.—Analgesic and antipyretic dose : 300mg-1g, orally every 4-6 hours. Children, 10-20mg/kg every 6 hours, but not to exceed a total daily dose of 3.6g. Acute rheumatic fever : 1g 4-6 hourly. Children, 80-120mg/kg daily in divided doses. Continue full doses for 2 weeks after symptoms disappear ; then tail off over 7-10 days. Rheumatoid Arthritis : 3.6-8g daily in divided doses.

Overdosage.—See Emergency Treatment of Poisoning (Chapter 2).

PARACETAMOL

Dosage forms.—Tablet, 500mg; Elixir and Syrup, 125mg/5ml.

Mode of action.—Non-narcotic analgesic.

Pharmacological properties.—Analgesic and antipyretic, but with only a week anti-inflammatory action.

Uses.—Mild to moderate pain including headache, toothache, myalgias, neuralgias, dysmenorrhoea, musculo-skeletal pain associated with arthritis, fever due to bacterial and viral infections. Useful in patients in whom aspirin is contraindicated.

Precautions.—Patient should not exceed maximum recommended dose of 4.0g daily or use for more than 10 days without advice or supervision by doctor.

Adverse Reactions.—Haematological (rare), but may cause anaemia, neutropenia, leucopenia, thrombocytopenia or pancytopenia. Hypersensitivity (rare) skin rashes, mucosal lesions, laryngeal oedema and drug fever.

Dosage.—Adult: 0.5-1g, 4-6 hourly up to 4.0g daily.
Child: up to 1 year, 60-120mg ;
1-5 years, 125-250mg ;
6-12 years, 250-500mg ;

These doses may be repeated 4-6 hourly when necessary.

Overdosage.—Early: nausea, vomiting, malaise, sweating. Late: (48-72 hours after ingestion)—Signs and Symptoms: Clinical and laboratory evidence of hepatotoxicity. Right hypochondrial pain and tenderness, increased SGOT, SGPT, Serum bilirubin and prothrombin time and hypoglycaemia. Treatment: Gastric aspiration to remove contents, Gastric lavage. Determine serum level of drug and liver function tests within 4 hours. Give acetylcysteine (within 24 hours only), orally in a loading dose of 140mg/kg followed by 70mg/kg every 4 hours for 17 doses. Dosage is terminated if plasma levels show that risk of liver damage is low.

1.2. *Anti-Migraine Drugs.*—Most migraine attacks are mild and can be treated with aspirin or paracetamol. However, since peristalsis is usually reduced during migraine attack the amount of drug absorbed may not be enough to control an attack. Drugs may be used for the treatment of acute attacks or prophylaxis of migraine.

ERGOTAMINE

Dosage Form.—Tablet, 2mg as the tartrate.

Mode of action.—It constricts the cranical arteries.

Pharmacological properties.—Relieves migraine headache.

Uses.—Treatment of migraine.

Precautions.—Contraindicated in infections, marked atherosclerosis, coronary artery disease, thromonbophlebitis, Raynaud's or Buerger's syndrome, pregnancy, severe liver or kidney disease.

Adverse Reactions.—Headache, nausea, vomiting, repeated doses may cause ergotism with gangrene of extremities and mental derangement.

Dosage.—Oral For acute attack, 1-2mg at the onset of attack, repeated every 30 minutes if necessary until a total of 6mg has been taken. No more than 10mg per week.

Overdosage-Signs and Symptoms.—Vomiting, diarrhoea, thirst, tingling, itching and coldness of skin and extremities, weak pulse, gangrene of extremities, dizziness, depression, convulsion, hemiplegia, fixed miosis, anginal pain, tachycardia or bradycardia, and elevated or lowered blood pressure.

Treatment.—Withdrawal of drug, symptomatic treatment with vasodilators, anti-coagulants, and low molecular weight dextran.

Other.—Other anti-migraine drugs are Clonidine and Pizotifen.

1.3. *Hypnotics and Sedatives*

1.3.1. *Anxiolytics.*—Benzodiazepines are the most widely prescribed anxiolytics. Their use should be limited to those whose anxiety interferes with work, leisure or family relationship. Treatment should be limited to short periods because tolerance develops within four months of continuous use. Dependence and addiction are more lively in patient with personality disorders, history of alcoholism or drug abuse.

DIAZEPAM

Dosage form.—Tablet, 2, 5mg. Injection, 5mg/ml in 2ml ampoule and 10ml vials. Syrup, 2mg 5ml.

Mode of action.—Minor tranquillizer of the beuzodiazepine group.

Pharmacological properties.—Anxiolytic with hypnotic effect. It increases seizure and is a centrally acting muscle relaxant.

Uses.—Tension and anxiety states ;
Moderate to severe psychoneurosis ;
Acute alcohol withdrawal syndrome ;
Preoperative medication ;
Status epilepticus or severe recurrent convulsive ;
seizures ;
Tetanus ;
Skeletal muscle spasm prior to endoscopic procedures.

Precautions.—Care in glaucoma unless patient is receiving appropriate therapy. Habit forming and addiction liable. Additive effects with alcohol and other CNS depressants. Consciousness may be impaired, therefore patient should not drive or operate hazardous machinery. Abrupt discontinuation of long term treatment should be avoided because of barbiturate—like withdrawal syndrome. Should be prescribed in only small quantities to potential suicidal patients. Intravenous use may result in phlebitis and venous thrombosis ; must be given slowly, not faster than 5mg per minute. Apnoea or cardiac arrest may occur in the elderly or debilitated. May increase frequency and or severity of grand mal seizurse. Abrupt withdrawal may also precipitate convulsion.

Adverse Reactions.—Drowsiness, fatigue, ataxia (particularly in the elderly), confusion, dry mouth, headache. Cardiac and respiratory depression ; hypersensitivity reactions ; pain and venous thrombosis from i. v. injection.

Drug Interactions.—Additive with CNS depressants like alcohol, narcotic analgesics and sedative hypnotics. Increased CNS effects with MAO inhibitors and other anti-depressants.

Dosage.—Adults, oral : 2-10mg, 2-4 times daily. By i.m. or i.v., 5-10mg start, and then 3-4 hourly. For status epilepticus, 5-10mg i.m. or i.v. slowly every 10-15 minutes up to 30mg ; repeat 2-4 hours later if needed. Children's doses must be reduced appropriately.

Overdosage.—Symptoms and Signs—Drowsiness, confusion, diminished reflexes, coma and hpotension. It has a wide margin of safety. Serious sequale are rare unless alcohol or other CNS depressants are also taken.

Treatment.—Empty stomach by gastric lavage. General supportive measures. I.V. fluids Hypotension may be treated with noradrenaline.

NITRAZEPAM

Dosage form.—Tablet or capsule, 5mg.
Mode of action.—Benzodiazepine.
Pharmacological properties.—Depresses CNS.
Use.—Mainly as hypnotic.
Precautions.—Care in acute or chronic pulmonary insufficiency. Discontinue gradually after long termuse.
Adverse Reactions.—Depresses respiration.
Drug Interactions.—Additive with alcohol and other CNS depressants.
Dosage.—5-10mg.
Overdosage.—Symptoms, signs and treatment as for diazepam.

1.3.2. *Barbiturates.*—These are becoming obsolete as sedatives and hypnotics and have been largely replaced by the benzodiazepines. This is becuase the barbiturates are more hazardous in use ; they cause paradoxical excitement in children, confusion in the elderly, interact dangerously with other drugs and alcohol, are liable to abuse and are often used in self posioning. They have therefore not been included as hypnotics or sedatives in the Essential Drugs List.

Others.—Other hypnotics which are still sometimes used are Chloralhydrate and Paraldehyde.

1.4. *Anti-Convulsants (Anti-Epileptics).*

1.4.1. *Barbiturates.*—Having fallen into disfavour as sedative—hypnotics, the barbiturates are now more used as anti-convulsants. Most barbiturates have anti-convulsant properties However, it is those with low anti-convulsant : hypnotic ratio that are used as anti-convulsants.

PHENOBARBITONE

Dosage forms.—Tablets, 30 and 60mg, Syrup, 15mg/5ml.

Mode of action.—CNS depressant.

Pharmacological properties.—Sedative, hypnotic and anti-convulsant which elevates seizure threshold and limits spread of seizure activity.

Uses.—Sedative to decrease restlessness in children with whooping cough, pylorospasm, nausea and vomiting ; hypnotic, anti-convulsant in tetanus, eclampsia, cerebral haemorrhage, poisoning by convulsant drugs and in status epilepticus ; to antagonise unwanted stimulant effects of anti-asthma drugs e.g. ephedrine and theophylline ; neonatal hyperbilirubinaemia and kernicterus.

Precautions.—Addiction liable; has largely been replaced by benzodiazepines as sedative and hypnotic because of abuse liability and frequent use in drug poisoning ; contra indicated in acute intermittent porphyria or porphyria variegata.

Adverse Reactions.—Drowsiness, hangover effect, impaired mental and physical faculties, paradoxical excitement, irritability, myalgic pain in the neck, shoulder girdle and upper limbs.

Drug Interactions.—Severe CNS depression when used with alcohol and other CNS depressants. Potentiated by isoniazid, MAO inhibitors. Accelerates metabolism of corticosteroidids, oral contraceptives, oral anti-coagulants, digitoxin, phenytoin, testosterone, sulphadimethoxine, and tricyclic anti-depressants. Accelerated metabolism of Vitamin D may cause hypocalaemia in the elderly.

Dosage.—Anti-convulsant, 30-60mg, 2 to 3 times daily.

Status epilepticus : Injection, 200 mg by i.m. or i.v.

Hypnotic : 60-200mg.

Children's doses reduced appropriately.

Overdosage.—Symptoms and signs—Moderate intoxication which resembles alcoholic inebriation ; severe intoxication results in coma, depressed respiration, positive Banbinski response ; pupils intially constricted and reacting to light but later become dilated ; hypotension, shock, barbiturate bullae, hypothermia and renal failure.

Treatment.—General supportive measures include maintenance of patient airway, gastric lavage taking care to avoid aspiration of gastric contents, maintenance of circulation ; forced diuresis, haemodialysis or haemoperfusion for renal failure.

1.4.2. *Hydantoins*

PHENYTOIN SODIUM

Dosage form.—Tablets, 50mg, 100mg Capsules, 50mg, 100mg.

Mode of action.—Limits development of seizure activity and reduces spread of seizure.

Pharmacological properties.—Exerts anti-epileptic action without causing general depression of CNS.

Uses.—1. Grand mal epilepsy.

2. Partial seizures.

3. Cardiac arrhythmias.

Precautions.—Breast-feeding females ; change over from other drugs should be made cautiously ; avoid sudden withdrawal.

Drug Interactions.—Potentiates effect of chloramphenicol, cimetidine, cotrimoxazole, diazepam, dicoumarol, disulfiram, izoniazid, phenylbutazone, sulphaphenazole, sulphinpyrazone and sulthiame. Transient potentiation of aspirin and sodium valpuate.

Adverse Reactions.—Nausea, vomiting, confusion, dizziness, headache, tremor, insommia occur commonly. Ataxia, slurred speech, nystagmus and blurred vision are signs of overdosage. Rare side effects include skin rashes, coarse face, acne, hirsutism, fever, hepatitis, lupus erythematosus, erythema multiforme, lymphadenopathy, gum hyperplasia and tenderness, folate deficiency megaloblastic anaemia, leucopenia, thrombocytopenia, agranulocytosis and aplastic anaemaia.

Dosage.—Grand mal and psychomotor epilepsies : Orally 100mg thrice daily initially ; may be increased to 200mg thrice daily ; maintenance dose, 100mg 3 to 4 times daily to achieve a therapeutic serum level of 10-20ug/ml. I.V. 100-250mg, then 100-200mg i.m., 4-6 hourly for seizures associated with neuro-surgery.

Overdosage.—Signs and Symptoms—Nystagmus, ataxia, dysarthria, coma, fixed pupils, hypotension, respiratory depression, apnoea, death.

Treatment.—Gastric lavage, and symptomatic treatment.
Haemodialysis.

1.4.3. *Succinimides*

ETHOSUXIMDE

Dosage form.—Tablets or Capsules, 250mg.

Mode of action.—Elevates seizure threshold induced by electroshock and pentylenetetrazol.

Pharmacological properties.—Prevents spread of epileptic focus.

Uses.—Absence seizures (petit mal).

Precautions.—May precipitate grand mal seizures if used alone for a patient with mixed type of epilepsy ; may impair mental activity. Caution in liver and kidney function impairment. Abrupt withdrawal may precipitate petit mal status.

Adverse Reactions.—Anorexia, nauses, vomiting epigastric pain, diarrhoea, blood dyscrasias (leukopenia, agranulocytosis, aplastic anaemia), drowsiness, headache, dizziness, hiccoughs ataxia, allergic reactions, urticaria, Stevens-Johnson syndrome, hirsutism, myopia, vaginal bleeding and systemic lupus erthematosus.

Drug Interactions.—High doses of tricyclic anti-depressants and anti-psychotics induce seizures.

Dosage.—500mg daily initially, increasing every 4-7 days to 1.5g daily in 3 divided doses Child (3-6 years), 250mg daily initially, increasing every 4-7 days to 1.5g daily in divided doses.

Overdosage.—Signs and Symptoms—As in adverse reactions.

Treatment.—Gastric lavage and symptomatic treatment.

1.4.4. *Benzodiazepines*

DIAZEPAM

See Anxiolytics, 1.3.1.

1.4.5. *Others.*—Other widely used anti-convulsant drugs are carbamazepine, paradehyede Sodium valprote.

1.5. *Anti-Depressants*

1.5.1. *Tricyclic Anti-depressants*

AMITRIPTYLINE

Dosage form.—Tablet 25, 50mg.

Mode of action.—Prevents the re-uptake of noradrenaline and other catecholamines into central and peripheral stores.

Pharmacological properties.—Elevates depressed mood and has prominent anti-cholinergic properties; may also induce sedation.

Uses.—Depression, especially endogenous depression.

Precautions.—Do not use concurrently with MAO inhibitors, wait at least two weeks after stopping the latter. Caution in elderly males and those with urinary retention or glaucoma. Caution in coronary artery disease since it can produce tachycardia and cardiac arrhythmias. May increase psychotic symptoms in schizophrenic patients and shift manic depressive patients to manic phase. Aviod dispensing large quantities to potentially suicidal patients. Stop drug several days before elective surgery. Caution in hepatic dysfunction, thyroid dysfunction and those with history of epilepsy.

Adverse Reactions.—Tachycardia, palpitation, hypertension, hypotension, myocardial infarction, arrhythmias, stroke, confusion, disorientation, delusions, hallucinations insomnia, nightmares, paraesthesiae, peripheral neuropathy, tinnitus, ataxia, dry mouth, blurred vision, cycoplegia, increased intraocular pressure, constipation, urinary retention, blood gdyscrasias anorexia, nausea, vomiting, diarrhoea, parotid swelling, black tongue, impairment of liver function, gynaecomastia, testicular swelling (males) breast enlargement and galactorrhoea (females), increased or decreased libido, skin rash, urticaria, oedema of face and tongue, sweating, mydriasis, urinary frequency, alopecia, weight gain or weight loss and drowsiness.

Drug Interactions.—Reduces anti-hypertensive effect of guanethidine ; causes severe hypertension and hyperpyrexia with sympathomimetics : causes convulsions and excitability with MAO inhibitors.

Dose.—25mg thrice daily, increase to 50mg thrice daily. Effect may not manifest for three weeks.

Over dosage.—Symptoms and signs—Drowsiness, tachycardia, hypothermia, arrhythmias, mydriasis, convulsions, coma, hyperreflexia, rigidity, hyperpyrexia and vomiting.

Treatment.—Gastric lavage ; activated charcoal, 20-30g. 4-6 hourly for 48 hours. Symptomatic management viz.

(*i*) tachycardia and arrhythmias—give neostigmine, pyridostigmine or propranolol.

(*ii*) congestive heart failure—give digitalis.

(*iii*) convulsions—give diazepam, or inhalation anaesthetics (*not* barbiturates).

N.B.—Dialysis not effective because of extensive tissue binding. Other tricyclic anti-depressants including imipramine, desimipramine and nortriptyline can be used in place of amitriotyline.

1.5.2. *Monoamine—Oxidase Inhibitors* (*MAOI's*).—These are no longer recommended because of the risk of very severe adverse reactions.

1.6. *Anti-Psychotics* (*Major Tranquillisers*)

1.6.1. *Phenothiazines*

CHLORPROMAZINE

Dosage form.—Tablet, 25, 50, 100mg.

Capsules, 30, 75, 150, 200, 300mg.
Injections, 25mg/ml in 2ml ampoules.
Syrup, 25mg/5ml.

Mode of action.—Major tranquillizer.

Pharmacological properties. —Exerts neuroleptic syndrome, i.e. suppresses spontaneous movements and complex behaviour while spinal reflexes and nociceptive avoidance—behaviours remain intact. It causes disinterest in environment and little display of emotion. There is slowness in response to external stimuli and drowsiness but patient is easily roused, capable of giving appropriate answers to direct questions and has intact intellectual function. It reduces agitation in psychotic patients. Also has anti-emetic, anti-histamine, anti-adrenergic, anti-cholinergic properties.

Uses : (1) Psychotic disorders.
(2) Aggressiveness in disturbed children.
(3) Excessive anxiety and agitation.
(4) Nausea and vomiting—drug or disease induced.
(5) Intractable hiccough.
(6) Acute intermittent porphyria.
(7) Preoperative restlessness and apprehension.
(8) Post-operative medication.
(9) Tetanus.
(10) Mild alcohol withdrawal symptoms.
(11) Cancer pain and other severe pain.

Precautions.—Contra indicated in marrow depression and hypersensitivity to phenothiazines. Impairs mental activity, therefore patient should not operate hazardous machines. Caution in liver and cardiovascular diseases and those taking atropine-like drugs or exposed to heat and organophophorus insecticides. Abrupt withdrawal after prolonged use may cause withdrawal symptoms including nausea, vomiting, dizziness and tremulousnes.

Adverse Reactions.—Drowsiness, dizziness, faintness, Parkinsonism, hyperreflerial, tardive dyskineia, psychotic symptoms, catatonic states, cerebral oedema and grand mal or petit mal seizures. Blood dyacrasias, postural hypotension, tachycardia, cholesatic jaundice, allergic reactions, skin pigmentation, lupus erythematosus, breast engorgement and lactation (females), gynaecomastia, amenorrhoea, glycosuria, hyperglycaemia, hypolycaemia, lens opacities, particulate deposits in lens and cornea, retinitis pigmentosa, dry mouth, nasal congestion, constipation, urinary retention, miosis, mydriasis, increased appetite, weight gain, oedema, fever, hyperpyrexia and lupuserythematosus-like syndrome.

Drugs Interactions.—Increased CNS depression with alcoholic, anaesthetics, barbiturates, narcotics and other CNS depressants ; reduces convulsions threshold when used with anti-convulsants ; causes severe hypotension with noradrenaline ; reduces the anti-hypertensive effect of guanethidine ; potentiates atropine-like drugs, but the latter reduce is plasma level ; antacids containing aluminium and magnesium reduce absorption ; MAO inhibitors and tricyclic anti-depressants potentiate sedation and anti-muscarinic effects.

Dosage.—Oral : 10mg-25mg, 3 or 4 times daily, increased every 3 days by 25-50mg/day to maximum of 200-800mg daily in divided doses.

Injection : 25mg i.m. start repeated 1 hour later if needed, then orally 25mg-50mg three times daily.

Child, oral : 0.5mg/kg every 4-6 hours.

Overdosage.—Symptoms and signs—CNS depression, somnolence, coma, hypotension, extrapyramidal symptoms, agitation, restlessness, dry mouth, fever, convulsions, arrhythmias.

Treatment.—Gastric lavage and symptomatic treatment. For extrapyramidal symptoms use Biperiden ; for shock use standard measures and phenylephrine when necessary. Dialysis not helpful.

FLUPHENAZINE

Dosage form.—Injection, 25mg (Decanoate or Enanthate) in 1ml ampoule.

Mode of action.—Phenothiazine.

Pharmacological properties.—As for chlorpromazine.

Uses.—Psychotic disorders.

Precautions.—Contraindicated in severe CNS depression, coma, subcortical brain damage, liver disease, blood dyscrasias, allergy to phenothiazines. May impair mental and physical judgment ; must be tailed off to prevent withdrawal symptoms.

Adverse Reactions.—As for chlorpromazine, but there usually are anorexia, nausea, salivation, polyuria, sweating, bladder paralysis and faceal impaction, cholestatic jaundice, flare up of psychotic behaviour, sudden death.

Dose.—Injection : Decanoate : 12.5-25mg subcutaneously, or i.m. every 4-6 weeks.

Enanthate.—25mg s.c. or i.m. every 1-3 weeks.

Overdosage.—Symptoms and signs—As for chlorpromazine.

Treatment.—Gastric lavage and symptomatic treatment.
But to combat hypotension do not use adrenaline, use noradrenaline.

1.6.2. *Butyrophenones*

HALOPERIDOL

Dosage forms.—Tablet, 1.5mg and 5mg.
Injections, 5mg/ml in 1 ml ampoules ; 2mg/ml ;
5mg/ml in 10ml vials.

Mode of action.—Major tranquillizer

Pharmacological Properties.—Similar to those of chlorpromazine but it causes less sedation and hypotension.

Uses.—1. Psychotic Disorders.
2. Severe behavioural disorders in children.
3. Tics and vocal utterances of Gilles de la Tourette's syndrome in children.

Precautions.—Contraindicated in Parkinsonism, CNS depression and coma. Concomitant lithium therapy may result in encephalopathy. May cause mental impairment and slowing of reflexes; may antagonise anti-convulsants. Caution in those with allergic history.

Adverse Reactions.—Extrapyramidal symptoms may be marked. Insomnia, headache, vertigo, confusion, anxiety and exacerbation of psychotic symptoms including hallucinations ; tachycardia, hypotension, blood dyscrasia, rashes, alopecia, lactation, breast engorgement and mastalgia, menstrual irregularities, gynaecomastia, increased libido, anorexia, nausea, vomiting, dry mouth, blurred vision, impaired liver function and laryngospasm.

Drug Interactions.—Potentiates CNS depressants and causes hypotension with alcohol adrenaline and antihypertensives. With lithium it causes irreversible brain damage and encephalopathy.

Dose.—Oral, 0.5-2mg two or three times daily.
3-5mg or more, two or three times daily for severe cases; then reduce to lowest maintenance dose.

Injection: 2-5mg i.m. every 1-8 hours until controlled, then change to oral dosage form.

Overdose.—Signs and symptoms—Hypotension, sedation, Extrapyramidal symptoms, coma, respiratory depression.

Treatment.—Gastric lavage, followed by activated charcoal; Symptomatic treatment.

Others.—Other anti-psychotic drugs in common use are Clozapine and Lithium carbonate.

1.7. *Anti-Parkinsonism Drugs*

1.7.1. *Anticholonergics*

BENZHEXOL

Dosage forms.—Tablet, 2mg, 5mg
Elixir, 2mg/5ml

Mode of action.—Anticholonergic.

Pharmacological Properties.—Anti-parkinsonian by blocking the excitatory effects of the cholinergic system in the nigrostriatal pathway.

Uses.—Parkinsonism—postencephalitic, arteriosclerotic and idiopathic, mainly as adjunctive treatment.

Drug induced extrapyramidal disturbances.

Precautions.—Care in glaucoma (monitor intraocular pressure); elderly male with prostatic hypertrophy; hypertension, cardiac, hepatic or renal disorders.

Adverse Reactions.—Dizziness, nervousness, delusions, hallucinations, confusion, agitation, euphoria, drowsiness, headache, nausea, dilatation of colon, paralytic ileus, constipation, rashes, tachycardia, blurred vision, mydriasis, increased intraocular pressure, urinary hesitancy or retention, dry mouth.

Drug Interactions.—Additive effect with laevodopa.
Dosage.—Tablet, 1mg daily; increased gradually to 2mg daily. Maintenance dose, 5-15mg daily in 3-4 divided doses.

Overdosage.—Signs and symptoms—CNS stimulation (confusion, excitement, agitation, hyperpyrexia, disorientation, delirium hallucinations); CNS depression (drowsiness, sedation, coma).

Treatment.—Treat symptomatically and use supportive measures as needed. Empty stomach. Treat circulatory collapse with vasopressors.

BIPERIDEN

Dosage forms.—Tablet 2mg; Injection, 5mg/ml in 1ml ampoule.

Mode of action.—Anticholinergic.

Pharmacological properties.—Anti-parkinsonian.

Uses.—Parkinsonism and drug-induced extrapyramidal disorders.

Precautions.—As for Benzhexol.

Adverse Reactions.—As for Benzhexol.

Drug Interactions.—Increased sedative effects with alcohol and CNS depressants. Increased atropine-like effects with anti-histamines, amantadine, anti-muscarinics, haloperidol MAO inhibitors, tricyclic anti-depressants.

Dosage.—2-10mg/day in divided doses.

Overdosage.—Symptoms, signs and treatment as for Benzhexol.

1.7.2. *Dopaminergic Drugs*

LEVODOPA

Dosage forms.— Tablet, 250mg
Capsules, 250mg

Mode of action.—Replaces brain dopamine because it crosses the blood-brain barrier and is decarboxylaxed in situ.

Pharmacological properties.—Dopamine receptor agonist. Rigidity and bradykinesia respond better than does tremor. Speech, gait, handwriting, swallowing and respiration are improved. There is improvement in mental function and mood.

Uses.—1. Idiopathic Parkinson's disease.
2. Post encephalitic Parkinsonism.
3. Symptomatic Parkinsonism due to carbon monoxide or manganese poisoning.
4. Arteriosclerotic Parkinsonism.
5. Other drug-induced Parkinsonism except those due to phenothiazines or neuroleptic-induced Parkinsonism.

Precautions.—Contraindicated with, or within 2 weeks of, MAOI therapy, severe psychoses, raised intraocular pressure. Use with extreme caution in pregnancy, those taking vitamin B6, tranquillizers, anti-depressants, and anti-hypertensives; caution in patients with cardiovascular, renal, hepatic, pulmonary or endocrine disorders, and peptic ulceration.

Adverse Reaction.—Nausea, vomiting, cardiac arrhythmias, involuntary movements, ataxia, increased hand tremor, depression, dementia, agitation, confusion, dry mouth constipation, palpitation, orthostatic hypotension, rashes, alopecia, haemolytic anaemia, leukopenia, urinary retention, oedema, blurred vision, mydriasis, burning sensation of tongue, bitter taste in mouth, sweating and hoarseness of voice.

Drug Interactions.—Pyridoxine antagonises levodopa. Methyldopa, haloperidol, phenothiazines, papaverine, reserpine and phenytoin reduce its anti-parkinsonism effect. Potentiates anti-hypertensive drugs. Risk of hypertensive crisis with MAO inhibitors. Risk of cardiac arrhythmias with sympathomimetics.

Altered laboratory values.—Increases blood urea, SGOT, SGPT, LDH, bilirubin, alkaline phosphatase, PBI, and causes positive Coomb's Test.

Dosage.—Oral, initially 125-500mg daily in divided doses after meals ; increased, gradually, at intervals of 2-3 days, to a maximum of 4g daily in divided doses.

Overdosage.—Signs and symptoms—Anorexia, nausea, vomiting, confusion, headache, insomnia, dystonic and involuntary movements, hypotension and cardiac arrhythmias.

Treatment.—Empty stomach by gastric lavage ; normal supportive measures and I.V. fluids.

Pyridoxine may reverse the effects.

1.7.3. *Dopa Decarboxylase Inhibitor*

CARBIDOPA

(Used in combination with Levodopa)

Dosage form.—Tablets :

10mg Carbidopa plus 100mg Levodopa (10/100)
25mg Carbidopa plus 100mg Levodopa (25/100)
25mg Carbidopa plus 250mg Levodopa (25/250)

Mode of action.—Peripheral dopa decarboxylase inhibitor, thereby increasing the amount of Levodopa reaching the brain.

Pharmacological properties.—Potentiates the effect of levodopa, the dopaminergic receptor stimulant in the brain substantia nigra.

Uses.—As for Levodopa. It is usually used in conjunction with Levodopa.

Precautions and Adverse Reactions.—As for Levodopa.

Dosage.—The combination of Carbidopa with Levodopa enables the effective dose of levodopa to be greatly reduced, thereby minimising many of the dose—limiting adverse effects of levodopa given alone. In combination with carbidopa, the daily dose of levodopa rarely exceeds 1-1.5g.

Tablet.—One (10/100) or one (25/100) thrice daily, increasing to two (10/100 or 25/100) thrice daily or on alternate days ; change to 25/250mg tablets if more is needed, up to maximum of 6-8 tablets/day in divided doses after meals.

Overdosage.—As for Levodopa. Increased incidence of abnormal involuntary movements.

Treatment.—As for Levodopa.

1.7.4. *Other Anti-Parkinsonism Drugs*

Other useful drugs are Amantadine and Bromocriptine.

2. ANAESTETIC DRUGS

Anaesthetic drugs are discussed under the following headings :

2.1. General Anaesthetics and Oxygen.

2.2. Premedication Drugs.

2.3. Adjuncts to General Anaesthetics.

2.4. Local Anaesthetics.

2.1. *General Anaesthetics and Oxygen.*—General anaesthetics produce reversible loss of consciousness accompained by analgesia and muscle relaxation. The ideal general anaesthetic should be easily administered, provide quick induction, be stable, non-flammable, metabolically inert, produce adequate analgesia, muscle relaxation, be rapidly eliminated so that recovery would occur quickly and be free from adverse effects. No single drug possesses all these ideal properties. Except for short minor procedures, the use of a single anaesthetic agent to produce general anaesthesia has been replaced by balanced anaesthesia.

Balanced anaesthesia employs judicious combination of drugs to achieve optimal anaesthesia with minimal toxicity so that the recovery of protective reflexes is possible within a few minutes of termination of anaesthesia. It usually involves the use of an intravenous anaesthetic for induction ; inhalation anaesthetics, oxygen and adjuncts to general anaesthetics for maintenance of anaesthesia.

2.1.1. *Inhalation Anaesthetics.*—These are volatile liquids or gases. To prevent hypoxia they are usually given with oxygen.

ETHER

Induction is prolonged. It is inflammable and explosive at concentrations necessary for maintaining anaesthesia. It stimulates sympatho-adrenal activity and increases circulating catecholamines. Skeletal muscle relaxation is adequate. Recovery is prolonged and it is irritating to the respiratory tract. It produces a high incidence of post-anaesthetic nausea and vomiting.

It is occasionally used in paediatrics as a supplement to nitrous oxide-oxygen mixtures, but because it is inflammable and irritant it is becoming obsolete.

Precautions.—Do not use diathermy.

Drug Interactions.—Potentiates curariform neuromuscular blocking drugs. Premedication with anti-muscularinic drugs may minimise excessive bronchial secretions.

Adverse effects.—It produces a high incidence of nausea and vomiting. Transient slight abnormalities in the results of liver function tests have been reported. Other transient effects include reduced unrinary output, hyperglycaemia, reduced intestinal tone and motility.

Dosage.—From an open mask or a suitable vaporiser : For induction, 10 to 30 *per cent* ether vapour in oxygen or in nitrous oxide/oxygen mixture is generally required. For maintenance of surgical anaesthesia, 5 *per cent* is used.

HALOTHANE

Halothane is a volatile liquid boiling at 50°C. It is the most widely used of the volatile agents. It is an extremely convenient anaesthetic, being potent and non-irritant. Induction is smooth and reasonably quick. It is used for maintenance of anaesthesia in major surgery and to supplement the anaesthetic action of nitrous oxide-oxygen mixtures in balanced anaesthesia.

Halothane should be used for the induction of anaesthesia in children and in short procedures where rapid recovery is needed. Induction is slow (about 5 minutes) and so this is often achieved with thiopentone sodium. Halothane is however used alone for patients with poor veins.

Concentration of up to 5 *per cent* mixed with at least 25 *per cent* oxygen are used alone with nitrous oxide-oxygen mixtures. Recovery is less prolonged than intravenous anaesthetic agents. Halothane will produce moderate muscle relaxation, but use of specific muscle relaxants may be necessary where there is need for additional relaxation.

Adverse effects.-Halothane has three important adverse effects namely : hypotension, respiratory depression (rapid, shallow breathing) and cardiac arrhythmia. Halothane, especially when administered repeatedly over short periods, can cause impairment of liver function and rarely hepatocellular jaundice may occur, especially in obese patients. The risk is great when the interval between repeated administration is less than 6 weeks. The hypotensive effect is proportional to the concentration of the anaesthetic administered. Hypotension is an advantage in operations where a controlled relatively bloodless field is required.

Dosage.—Using a suitable vaporiser : For induction : a 1 to 4 *per cent* concentration, vaporised by a flow of oxygen or a nitrous oxide-oxygen mixture. Children, 1.5.-2 *per cent*. For maintenance, 0.5 to 2 *per cent*, adults and children.

NITROUS OXIDE

Nitrous oxide is a sweet smelling, non-explosive gas with low anaesthetic potency, but a marked analgesic action. It is relatively non-toxic. It is widely used for induction and maintenance of anaesthesia. It is also used as a carrier gas for other volatile agents in general anaesthesia. More powerful inhalational and intravenous anaesthetic agents and narcotic

analgesics are given to increase its weak action when necessary. Due to its good analgesic properties, it is found useful as the sole analgesic in dentistry and in the second stage of labour. However, it should not be used to produce analgesia or slight narcosis for longer than 48 hours (e.g. in patients receiving artificial respiration) because of its tendency to produce leukopenia.

Nitrous oxide does not appear to have any serious effects on the cardiovascular or ventilatory systems or on the liver, kidneys, or metabolic function, provided that an adequate concentration of oxygen and ventilation are maintained. However, nitrous oxide may have a slight depressant effect on the cardiovascular and ventilatory systems under some circumstances and a sympathetic stimulating effect if given during administration of halothane.

As nitrous oxide diffuses into space, it should not be used in patients with an air-containing closed space, such as tension pneumothorax, pulmonary air cysts or intestinal obstruction and during pneumo-encephalography. Diffussion hypoxia may develop after discontinuing prolonged nitrous oxide anaesthesia, and it is advisable to administer oxygen briefly during emergence from anaesthesia.

Dosage.—For analgesia, 25 to 50 *per cent* nitrous oxide with 75 to 50 *per cent* oxygen. For induction of anaesthesia, 80 *per cent* nitrous oxide with 20 *per cent* oxygen for two or three minutes. For maintenance, between 50 *per cent* nitrous oxide with 34 *per cent* oxygen depending upon the amount of supplemented agents used.

OXYGEN

Oxygen has no anaesthetic properties as such but is an invaluable gaseous adjunct to anaesthesia. It is administered in concentration varying from 20 to 50 *per cent* in conjunction with nitrous oxide and some volatile anaesthetics like ether and halothane, alone or in nitrous oxide-oxygen mixtures.

Other Uses.—Oxygen is administered by inhalation to correct hypoxaemia in conditions causing under ventilation of the lungs, such as exacerbations of chronic bronchitis, pneumonia or pulmonary oedema ; in extensive fibrosing alveolitis or in circulatory failure associated with conditions such as myocardial infarction or after cardiac arrest. It is also used in asphyxia in the new-born, and in infants. Concentrations ranging from 30 to 100 *per cent* are employed.

2.1.2. *Intravenous Anaesthetics.*—Intravenous anaesthetics are mainly used for the rapid induction of anaesthesia which is then maintained with an appropriate inhalation agent such as nitrous oxide-oxygen. They may also be used alone to produce a light level of narcosis for short surgical procedures. All the intravenous agents except ketamine depress cerebral function and can cause respiratory depression and hypotension. Facilities for providing resuscitation must be available.

Large doses should be avoided in obstetrics as they rapidly cross the placental barrier. They are contraindicated in patients where there is no direct access to the air-way or whose unprotected air-ways are likely to become obstructed during the procedure e.g. in mouth or throat surgery.

Where there is concomitant administration of narcotic analgesic or central nervous depressant drugs, their dosage should be reduced. Since there is a great individual variation in response, the dosage of these agents should be assessed for each patient. To do this, the estimated dose should be injected over 20 seconds while a further 20-30 seconds is needed to assess the effect before giving any supplementary dose. Intravenous anaesthetics should not be given in sufficiently large doses to produce muscle relaxation, except for brief procedures. For tracheal intubation they should be followed by an inhalational sequence or by a muscle relaxing agent.

THIOPENTONE SODIUM

Thiopentone is the most widely used anaesthetic but also one of the most toxic. It is potent and quick acting and is especially suited to providing a pleasant induction. Induction is generally smooth and takes 10- 30 seconds. It lacks analgesic poperties.

Anaesthesia may be induced in a healthy adult by injecting 6 to 10 ml of a 2.5 *per cent* solution (i.e. 150 to 250 mg) in 30 seconds (a 5 per cent solution is prone to cause venous thrombosis) and waiting at least one minute before injecting more. In those with a slow circulation time (the old, the diseased) injection should be slower. Laryngospasm is comparatively frequent. The great rapidity with which a patient may pass through the stages of anaesthesia means that the first obvious sign of overdosage may be apnoea due to its potent ventilatory depressant effect. Great care is therefore necessary when using thiopentone. Anaesthesia may be continued by nitrous oxide supplemented if neccessary by pethidine or by another inhalation agent e.g. ether.

Thiopentone should not be given to known or suspected perphyriacs and should be avoided in patients with a raised blood urea. It is best avoided in patients with marked congestive heart failure, but with preoxygenation and slow injection, small doses can be gives to patients with other cardiac conditions. It should be used with great caution in patients with bronchospasm or upper airway obstruction.

Recovery from thiopentone is slow and its effects persists for 6-8 hours. Return of consiousness does not imply return of full mental faculties. Patients are particularly susceptible to alcohol for up to 24 hours after administration. Given by intermittent dosage or by infusion, thiopentone has a marked cummulative effect which should be allowed for by reducing the dosage. Dosage should be further reduced when narcotic analgesics are administered as supplements.

Dosage.—Intravenous : The dosage required to produce and maintain anaesthesia varies widely and depends on body size, physical status, pre- existing diseases, and adequacy of respiratory and circulatory systems. In pre-medicated adult, initial 100-150mg (4-6ml of a 2.5 per cent solution) over 10-15 seconds, repeated if necessary according to patients response after 20-30 seconds. Alternatively, a single injection of 3-5mg/kg body weight is given.

By continuous intravenous infusion, as a 0.2-0.4 *per cent* solution, according to the patients response.

2.2. *Premedication Drugs.*—Premedication agents are given before anaesthesia. They may be divided into those used for their anti-cholinergic effects and those used for the sedative effects. Anti-cholinergic premedication agents, usually atropine (or hyoscine) are used to dry bronchial and salivary secretions which are increased by intubation and the inhalation anaesthestica. They are also used to prevent excessive bradycardia and hypotension caused by halothane, thiopentone, suxamethonium and neostigmine.

Hyoscine is a less effective drying agent than atropine but provides a higher degree of amnesia. A disadvantage is its tendency to slow the heart rate.

Sedative premedication agents include the narcotic analgesics (morphine, pethidine), anxiolytics (diazepam) and neuroleptics (e.g. chlorpromazine). These drugs are described in other sections of this formulary.

2.3. *Adjuncts to General Anaesthetics.*—Drugs used as adjuncts to anaesthesia fall into two categories : premedication agents and neuromuscular blocking agents. A number of these drugs are also given practically for other purposes and are discussed in more details to other sections of the formulary. They also facilitate induction and diminish overall anaesthetic requirements by enhancing the effect of the anaesthetic agents. Large doses should be avoided as they also enhance the respiratory depressant and hypotensive effects of anaesthetics.

The narcotic analgesics (morphine, pethidine) provide additional analgesics during surgery, and post operatively. They are the most common premedication agents, usually administer an hour before the operation.

There is a trend towards the use of the oral premedicating agents such as diazepam, given the night before and on the morning of the operation. Alternatively, promethazine or chlorpromazine may be given. The phenothiazine derivatives have useful antiemetic action which may prevent post-operative sickness, but they increase respiratory depression and hypotension ; large doses should therefore be avoided. Barbiturates should be avoided, especially where pain is present, as they cause restlessness and confusion.

Premedication in Children.—Oral or rectal administration is premedication general injection where possible, but is not altogether satisfactory. Diazepam may be given. Thiopentone is rarely used.

2.3.1. *Anticholinesterases*

NEOSTIGMINE

Dosage forms.—Tablet, 15mg, Injection, 2.5mg/ml in 1ml ampoule.

Mode of action.—Reversible anticholinesterase.

Pharmacological properties.—Constricts the pupils and reduces raised intraocular pressure ; stimulates skeletal muscles paralysed by curariform agents, stimulates intestinia smooth muscles.

Uses.—Termination of effects of competitive neuromuscular blockers ; myasthenia gravis ; intestinal atony especially post-operative ; ileus ; atony of urinary bladder.

Adverse Reactions.—Alopecia, vomiting, abdominal cramps, diarrhoea, miosis, involuntary muscle twitchings, general weakness and fatigue, bradycardia, hypotension.

Dosage.—15-30mg thrice daily. Injection 0.5-2.0mg i.m.

Overdosage.—Symptoms and signs—Exaggeration and persistence of adverse reactions, extending to bronchospasm, paralysis of respiratory muscles and death.

Treatment.—Atropine injection and supportive measures.

2.3.2. *Depolarising Muscle Relaxants.*—They act by mimicking the action of acetylcholine at the neuromuscular junction. Because the receptor membranes are now fully activated, the end plate is refractory to acetylcholine and a depolarisation blockade occurs. Paralysisis preceded by muscle fasciculations that are usually visible. This type of blockade is not antagonised by anticholinesterase drugs.

They produce rapid, complete and predictable paralysis, and recovery is spontaneous. Unlike the non-depolarising muscle relaxants, their action cannot be reversed and their clinical application is therefore limited.

SUXAMETHONIUM

Suxamethonium is the only commonly used drug among the depolarising blockers. With a 5 minute duration of action, it is the ideal agent for passage of endotracheal tube but may be used in repeated dosage for longer procedures.

Prolonged muscle paralysis may occur in patients with low or a typical plasma pseudocholinesterase enzymes. Prolonged paralysis may also occur in dual block which occurs after repeated doses of the drug have been used, and is caused by the development of a non-depolarising block following the primary depolarising block. All patients with prolonged muscle paralysis should be given artificial ventilation. Dual block is diagnosed by giving a short acting anticholinesterase such as edrophonium. If an improvement occurs the block is treated with neostigmine.

Indications.—Depolarising muscle relaxant of short duration.

Caution.—Suxamethonium is contra-indicated in severe liver disease and in patients with burns.

Dose.—By intravenous injection, 20-100mg (as the chloride), according to the patient's needs. By i.v. infusion, as a 0.1 *per cent* solution in dextrose or sodium chloride infusion, 2-5mg/minute (2-5ml/minute).

2.3.3. *Non-Depolarising Muscle Relaxants.*—Drugs of this group include pancuronium and tubocurarine. They cause blockade by competing with acetylcholine at the receptor site at the neuromuscular junction. They are best suited for the production of paralysis of long duration. They have a slower, less complete action than the depolarising agents, and should be avoided in myasthenia gravis. The action of the non-depolarising agents can be reversed with anticholinesterase such as neostigmine.

PANCURONIUM

Pancuronium is a synthetic bisquarternary ammonium steroid that produces a non-depolarising neuromuscular block. It has replaced tubocurarine as the drug of choice for major surgery.

It is approximately five times more potent than tubocurarine. It also has the advantages of a quicker onset of action and of not causing significant histamine release or significant changes in blood pressure. There is no evidence that it causes ganglionic blockade and hence does not cause hypotension. There is evidence that pancuronium may increase the heart rate, cardiac output, and arterial pressure, probably because of its vagal action and/or stimulation of cardiac adrenergic receptors. Therefore, the drug is indicated where these effects are desired. It may however produce occasional ventricular extrasystoles.

Dose.—By intraveneous injection, initially for intubation, 80-100 micrograms/kg ; after intubation, 20-80 micrograms/kg, and subsequently 30-40 micrograms/kg (every 20-40 minutes, according to patient's response).

Children.—Initially, 60-80 micrograms/kg, then 30-40 micrograms/kg.

Neonates.—Initially, 30-40 micrograms/kg then 15-20 micrograms/kg.

Intensive care, by I.V. 60 micrograms/kg every 1-1½ hours ;

By i.m. injection, 30-60 micrograms/kg every 1-2 hours.

TUBOCURARINE

Tubocurarine may be regarded as the standard non-depolarising muscle relaxant but its use has declined in recent years. It starts to act between 3-5 minutes and lasts for about 30 minutes after injection. It often causes an erythematous rash on the chest and neck and this is probably caused by histamine release. Onset of blockade is invariably associated with hypotension, and this, though transient, is dangerous in poor-risk patients.

Dose.—By i. v. injection, initially, 10-15mg, then supplements, according to the patient's response, of 5 mg to a maximum of 40mg.

Children.—Initially, 330 micrograms/kg, then 1/3 of the initial dose.

2.4. *Local Anaesthetics.*—Local anaesthetic drugs act by preventing the generation and conduction of impulses along nerve fibres. They do this by preventing the sodium influx through the cell membrane, which is necessary for the generation of the action potential, and by competing with calcium at some site that controls the permeability of the membrane. The blockade caused by local anaesthetics is however completely reversible. The smaller the nerve fibre the more sensitive it is so that a differential block may occur when the smaller fibres carrying pain sensation and automatic impulses are blocked.

The drugs used vary widely in their potency, toxicity, duration of action, stability, solubility in water and ability to penetrate mucous membranes. These variations determine their suitability for surface infiltration, regional, epidural, and spinal anaesthesia. In estimating the safe dosage of these drugs, it is important to take account of the rate at which they are absorbed and excreted as well as their potency. Other pertinent factors worthy of consideration are the patient's age, physique, and clinical condition ; the degree of vascularity of the area to which the drugs are to be applied, and the duration of administration.

Prolongation of action by vasoconstrictors.—The duration of action of a local anaesthetic is proportional to the time during which it is in actual contact with nervous tissues. Consequently, procedures that maintain the localization of the drug at the nerve (i.e. use of vasoconstrictors) greatly prolong the period of anaesthesia, and can reduce the systemic toxicity (where large volumes are used). Adrenaline (1 in 200,000) is commonly used ; while in dental surgery up to 1 in 80,000 (1, 25mg/100ml) of adrenaline is used with local anaesthetics.

Higher concentrations are occasionally used but there is no justification for this. The total dose of adrenaline should not exceed 500 micrograms and it is essential not to exceed a concentration of 1 in 200,000, if more than 500ml of the mixture is to be injected. A vasoconstrictor should not be used for nerve block of digits and appendages. For obvious anatomics reasons, the whole blood supply may be cut off by intense vasoconstriction so that the organ may be damaged or even lost.

Local anaesthetics containing adrenaline and noradrenaline should not be used in patients taking tricyclic antidepressants because of an increased risk of cardiac arrhythmias and hypertension. This restriction does not apply to patients on monoamine oxidase inhibitors.

Toxicity.—Toxic effects associated with the local anaesthetics are usually a result of excessively high blood concentrations. The main effects are excitation of the CNS (nervousness, and convulsions) followed by respiratory depression. Less commonly, the cardiovascular system is depressed. Hypersensitivity reactions occur mainly with the ester-type local anaesthetics such as amethocaine, benzocaine, cocaine and procaine. Toxicity may occur with repeated dosage due to accumulation of the drug ; in such cases smaller doses should be given. Toxic effects may also occur if the injection is too rapid. Local anaesthetics should not be injected into inflamed or infected tissues nor should they be applied to the traumatised urethra. Under these conditions the drug may be so rapidly absorbed that a systemic rather than local reaction is produced.

Uses.—Local anaesthetics are generally used for minor operations when loss of consciousness is neither necessary nor desirable and also as an adjunct to major surgery to avoid deep general anaesthesia. A local anaesthetic is seldom used alone for major surgery not because of its impracticability but because patients prefer unconsciousness. Local anaesthetics can also be used topically for short periods to give relief from local pain and itching (but skin allergy is common).

LIGNOCAINE

Lignocaine is employed as the hydrochloride salt. It is the most widely used local anaesthetic drug. It acts more rapidly and is more stable than most other local anaesthetics. It is effectively absorbed from mucous membranes and is a useful surface anaesthetic in concentrations of 2 to 4 *per cent.*

Dosage form.—Injection 0.5% (5mg/ml) 1% (10mg/ml) and 2% (20mg/ml) in 20ml ampoules and 50ml vials. Except for surface anaesthesia, solutions should not exceed 1% in strength. The duration of the block (with adrenaline) is about 1½ hours.

Uses.—Local anaesthesia by surface infiltration, religions, epidural and caudal routes ; dental anaesthesia.

Cautions.—Epilepsy, hepatic impairment, impaired cardiac, conduction, bradycardia. Reduce dose in elderly or debililated patients. Resuscitative equipment should be available.

Contra-Indications.—Myasthenia gravis, hypovolaemia, complete heart block. Do not use solutions containing adrenaline for anaesthesia in appendages.

Side effects.—Include hypotension, bradycardia, cardiac arrest, agitation, euphorial respiratory depression and convulsions.

Dose.—Adjusted according to the site of operation and response of the patient.

(*a*) *By injection.*—Maximum dose is 200mg or 500mg with solutions which also contain adrenaline. Maximum dose of adrenaline is 500 micrograms.

(*b*) *Infiltration anaesthesia.*—0.25-0.5 *per cent* with adrenaline in 200,000, using 2–50ml of a 0.5 *per cent* solution in minor surgery and up to 60ml in more extensive surgery.

(*c*) *Nerve block.*—With adrenaline 1 in 200,000, 1 *per cent* to a maximum of 50ml, 2 *per cent* to a maximum of 25ml.

(*d*) *Epidurai and caudal block.*—With adrenaline 1 in 200,000, 1 *per cent* to a maximum of 50ml, 2 *per cent* to a maximum of 25ml.

(*e*) *Surface anaesthesia.*—Usual strengths, 2–4 *per cent.* For mouth, throat and upper gastrointestinal tract, 1–4 *per cent*, to a maximum of 200mg.

Others.—Other commonly used local anaesthetic is Bupivacaine.

3. CARDIOVASCULAR SYSTEM DRUGS

Drugs acting on the cardiovascular system (CVS) are discussed under the following headings :

3.1. Cardiac glycosides
3.2. Antiarrhythmic Drugs
3.3. Antihypertensive Drugs
3.4. Anti-angina Drugs

3.1. *Cardiac Glycosides.*—Digitalis is the common name given to the cardiotonic drugs which are mostly extracts of the digitalis plant leaves and seeds. The cardiac glycosides are the active principles of these extracts. The two commonly used cardiac glycosides are digoxin and digitoxin. Digoxin is the drug of cbojoe.

DIGOXIN

Dosage forms.—Tablets 0.25mg ; Oral Solution, 0.05mg/ml, 0.25mg/ml injection : 0.25mg/ml in 2ml ampoules.

Mode of action.—Inhibits sodium—potassium ATPase thereby allowing entry of sodium and calciumions into the myocardial cell. The calciumions bind to troponin which is an inhibitor of actomyosin complex. The uninhibited combination of actin-myosin results in myocardial contraction.

Pharmacological properties.—Increases the force of contraction (positive inotropic effect) while reducing total oxygen consumption; it thus increases the efficiency of the heart, slows the heart rate (negative chronotropic effect) by both direct and indirect vagal action of prolonging the refractory period in atria and Bundle of His; it increases myocardial excitability.

Uses.—Congestive heart failure Atrial fibrillation—reduces ventricular rate but does not convert fibrillation to sinus rhythm. Supraventricular tachycardia Atrial flutter.

Precautions.—Caution in hypokalaemia and in those concurrently using potassium wasting diuretics (thiazides), recent myocardial infarction, hypothyroidism, the elderly and those with renal failure.

Adverse Reactions.—Nausea, vomiting, bradycardia, heartblock, any kind of arrhythmias but characteristically pulsus paradoxus and ventricular tachycardia and gynaecomastia.

Drug Interactions.—Thiazides and related diuretics cause hypokalaemia which predisposes to digitalis toxicity. Cholestyramine reduces its absorption.

Dosage.—Oral 0.25mg 2 or 3 times daily until digitalised (i.e. heart rate 60-80/min) then 0.125—0.5mg daily. I.V. 0.5—1mg initially, then 0.25mg every 4-6 hours ; monitor ECG.

Overdosage.—Symptoms and signs—As for Adverse Reactions. Treatment Stop digoxin; Symptomatic treatment; I.V. KCL 40m in 500ml 5 *per cent* Dextrose in water over 1-2 hours. Monitor ECG and check serum potassium.

For bradycardia : atropine 0.6mg i.m.
For ventricular arrhythmias, i.v. lignocaine, phenytoin, or propranolol.

3.2. *Anti-Arrhythmic Drugs.*—Management of an arrhythmia requires precise diagnosis of the type of arrhythmia. Drugs used in supraventricular arrhythmias include digoxin, beta-adrenoceptor blockers and quinidine. Those used in ventricular arrhythmias include lignocaine, procainamide, phenytoin, and beta adrenoceptor blockers. They may be broadly classified as membrane stabilizers, beta adrenoceptor blockers and calcium entry antagonists.

3.2.1. *Membrane Stabilizers.*—These include quinidine, procainamide, lignocaine and phenytoin.

LIGNOCAINE

Dosage form.—Injection 20mg/ml (Hydrochloride) in 5 ml ampoules.

Mode of action.—Membrane stabilizer.

Pharmacological properties.—Prolongs effective refractory period of myocardium.

Uses.—Ventricular arrhythmias occurring during acute myocardial infraction.

Precautions.—Contraindicated in supraventricular tachycardias, heart block, Stokes Adams syndrome, hypersensitivity to amide-type local anaesthetics. Use with caution in patients with hypovolaemia, shock, heart block, hepatic or renal impairment.

Adverse Reactions.—Vomiting, hypotension, bradycardia, cardiac arrest, light headedness, drowsiness, dizziness, tinnitus, blurred vision, convulsions, coma, respiratory depression, allergic reactions and soreness at side of i.m. injection.

Drug Interactions.—Propranolol potentiates, while phenobarbitone and phenytoin inhibit its effect.

Dosage.—I.V., 50-100mg at 20-50mg/min repeated in 5 minutes if necessary. No more than 200-300mg in 1 hour.

Overdosage.—Symptoms and signs—Drowsiness, confusion, dyspnoea, prolonged P-R interval, widened QRS complex, increase in arrhythmias, convulsions, respiratory depression and cardiac arrest.

Treatment—Stop injection. Symptomatic and supportive treatment.
Give i.v. diazepam for convulsions.

3.2.2. *Beta-Adrenoceptor Blockers*

PROPRANOLOL

Dosage forms.—Tablets, 10 and 40mg (Hydrochloride) ; Injection, 1mg (Hydrochloride) in 1ml ampoule.

Mode of action.—Non-selective beta-adrenoceptor blocker with membrane stabilising action but without intrinsic sympathomimetic activity.

Pharmacological properties.—Decreases heart rate, cardiac output and blood pressure ; myocardial oxygen consumption is reduced ; antiarrhythmic which decreases spontaneous rate of depolarization of ectopic pacemakers and slows conduction in atrial and A-V node ; increases airways resistance and broncho-constriction.

Uses.—Hypertension, cardiac arrhythmias including both supraventricular and ventricular arrhythmias, digitalis-induced arrnythmias and anaesthetic agents—induced arrhythmias ; angina pectoris ; prophylaxis of migraine. Hypertrophic obstructive cardiomyopathy ; adjunct to alpha adrenoceptor blockers in the management of phaeochromocytoma.

Precautions.—Contraindicated in bronchial asthma, congestive heart failure, sinus bradycardia. Avoid abrupt discontinuation of therapy in coronary or thyrotoxic patients. Care in diabetes, as premonitory signs and symptoms of hypoglycaemia may be masked.

Adverse Reactions.—Bradycardia, A-V block, congestive heart failure, Raynauds phenomenon, paraesthesia of hands, light headedness, insomnia, depression, hallucination, loss of memory, nausea, vomiting, abdominal cramps, diarrhoea, constipation, mesenteric artery thrombosis, ischaemic colitis, bronchospasm, rash, agranulocytosis, reversiblealopecia.

Drug Interactions.—Reduced A-V conduction with digitalis ; antagonises bronchodilators. Produces increased risk of hypotension, syncope, vertigo when used with reserpin.

Altered laboratory values.—Increased values of blood urea, SGOT, SGPT, LDH and alkaline phosphatase.

Dosage.—Oral: Hypertension : 40mg twice daily increasing to 160-480mg/day in 3 to 4 doses, combined with diuretic.

Arrhythmias : 10-30mg 3 or 4 times daily.
Angina pectoris : 10-40mg 3 or 4 times daily.
Migraine : 80-240mg/day in 2-4 doses.
Hypertrophic obstructive cardiomyopathy : 20-40mg 3 or 4 times daily.
Injection : 1-3mg i.v., may be repeated after 10-15 minutes.

Overdosage.—Signs and symptoms : Severe bradycardia, hypotension. Treatment—For bradycardia, use i.v. atropine, 0.25-1.0mg ; for bronchospasm, use aminophylline and adrenaline ; for hypotension, use adrenaline or noradrenaline ; for cardiac failure, use digoxin and diuretics.

Others.—Other anti-arrythmic drugs in use are phenytoin, Procainamide and Quinidine.

3.3. *Anti-Hypertensive Drugs*

3.3.1. *Thiazide Diuretics*

BENDROFLUAZIDE

Dosage form.—Tablets, 2.5 and 5mg.

Mode of action.—Inhibits sodium reabsorption mainly at the proximal part of the distal tubule.

Pharmacological properties.—Induces diuresis and lowers blood pressure.

Uses.—Oedema associated with congestive heart failure, nephrotic syndrome, cirrhosis of liver. Mild hypertension (useful alone) Moderate to severe hypertension (in combination with other drugs).

Diabetes insipidus.

Idiopathic hypercalciuria.

Precautions.—Contraindicated in renal failure ; may precipitate or aggravate diabetes mellitus and gout ; may predispose to digitalis toxicity. Caution in renal or hepatic impairment.

Adverse Reactions.—Hypokalaemia, hyperglycaemia, hyperuricaemia, rashes, thrombocytopenia.

Drug Interactions.—Predisposes to digitalis toxicity.

Dosage.—Hypertension, 2.5-5mg in the morning.

3.3.2. *Direct Vasodilators*

HYDRALAZINE

Dosage form.—Injection, 20mg in 1ml ampoule.

Mode of Action.—Direct vasodilator.

Pharmacological properties : Antihypertensive.

Uses.—Moderate to severe hypertension. Hypertensive emergencies. Congestive Heart Failure.

Precautions.—Contraindicated in coronary artery disease, rheumatic valvular disease and early pregnancy. Obtain full blood count, LE cell preparation and antinuclear antibody (ANA) titre before and periodically during the prolonged treatment.

Stop treatment if patient develops malaise, fever, chest pain, or other unexplained symptoms or if ANA titre rises or LE cell reaction becomes positive.

Adverse Reactions.—Headache, anorexia, tachycardia, palpitations, hypotension angina pectoris, paradoxical hypertension, diarrhoea, rash, Lupus erythematosus-like syndrome, arthralgia, peripheral neuropathy responsive to pyridoxine, anaemia, leukopenia agranulocytosis, thrombocytopenia, lymphadenopathy, splenomegaly and fluid retention.

Drug Interactions.—Potentiated by antihypertensive drugs. Altered laboratory values, Positive ANA titre, LE-cell phenomenon and direct Coombs' test. Increased plasma renin activity.

Dosage.—Injection, 20-40mg i.v. slowly as infusion or i.m., repeated as necessary 4-8 hourly.

Overdosage.—Symptoms and Signs—Hypotension, tachycardia, headache, myocardial ischaemia, cardiac arrhythmia and shock. Treat shock with plasma expander. Digitalization may be necessary.

PRAZOSIN

Dosage form.—Tablet, 1, 2, and 5mg.

Mode of Action.—Direct vasodilator ; also with post-synaptic alpha I adrenergic blockade.

Pharmacological properties.—Antihypertensive.

Uses.—Hypertension, congestive heart failure.

Precautions.—First dose syncope especially with large initial doses or rapid dose increase. Caution in renal function impairment.

Adverse Reactions.—Postural hypotension, tachycardia, palpitation, weakness, dizziness, headache, drowsiness, nausea, syncope, impotence, Urinary incontinence, nasal congestion, tinnitus, rashes, blurred vision, reddened sclera, pigmentary mottling cataract retinopathy.

Drug Interactions.—Potentiates other antihypertensives ; increased risk of hypotension with beta adrenoceptor blockers.

Dosage :

(*a*) Hypertension : 0.5-1mg, 2-3 times daily, increased every 2 days to a maximum of 20mg daily.

(*b*) Heart Failure : 0.5mg, initially, then 1mg, 3-4 times daily ; maintenance dose 4-20mg daily.

3.3.3. *Beta-Adrenoceptor Blockers*

PROPRANOLOL

See 3.2.2., under Anti-arrhythmic Drugs Propranolol is used here to represent the therapeutic group of Beta-adrenoceptor blocking drugs.

3.3.4. *Centrally-Acting Drugs* :

METHYLDOPA

Dosage form.—Tablets, 250, 500mg.

Mode of action.—Acts centrally and peripherally both directly and indirectly by forming alpha methyl noradrenaline, a false transmitter. Thus, it reduces brain and peripheral stores of moradrenaline.

Pharmacological properties.—Lowers the blood pressure.

Uses.—Hypertension.

Precautions.—Contraindicated active hepatic disease e.g. hepatitis and cirrhosis. Paradoxically, hypertension may occur on i.v. injection. Caution in renal impairment. Dialysis patients may be difficult to control since it is removed by dislysis.

Adverse Reactions.—Sedation, postural dizziness, nausea, vomiting, fever, parkinsonism, night-mares, depression, bradycardia, oedema and weight gain, impairment of liver function, positive direct coombs' test, haemolytic anaemia, loss of libido, impotent, breast enlargement, gynaecomastia, nasal stuffiness, rashes, arthralgia, myalgia, lupus erythematosus

Drug Interactions.—Potentiates other antihypertensive drugs.

Dosage.—Oral, 250mg 2 or 3 times daily initially, may be gradually increased to 2-3g daily in divided doses.

Child.—10mg/kg/day in divided doses, may be increased to 55mg/kg/day.

3.3.5. *Other Antihypertensive Drugs.*—Direct Vasodilators—Diazoxide, Minoxidil, Sodium nitroprusside Alpha—Adrenoceptor Blocker—Phenoxybenzamine. Centrally-Acting Drugs.—Clonidine, Reserpine.

3.4. *Anti.—Angina Drugs*

3.4.1. *Nitrates and Nitrites*

CLYCERYL TRINITRATE

Dosage form.—Tablet (sublingual) 0.5mg

Mode of Action.—Dilates peripheral vessels, thereby reducing the cardiac work and relieving angina.

Pharmacological properties.—Antiangina.

Uses.—Prevention of angina pectoris. Treatment of angina pectoris. Congestive heart failure.

Precautions.—Contraindicated in early myocardial infarction, severe anaemia, increased intraocular pressure, increased intracranial pressure, postural hypotension, and hypersensitivity to nittes or nitroglycerin. Tolerance may develop.

Adverse Reaction.—Throbbing headache, dizziness, vertigo, palpitation, tachycardia, syncope, nausea and vomiting, rashes.

Drug Interaction.—Alcohol increases cerebral ischaemic symptoms (dizziness, weakness, palpitations, syncope).

Dosage.—Sublingual Tablet : 1 tablet (0.5mg) under the tongue immediately upon indication of attack; repeated as needed.

Overdosage.—Symptoms and signs—severe headache, blurred vision and dismuth Treatment—Discontinue drug and treat symptomatically.

4. DIURETICS

Diuretics are described in this section under the following headings :

4.1. Thiazide Diuretics ;

4.2. Loop Diuretics ;

4.3. Other Diuretics.

Diuretics are drugs used to increase the volume of urine excreted by the kidneys, with a net loss of sodium and/or chloride ions (block of renal reabsorption of these ions). They are employed principally for the relief of oedema and ascites. Diuretics are most effective in the treatment of cardiac oedema, particularly that associated with congestive heart failure. They are also used in ascites of cirrhosis, nephrotic syndrome, diabetes insipidus, hypertension, oedema of pregnancy, and to reduce cerebrospinal and intraocular fluid pressure. Some diuretics have highly specialized uses in glaucoma.

4.1. *Thiazide Diuretics*

BENDROFLUAZIDE

Dosage form.—Tablets, 2.5 and 5mg.

Mode of action.—Inhibits sodium reabsorption at the proximal part of the distal tubule, has weak carbonic anhydrase inhibitory effect and promotes urinary loss of potassium.

Pharmacological properties.—Diuretic, antihypertensive,

Uses.—Oedema due to congestive heart failure, nephrotic syndrome, liver disease ; Mild hypertension ; As an adjunct to other antihypertensives in moderate to severe hypertension ; Diabetes insipidus ; Idiopathic hypercalciuria.

Precautions.—Contraindicated in renal failure, liver failure, pregnant women, allergy to thiazides. May aggravate diabetes mellitus and precipitate gout.

Adverse Reactions.—Hypokalaemia, hyperglycaemia, hyperuricaemia and gout, rashes, hypovolaemia, thrombocytopenia, anorexia, nausea, vomiting, acute pancreatitis, cholestatic jaundice.

Drug Interactions.—Predisposes to digitalis toxicity.

Dosage.—2.510mg daily

Others.—Other commonly used thiazide diuretics are Hydrochlorothiazide, Hydroflumethiazide, polythiazide and Clopamide.

4.2. *Loop Diuretics.*—These are also called high ceiling diuretics because they preched a peak diuresis much greater than other diuretics. They include frusemide, ethacrynic acid and bumetanide.

FRUSEMIDE

Dosage form.—Tablets, 40mg Injection : 10mg/ml in 2, 5 and 25ml ampoules.

Mode of action.—Inhibits sodium and chloride reabsorption in the ascending limb of the loop of Honle.

Pharmacological properties.—Potent diuretic.

Uses.—Oedema of cardiac renal or hopatic origin : Refractory oedema ; Early phase of acute rennal failure ; Symptomatic hypercalcaemia, to lower plasma calcium by increasing its urinary loss.

Precautions.—Contraindicated in ci-rhosis of liver with hepatic failure.

Adverse Reactions.—Hypovolaemia, postural hypotension, hypokalaemia, hyperuricaemia, tinnitus, rashes.

Drug Interactions.—Increased potassium loss when used with corticosteroids and acetazolamide.

Dosage.—Oral : 20-80mg, once or twice daily. In oliguric renal failure, initially 250mg repeated if necessary, 4-6 hourly to a maximum of 2g. By i. m. or slow i. v. injection, 20-50 mg. By i. v. infusion, in oliguria, 0.25g at a rate not exceeding 4mg/minute.

Overdosage.—Symptoms and signs—*see* Adverse Reactions. Treatment-Gastric lavage and life supportive measures.

OTHERS : Bumetanide ; Ethacrynic acid.

4.3. *Other Diurettics.*—Osmotic Diuretics, e.g. Mannitol. Potassium-sparing Diuretics, e.g. Amiloride, Triamterene. Aldosterone antagonists, e.g. Spironolactone. Combination Diuretics—*see* Formulary Section.

5. BLOOD AND NUTRITION

Drugs treated in this section include :

5.1. Haematinics
5.2. Anticoagulants
5.3. Plasma substitutes
5.4. Plasma fraction for specific use
5.5. Vitamins
5.6. Minerals
5.7. Oral Rehydration Salts
5.8. Parenteral fluids
5.9. Peritoneal Dialysis Solution and Haemodialysyis Solution

5.1. HAEMATINICS—Drugs used in anaemias Anaemia may be due to blood loss (e. g. haemorrhoids, hookworms, menorrhagia, duodenal ulcer), poor intake or malabsorption of essential nutrients (e.g. irons folate, vitamin B 12), reduced red cell life span (haemolysis e.g. sickle cell disease) or failure of adequate production of red cells by the bone marrow. A refractory type of anaemia may also be secondary to severe systemic disease such as uraemia, infection, malignant disease or connnective tissue disease. In these cases, the pathogenesis or mechanism of the anaemia may vary (e.g. reduced red cell life span, non-utilization of

available iron, hypoplasia of marrow) and the anaemia responds only to effective control of the primary disease. Protein malnutrition apart from being accompanied often by malnutrition of haemopoietic nutrients can also cause a secondary red cell hypoplasia. Treatment of anaemia lies in the treatment of its root cause. Harm can be done by treatment with the wrong agent. For example, patients with sickle cell anaemia suffer from h aemolysis and not from iron deficiency and often have excess iron in their stores. Further administration of iron preparations leads to dangerous haemosiderosis. Blood transfusion does not cure anaemia and should not be used with that intention. It may in fact delay the diagnosis of anaemia apart from introducing side effects which are sometimes fatal. Its main use is to replace massive blood loss or to buy time in severe secondary anaemia while the primary disease is being tackled.

The body stores of iron are usually depleted before the anaemia develops. Therefore the aims of therapy are—

(*a*) to correct anaemia,
(*b*) to replenish the stores.

The latter is accomplished by the continuation of oral iron therapy for a further 3 months after the haemoglobin level is restored to normal or by giving an additional 1 to 1.5g of iron parenterally.

5.1.1. *Iron Preparations*

FERROUS SALTS

Dosage Forms.—The drug of choice is Ferrous sulphate tablets B.P. 200mg (60mg elemental iron). Suitable but more expensive alternatives are—

(*i*) Ferrous gluconate tablets B. P. 300mg (35mg elemental iron) ;
(*ii*) Ferrous fumarate tablets B. P. 200mg (65mg elemental iron) ;
(*iii*) Slow-release ferrous sulphate tablets.

Liquid preparations recommended are ferrous sulphate mixture for infants B. P. C. containing 12mg of elemental iron per 5ml. proprietary preparations of ferrous fumarate and colloidal ferric hydroxide containing respectively, 45mg, 40mg elemental iron in 5ml.

Pharmacological Properties.—The oral iron preparations are best absorbed from an empty stomach but when rare gastrointestinal side effects occur, they should be taken after meals at the cost of reduced absorption. The ferrous salts are better absorbed than the ferric salts. High doses of ascorbic and succinic acids aid absorption but are rarely necessary. Absorption is enhanced by iron deficiency.

Uses.—To cure or prevent iron deficiency.

1. Chronic blood loss.

2. Pregnancy. Foetus requires up to 600mg of iron from mother.

3. Malabsorption syndromes where proportion of dietary iron absorbed may be r educed, e.g. gastrojejunostomy, gastrectomy, sprue.

4. Babies who are born prematurely or weaned late.

5. Lack of the iron-containing items (e.g. meat, liver, plantain, green vegetables) in the diet.

6. Frequent urinary iron loss during haemoglobinuria e.g. due to C-S-P-D deficiency and haematuria crises.

Contra-indications

1. Sickle cell anaemia or chronic haemolytic states.

2. Aplastic anaemia.

Dosage.—Ferrous sulphate (200mg), gluconate (300mg) or fumarate (200mg) one tablet thrice daily, on empty stomach. Slow release ferrous sulphate preparations one to two tablets daily. Ferrous sulphate mixture 5 to 20ml daily in divided doses depending on age of child.

Side Effects.—Gastrointestinal symptoms namely nausea, diarrhoea, abdominal pain and constipation occur rarely. If they do, different preparations may be tried. The faeces are blackened by iron therapy.

Overdosage.—Clinical manifestations of iron poisoning are—

1. Gastrointestinal irritation and vomiting.
2. Haematemesis and melaena.
3. Shock.
4. Brain and liver damage.
5. Late gastrointestinal obstruction from scarring.
6. Haemosiderosis.

5.1.2. *Folic Acid*

Dosage Forms.—Folic acid is converted to tetrahydrofolic acid (Folinic acid) which is used for biosynthesis of amino and nucleic acids essential for DNA and cell division.

Pharmacological Properties.—The liver storage is limited (5-10mg) and lasts for a few weeks only and therefore deficiency occurs quite readily due to increased demand (haemolysis, pregnancy, neoplasia) poor intake (anorexia, over-cooking, malnutrition) malabsorption (sprue, gut resections) and drugs (anticonvulsants, pyrimethamine, methotrexate). Deficiency causes magaloblastic anaemia.

Uses.—Treatment and prevention of folic acid deficiency especially in pregnancy, malnutrition, malabsorption, chronic haemolytic state e.g. sickle cell disease and therapeutic trial in megaloblastic anaemia.

Dosage.—1mg daily for therapeutic trial for folate deficicency. More folic acid will give false response in those with vitamin B_{12} deficiency. For prevention and treatment : 0.5-5mg daily.

Contra-indications.—Vitamin B_{12} deficiency.

Side Effects.—Rare hypersensitivity may occur.

Toxic Effects

1. Precipitates neurological lesions in Vitamin B_{12} deficiency.
2. High doses may cause deposits of crystalline folic acid in the kidney.

5.2. *Anticoagulants*

5.2.1. *Parenteral Anticoagulants*

HEPARIN

Dosage Form.—Injection, 1000 units/ml and 25,000 units/ml in 5ml ampoules.

Mode of Action.—Heparin is antithrombin and antithromboplastin in action. It is inactive orally and is best given intravenously. Intramuscular or subcutaneous administration can lead to painful haematomas and erratic effect. Half life of injected heparin is only about 1-2 hours and it is partly destroyed in the liver and partly excreted in the urine.

Uses :

1. For induction of anticoagulant therapy for 48 hours before the effect of simultaneously administered oral anticoagulant drugs becomes established.
2. Acute peripheral artery occlusion.
3. For pulmonary embolism.
4. Haemodialysis.
5. Extracorporeal circulation in cardiac surgery.
6. Disseminated intravascular coagulation.
7. Prophylaxis of deep vein thrombosis during and after surgery in high risk patients.

Dosage

(*a*) For continuous intravenous administration, 30,000 units are added to 1 litre of per cent dextrose or normal saline, and infused at the rate of 20-25 drops per minute, over 24 hours. If speed of action is desired an initial primary dose of 5,000 units should be given into the infusion tubing initially. Whole blood clotting time is checked every 2 to 3 hours, to maintain coagulation times between 2-3 times normal values.

(*b*) For intermittent intravenous injection, 4 hourly doses are more effective than 8 hourly ones in which cases 5,000-7,500 units given preferably into an indwelling intravenous needle is recommended. For children the dose is 50 units/kg body weight followed by 100 units/kg body weight 4 hourly.

(*c*) *Low-Dose Heparin*

This is useful for :

(1) prophylaxis of deep vein thrombosis (DVT) during and after surgery in high risk patients.

(2) Treatment of Disseminated Intravascular Coagulation. The advantage of the low dose is that it is sub-anticoagulant and does not require laboratory control. It is supposed to prevent thrombosis by suppressing factor II activation. Usual dosage is 5,000 units subcutaneously 2 hours before surgery and postoperatively every 12 hours for one week.

Side Effects, toxicity and complications

(1) Haemorrhage.

(2) Rare hypersensitvity reactions including rhinitis, urticaria, asthma and death. Test dose of 1,000 units is desirable in patients with history of allergic disease.

(3) Rare transient alopecia 3-4 months later.

(4) Rare cases of osteoporosis and spontaneous fracture and priapism following prolonged use.

Contra-indication

1. Haemorrhagic disease or presence of a source of bleeding e.g. active peptic ulcer.
2. Visceral carcinoma.
3. Regional or lumbar block anaesthesia.
4. Severe hypertension.
5. Previous cerebro-vascular accident—unless embolic.
6. Recent surgery or traumat to CNS.
7. Sub-acute bacterial endocarditis.
8. Threatened abortion.

Antidote.—i.v. protamine sulphate 1 mg for every 100 units of heparin in the last dose, may be given in an emergency.

5.2.2. *Oral Anticoagulants.*—The drugs of choice are coumarins e.g. warfarin, because serious and sometimes fatal sensitivity reactions can occur to the indanediones (e.g. phenindione) anytime from few days to 6 weeks from the start of therapy. They produce anticoagulant effect after 36-48 hours by inhibiting the synthesis of vitamin K dependent coagulation factors in the liver.

Dosage form.—Tablets as warfarin sodium.

Uses

1. Prevention of venous thrombosis in high risk patients.
2. Prevention of recurrent DVT or pulmonary embolism.
3. Prevention of thrombosis and embolism in patients with prosthetic heart valves and rheumatic heart disease with arterial fibrillation or a history of cerebral embolism.
4. Use for prevention of arterial thrombosis is controversial.

Side Effects, Toxicity and Complications

1. Haemorrhage.

Contra-indications

1. As for Heparin.
2. Severe hepatic or rental disease.
3. Pregnancy.
4. Concomitant use of certain other drugs.

Drug Interactions

Drug	*Action*	*Anticoagulant Effect of Warfarin*
Phenobarbitone	Induce liver microsomal enzyme activity	Decreased
Alcohol Chloramphenicol	Reduce liver microsomal enzyme activity	Increased
Aspirin, Sulphonamides	Displace warfarin from protein binding	Increased
Broad spectrum antibiotics	Decreased Vitamin K synthesis in gut	Increased
Griseofulvin Thyroxine Quinidine	Unknown	Increased
Vitamin K	Stimulation of synthesis of clothing factors	Decreased

Nitrazepam is a safe hypnotic during warfarin therapy.

Antidote.—Vitamin K^1 (phytomenadione) can be given orally, i.v. or i.m. depending on clinical situation. Other vitamin K preparations have a variable effect.

Dosage	*Vitamin K^1*
For frank haemorrhage and no plan for futrther anticoagulation	10-20mg i.v.
For frank haemorrhage but continuation of anticoagulant desired	5mg or omit warfarin
When the desire is to reduce excessive effect before haemorrhage	omit warfarin

Laboratory Control

1. 48 hours after start of therapy.
2. Daily or alternate days until control is established, then increased interval.
3. When fully controlled on long-term therapy, check laboratory result every 4–6 weeks.
4. Prothrombin Time to be between 2-3 times normal value.

5.3. *Plasma Substitutes*

DEXTRAN 70

Dosage Form.—Solution 500ml bottle containing 6 per cent dextran (M.wt 70,000) in 0.9 *per cent* NaCl or 5 *per cent* dextrose.

Mode of action.—Plasma expander.

Pharmacological properties.—restores and maintains blood volume reduces the tendency for sludging of blood that may accompany many forms of shock.

Uses.—Hypovolaemic shock due to loss of whole blood and plasma, prevention of thrombosis in postoperative throm boembolic disease.

Precaution.—Interferes with typing, cross matching or Rhesus determination of blood. Therefore blood must be taken before its emergency administration ; contraindicated in anaemia, thrombocytopenia and hypofibrin ogenaemia.

Adverse Reactions.—Antigenic and may precipitate allergic reactions such as itching, urticaria, joint pains.

Dosage.—500ml-100ml i.v. while waiting for blood to be matched.

Overdosage : rare and most unlikely.

5.4. *Plasma Fraction for Specific Use*

HUMAN ALBUMIN

Dosage form.—5 *per cent* or 25 *per cent* solution ; 5 *per cent* solution in 250 and 500ml bottles ; 25 *per cent* solution in 20ml, 50ml and 100ml bottles.

Mode of action.—Plasma expander.

Pharmacological properties.—Restores and maintains blood volume.

Uses.—hypovolaemia due to loss of whole blood or plasma (burns). Hypoalbuminaemia in nephrotic syndrome or severe hepatic insufficiency.

Precautions.—Salt content may aggravate oedema.

Adverse Reactions.—Risk of hepatitis B virus infection.

Dosage.—Whole blood or plasma loss : 250-1,000ml 5 *per cent.*
Nephrotic syndrome or Cirrhosis : 50-100ml of 25 *per cent.*

Overdosage.—Signs and symptoms : oedema and heart failure due to sodium overload
Treatment—diuretics.

5.5. *Vitamins and Minerals.*—Vitamins should be used for the prevention and treatment of specific deficiency states and not for conditions in which there is no evidence of vitamin deficiency.

RETINOL (VITAMIN A)

Dosage Forms.—Capsules or Tablets : 1.5mg (5,000 units), 7.5mg (25,000 units).

Mode of action.—Cofactor in various biochemical reactions e.g. mucopolysaccharide synthesis, sulphate activitation, hydroxysteroid dehydrogenation, cholesterol synthesis, hepatic microsomal demethylation and hydroxylation of drugs.

Pharmacological properties.—maintains health skin, interferes with carcinogenesis, essential for vision in dim light, growth and differentiation of epithelial tissues bone, tissues, reproduction and embryonic development, regulates membrane permeability.

Uses.—deficiency of Vitamin A.
Prophylaxis during periods of increased requirement such as infancy, pregnancy and lactation, skin diseases like acne, psoriasis, Darier's disease and ichthyosis.

Precautions.—Avoid excesively large doses as symptoms of hypervitaminosis may occur.

Adverse Reactions.—Erythema, skin desquamation, sensitizens skin to sunlight allergic dermatitis, decreased skin pigmentation, dizziness, thirst, potechiae, liver damage.

Drug Interactions.—Vitamin E increases its efficacy and protects against its toxicity by increasing its storage in the liver.

Dosage.—Pregnancy and lactation : 1,000-1,200 units retinol equivalents or retinol per day.

Overdosage.—Signs and symptoms—irritability, vomiting, anorexia, headache, dry and itchy skin, skin desquamation, dermatitis, fatigue, pain in ankles and feet, myalgia, loss of body hair, papilloedema, nystagmus gingivitis, mouth fissures, lymphadenopathy. Hepatosplenomegaly, cirrhosis with portal hypertension, ascites. Increased intracranial pressure and neurological symptoms may mimic brain tumour. Hyperstosis, increased osteoblastic activity and hypercalcaemia.

Treatment—Withdrawal or Vitamin A.
Supportive treatment

VITAMIN B^1 (THIAMINE)

Dosage Forms
Tablets : 25, 50mg

Injection : 25mg/ml in 1ml ampoule

Mode of action.—coenzyme in carbohydrate metabolism in the decarboxylation of alpha ketoacids such as pyruvate and alpha ketoglutarate ; its requirement is greatest when carbohydrate is the source of energy.

Pharmacological properties : Thiamine, given in usual therapeutic doses, is practically devoid of pharmacodynamic actions.

Uses.—treatment or prophylaxis of thiamine deficiency diseases, e.g. beriberi (dry and wet).

Wernicke's encephalopathy
Korsakoff's syndrome
Alcoholic polyneuropathy
Precautions.— Nil.
Adverse Reactions.—Parenteral administration may rarely be associated with hypersensitivity reaction in the form of shock.
Dosage.—Alcoholic neuritis : 50-100mg daily orally.
Infantile beriberi : 25mg intravenously for collapse.
Alcoholic cardiomyopathy : 10–30mg thrice daily, i.m.
Neuritis of pregnancy : 5–10mg daily, i.m.

VITAMIN B_6 (PYRIDOXINE)

Dosage Form.—Tablet : 10mg
Mode of action.—Coenzyme for a wide variety of metabolic transformation of amino acids including decarboxylation, transamination, and racemization ; cofactor in the conversion of trytophan to 5-hydroxytryptamine.
Uses.—Treatment and prophylaxis of deficiency diseases, e.g. therapy with isoniazid.
Oestrogen therapy
Pregnancy
Oral contraceptive therapy
Pyridoxine—responsive anaemia
Precautions.—Dependence may occur to large doses.
Adverse Reaction—Very rare.
Drug Interactions.—Isoniazid increases its urinary excretion, prolonged use of penicillamine may cause its deficiency, cycloserine and hydralazine antagonise its effect. It enhances peripheral decarboxylation of laevodopa and reduces its therapeutic effect.
Dosage.—5-20mg/day
50–200mg/day in Pyridoxine deficiency anaemia.

VITAMIN C (ASCORBIC ACID)

Dosage Forms.—Tablets : 100, 500mg.
Mode of action.—Reducing agent which converts proline to hydroxyproline in collagen synthesis, also used in synthesis of steroids by adrenal cortex, conversion of folic acid to folinic acid, microsomal drug metabolism, tyrosine metabolism ; also needed for synthesis of intercellular substances including collagen, matrix of bone and tooth, capillary endothelium.

Pharmacological properties.—Very large doses are reputed to prevent or cure viral respiratory infections and beneficial in cancer.

Uses.—Treatment and prophylaxis of deficiency states, e.g. scurvy idiopathic methaemoglobinaemia ; viral respiratory infections.
Precaution.—High doses may result in oxalate kidney stones
Drug Interactions.—Iron absorption enhanced ;
Interferes with anticoagulant therapy.
Dosage.—Tablets 50-250mg thrice daily

VITAMIN D (ERGOCALCIFEROL)

Dosage Forms.—Capsules 0.25mg (10,000 units) and 1.25mg (50,000 units).
Mode of action.—Active form increases plasma calcium concentration by facilitating the intestinal absorption and enhancing mobilization from bone ; it also increases proximal tubular reabsorption of calcium and phosphorus.

Pharmacological properties.—Deficiency results in rickets in children and osteomalaca in adults. Excessive doses result in deranged calcium metabolism.

Uses.—Prophylaxis and treatment of rickets, treatment of metabolic rickets and steomalaci as treatment of hypoparathyroidism.

Precautions.—Excessive doses result in hypervitaminosis.

Adverse Reactions.—Phenytoin and phenobarbitone reduce its intestinal absorption, increase target organ resistance to vitamin D and reduce its effect on bone resorption. Hence hypocalcaemia occurs leading to rickets or osteomalacia.

Dosage.—Vitamin D deficiency : up to 0.25mg (10,000 units) daily.
Rickets : up to 1.25 (50,000 units) daily.

Overdosage.—Symptoms and signs—weakness, fatigue, headache, nausea, vomiting diarrhoea, polyuria, nocturia, polydipsia, proteinuria, nephrolithiasis, diffuse nephrocalcinosis, metastatic calcification in blood vessels, heart, lungs, skin ; and hypertension. There is hypercalcaemia, raised blood urea but the phosphate concentrations are variable. Maternal hypocalcaemia may result in non-familial congenital supravalvular aortic stenosis, suppression of parathyroid, tetany and seizures.

Treatment.—Withdrawal of vitamin D treatment, low calcium diet liberal fluid intake and administrations of corticosteroids.

Others.—Other vitamins include Vitamins E and K. Vitamin K has been discussed under Antidotes (section 16). Minerals occasionally used in general practice include Calcium gluconate, Calcium lactate and Sodium fluoride. The indications for them are sufficiently few not to include them in the Essential Drug List.

5.7. Oral Rehydration Salts—*see* Section 7.6.1.

5.8. Parenteral I.V. Fluids

DEXTROSE

Dosage forms and routes.—5 *per cent* (50mg/ml) in 500ml and 1 litre bottles. Also 20, 25 per cent and 50 per cent in 20ml, 25ml, and 50ml ampoules.

Uses.—(1) Fluid replacement after mainly pure water loss.
(2) Provision of energy as well as fluid.

Adverse Reactions.—thrombophlebitis.

Dosage.—2-6 litres per day when necessary.

SODIUM CHLORIDE AND DEXTROSE I.V. INFUSION

Dosage form.—Sodium chloride 0.18 *per cent* and 4.3 *per cent* anhydrous dextrose.

Uses.—When need for water replacement is far greater than that for sodium.

1. Dehydration from vomiting.
2. Hyperosmotic : diabetic coma.

Dosage.—2-6 litres per day as required.

SODIUM CHLORIDE I.V. INFUSION

Dosage form.—0.9 *per cent* in 500, 1000 ml bottles (Normal strength).
0.45 per cent in 500, 1000 ml bottles (Half-normal strength).

Uses.—(1) Diabetic ketosis.
(2) Severe Diarrhoea.
(3) Pancreatic fistulae.
(4) Small bowel fistulae.

Dosage.—2.6 litres per day as required.

POTASSIUM CHLORIDE

Dosage form.—Injection, 10 *per cent* in 10ml ampoules.

Uses.—Hypokalaemia.

Precautions.—Monitor ECG ; ensure adequate urine is being passed Infuse at not more than 20mmol/hour.

Dosage.—up to 6g (80mmol) daily.

Adverse Reactions.—Cardiac: asystole

SODIUM BICARBONATE I.V. INFUSION

Dosage form.—1.4 per cent (167mmol) in 500ml 1.4 per cent (167mmol) in 500ml.

Use.—Metabolic acidosis e.g. after cardiac arrest.

Dosage.—Continuous i.v. infusion of a meak solution i.e. 1.4 *per cent* to correct base deficit or restore pH to 7.2.

SODIUM LACTATE COMPOUND SOLUTION

Dosage form.—Solution for i.v. infusion. Containing the following irons in mmol/litre : Na^{+} 131, K^{+} 5, Ca^{++} 2, HCO_3^{-}—(as lactate) 29, and Cl^{-} 111.

Uses.—Diabetic coma ; diminished alkali reserve.

Dosage.—100 ml or according to patient's need.

5.9. Peritoneal Dialysis Fluid

Dosage forms.—(Injection for peritoneal) 1 L or 2 L containing per litre of infusion :

Sodium : 136.5 mmol.

Potassium : Nil.

Chloride : 99.6 mmol.

Acetate : 35.0 mmol.

Magnesium : 1.5 mmol.

Calcium : 3.0 mmol.

Dextrose : either 1.5 *per cent* (isotonic) or 4.25 *per cent* (hypertonic).

Mode of action.—Withdraws urea and other toxic products from blood, the peritoneum acting as semi-permeable membrane.

Pharmacological Properties.—Nil.

Uses.—(Acute renal failure.

Chronic renal failure.

Chronic ambulatory peritoneal dialysis (CAPD)

Precautions.—Sterile procedure must be kept.

Adverse Reactions.—Peritonitis ; dehydration if too much of hypertonic solution is used.

Others.—Include the Haemodialysis Fluid which is used only in specialised centres and is not included in the Essential Drug List.

6. RESPIRATORY SYSTEM DRUGS

Drugs acting on the respiratory tract are described under the following headings :

6.1. Anti-asthmatics

6.2. Anti-tussives

6.3. Expectorants

6.1. *Anti-Asthmatics.*—Drugs are used in asthma to treat acute attacks or for maintenance therapy in the chronic asthmatics.

Treatment of acute attack.—A mild attack of asthma may respond to oral bronchodilators. The bronchodilator of choice is any of the selective beta$_2$-adrenoceptor stimulants. These drugs dilate the bronchus without producing cardiac stimulation and are therefore preferred to the non-selective beta-adrenoceptor agonists like isoprenaline. At least three types of beta$_2$-agonists are presently available in Nigeria : salbutamol, terbutaline and fenoterol. There is little to choose between these three as far as efficacy and safety are concerned. However, fenoterol has a significantly longer duration of action than salbutamol and can therefore be given at longer intervals. A small number of patients previously controlled with non-selective bronchodilators continue to express preference for this class of drugs over the newer beta$_2$-stimulants. The non-selective adrenoceptor stimulants such as adrenaline, isoprenaline and orciprenaline are now less suitable and less safe for prolonged use because they produce serious cardiac irregularities. However, Adrenaline continues to be useful in the relief of bronchial spasm of acute attacks of asthma.

For moderate attacks and mild ones that fail to respond to oral beta$_2$-agonists, response is usually obtained with aerosols of the selective beta$_2$-agonists.

Severe asthmatic attacks and status asthmatics should be treated in hospital using oxygen, intravenous eminophylline or salbutamol and, if necessary, intravenous hydrocortisone.

Prophylaxis.—For frequently occurring mild to moderate attacks of asthma, prophylaxis is given with sodium cromoglycate, ketotifen or corticosteroid inhalation. Regular administration of beta$_2$-stimulant tablets or aerosols can also be used for prophylaxis either as adjunct to the above or as substitutes for them if they are not available. Repeated severe attacks that fail to stabilise with the above will require oral corticosteroid prophylaxis.

6.1.1. *Methylxanthines*

AMINOPHYLLINE

Dosage form.—Injection 25mg/ml in 5ml ampoules.

Pharmacological properties.—Aminophylline is a 1:1 complex of theopylline and ethylenediamine. The latter merely serves to increase the solubility of theophylline. The main effects of aminophylline are :

(*i*) relaxation of bronchial and vascular smooth muscle.

(*ii*) increased cardiac excitability and tachycardia.

(*iii*) stimulation of the central nervous system.

Uses.—(1) Relief of severe airways obstruction due to asthma and other causes of bronchospasm.

(2) Emergency relief of severe acute left ventricular failure. However, the potent vasodilators like sodium nitroprusside, high ceiling diuretics like frusemide and specific cardiac inotropic agents are now generally preferred.

Precaution.—The injection should be given very slowly preferably over 15 minutes.

Adverse effects.—Vomiting even after intravenous injection. Headaches, palpitations, utahycardia, dizziness, hypotension, anginal pain, restlessness and agitation. Collapse and sudden death if injected rapidly.

Dosage.—By slow intravenous injection over a period of minutes.

Adults : 250-500mg (5mg/kg).

Children : 5mg/kg.

6.1.2. *Corticosteroids*

BECLOMETHASONE

Dosage form.—Oral inhalation (aerosol) 0.5mg (dipropionate) per metered dose.

Pharmacological effects.—A potent synthetic anti-inflammatory glucocorticoid which, delivered by metered aerosol, exerts a topical effect on the bronchi at dosages that do not produce significant systemic effects.

Uses.—Prophylaxis of asthma.

Adverse effects.—Oral candidiasis can occur with prolonged use.

Dosage.—2 inhalations, 3-4 times daily. This can be increased according to response to a maximum of 20 inhalations per day.

Childeren's dose.—approximately half of adult dose.

HYDROCORTISONE

See Section 8.1.

6.1.3. *Adrenoceptor Stimulants*

6.1.3.1. *Selective Beta$_2$-Adrenoceptor Stimulants*

SALBUTAMOL

Dosage forms.—Tablets, 2mg, 4mg (sulphate)

Syrup, 2mg/5ml (sulphate)

Oral inhalation (metered aerosol), 0.1mg per dose.

Injection, 0.5mg (sulphate) in 1ml ampoule.

Pharmacological properties.—A selective beta$_2$-adrenoceptor stimulant with potent bronchodilator activity and relatively weak cardiovascular effects.

Uses.—Relief of bronchospasm due to asthma and other causes. Uterine relaxant in premature labour.

Precaution.—Aerosol inhalation may be ineffective in the presence of severe broncho spasm, Hypertension, pregnancy.

Adverse effects.—Over-dosage may cause significant cardiovascular stimulation.

Dosage.—Oral tablets : Adults, 2-4mg, 3 or 4 times daily.

Children (2-5 years), 1-2mg, 3 or 4 times daily.

Aerosol inhalation.—Adults, 1-2 inhalations, 3-4 times daily.

Children (2-5 years) 1 inhalation, 3-4 times daily.

Subcutaneous or intramuscular injection : 0.5mg, 4 hour. Intravenous injection : 0.25mg, 4 hourly.

Others.—Terbutaline, Fenoterol.

6.1.3.2. *Non-selective Adrenoceptor Stimulants*

ADRENALINE

Dosage form.—Injection, 1mg (bitartrate)/ml. in 1ml ampoules.

Pharmacological properties.—Relaxes bronchial smooth musculature by stimulation of $beta_2$- adrenoceptors.

Uses.—In severe acute attacks of bronchial asthma ; injected subcutaneously to relieve bronchial spasm.

Caution.—Tolerance or refractoriness may develop with prolonged usage.

Adverse effects : *See* 15.2.

Dosage.—By subcutaneous injection of a 1 in 1000 solution (or 1mg/ml solution):

Adults.—0.2-0.5ml (200-500mg).

Children.—0.01ml or 10ug per kg body weight, up to max. of 0.5ml (500mg) as a single dose.

Relief is obtained within 5 minutes, or it may be repeated after 15-30 minutes.

Others.—Isoprenaline, Orciprenaline.

6.1.4. *Prophylactic Drugs*

KETOTIFEN

Dosage forms.— Tablets or Capsule 1mg

Syrup 1mg/5ml.

Pharmacological properties.—A prophylactic drug used to reduce the frequency of asthmatic attacks. Mode of action is not certain but appears to act like sodium cromoglycate to prevent release of histamine and other mediators of allergy. Has advantage over cromoglycate in being given by mouth thus removing the problems many patients have in the correct use of cromoglycate inhalation. Ketotifen also has some classical antihistamine properties.

Uses.—Prophylaxis of asthma ; prophylaxis of allergic reactions.

Symptomatic relief of allergy such as urticaria.

Adverse effects.—Drowsiness.

Dosage.—1-2mg twice daily.

Children (over 2 years), 1mg twice daily.

Others.—Sodium cromoglycate.

6.1.5. *Compound Bronchodilator Preparations.*

EPHEDRINE PLUS HYDROXYZINE PLUS THEOPHYLLINE

Dosage forms.—Tablet or syrup containing

Ephedrine 25mg
Hydroxyzine 10mg
Theophylline 30mg
per tablet or per 5ml syrup.

Pharmacological properties.—Combines two bronchodilators and an antihistaminic sedative, hydroxyzine.

Uses.—Relief of mild to moderate asthma. There is little place for this kind of preparation in the modern treatment of asthma.

Dosage.—Tablets : adult, 1-2 tablets, 4 times daily.

Syrup : Children (over 5 years), 5-10ml, 2 to 4 times daily ; (2-5 years), 2.5-5ml, 2-4 times daily.

6.2. *Anti-Tussives.*—Drugs are used in the symptomatic treatment of cough either to muppress cough or to aid the expectarotion of mucus. A dry, irritant, non-productive cough say need to be suppressed especially if it disturbs sleep at night. Codeine has a weak cough suppressant action. Methadone has a stronger suppressant action but its repeated use may lead to habituation or even addiction.

CODEINE

Dosage forms.—Tablets, 10mg (Phosphate).
Syrup, 5mg (Phosphate) /5ml.

Pharmacological properties.—Codeine is an opiate analgesic which also suppresses the cough reflex. It also increases smooth muscle tone and reduces its motility.

Uses.—Suppression of dry or painful cough.
Symptomatic treatment of diarrhoea.

Adverse effects.—Constipation when used as a cough suppressant.

Dosage.—Adult, Tablet : 2 tablets, 3-4 times daily.

6.3. *Expectorants.*—Although expectorants are used extensively in general medical practice, there is no evidence that they have more than a placebo effect. The best treatment for cough is to diagnose its cause and give appropriate treatment.

See formulary section for different expectorant formulations.

7. GASTROINTESTINAL SYSTEM DRUGS

Drugs acting on the gastrointestinal System are described under the following headings :

7.1. Antacids
7.2. Antiemetics
7.3. Antihaemorrhoidals
7.4. Antispasmodics
7.5. Purgatives
7.6. Antidiarrhoeals
7.7. Ulcer healing drugs

7.1. *Antacids.*—Gastric acid is generally believed to be responsible for most of the symptoms in peptic ulcer, gastritis, oesophageal reflux with heartburn and a variety of dyspepsias. High gastric acidity is also considered a hinderance to the healing of peptic ulcer.

The PH of the gastric acid is normally between 1 and 2. The aim in antacid medication is to raise it to about 4 without producing systemic alkalosis. Complete neutralisation is not helpful. It inhibits pepsin and may cause rebound hypersecretion of gastric acid.

Antacids are usually classified as *systemic* and *non-systemic.* The only systemic antacid that has been used to any great extent is sodium bicarbonate. It is now no longer used because of the systemic alkalosis that it causes. The non-systemic antacids are not absorbed and include calcium, magnesium and aluminium compounds. Calcium compounds cause acid rebound, are constipating and, with prolonged use, may cause hypercalcaemia. They are therefore no longer recommended. At present, the choice of antacid should be between magnesium and aluminium compounds. Aluminium compounds constipate whilst magnesium compounds cause diarrhoea.

There are many antacid preparations in the market but aluminium hydroxide, magnesium magnesium and magnesium trisilicate are as effective as any.

ALUMINIUM HYDROXIDE

Dosage forms.—Tablet, 500 mg.
Mixture, 320 mg/5 ml. *See* formulary for composition.

Pharmacological properties.—A non-systemic gastric antacid.

Uses.—Peptic ulcer.
Dyspepsia from various causes.
Hyperphosphataemia.

Adverse effects.—Constipation; loss of phosphate in faeces.

Precaution.—Best taken at least 1 hour after food. May interfere with the absorption of many drugs.

Dosage.—1-2 tablets or 5-10 ml of mixture at hourly, 2-hourly or 3-hourly intervals depending on severity of symptoms.

MAGNESIUM HYDROXIDE

Dosage forms.—Tablet, 500 mg
Mixture, 250 mg/5. ml. *See* formulary section for composition.

Pharmacological properties.—non-systemic gastric antacid.

Uses.—Peptic ulcer.
Dyspepepsia from various causes ; constipation.

Adverse effect.—Diarrhoea.

Precaution.—Not to be taken with food or with other drugs.

Dosage.—For peptic ulcer and dyspepsia ; 1-2 tablets or 5-10ml when required. For constipation : 25-50 ml as required.

MAGNESIUM TRISILICATE

Dosage forms.—Tablet, 500 mg
Mixture, 250 mg/5 ml. *See* formulary section for composition.

Pharmacological properties.—non-systemic gastric antacid.

Uses.—Peptic ulcer ; Dyspepsia from various causes.

Adverse effects.—Diarrhoea.

Precaution.—Not to be taken with food or other drugs.

Drug interaction.—Reduces absorption of iron.

Dosage.—1-2 tablets chewed when required or 10-20 ml mixture taken when required.

7.2. *Anti-Emetics.*—Nausea and vomiting can be classified into two main groups : (*i*) these resulting from vestibular disorders and (*ii*) those due to other causes.

Vomiting of labyrinthine or vestibular origin occurs in motion sickness, Meniere's disease, positional vertigo and labyrinthitis. This kind of vomiting usually requires anti-emitic treatment. Antihistamines (e.g. promethazine), anticholinergics (e.g. hyoscine) or phenothiazines (e.g. chlorpromazine) are the drugs of choice. Anti-histamines are probably better tolerated than anti-cholinergics.

Non-labyrinthine vomiting arises from stimulation of the vomiting centre either via afferent nerves from the viscera or ceebral cortex or from the nearby chemoreceptortrigger zone (CTZ). The CTZ is stimulated by circulating substances such as appomorphine and other narcotic analgesics, digitalis and urqemia, and the CTZ in turn stimulates the vomiting centre.

Antihistamines and anticholinergics act directly on the vomiting centre and so suppress vomiting from any cause. Although they are often prescribed for non-labyrinthine vomiting they are much less effective than in motion sickness. The phenothiazines are the drugs of choice for non-labyrinthine vomiting.

CHLORPROMAZINE

See section 1.6.1.

PROMETHAZINE

See section 15.1

7.3. *Anti-Haemorrhoidals.*—Patients suffering from haemorrhoids may experience anal and perianal pruritus, soreness and exdoriation. Considerable relief can be obtained in haemorrhoids by careful local toilet and adjustment of the diet to avoid hard stools. When necessary local preparations containing local anaesthetics and corticosteroids can be us ed to relieve the pain and inflammation associated with haemorrhoids.

LIGNOCAINE PLUS BETAMETHASONE

RECTAL PREPARATIONS

Dosage Forms.—Cream, ointment or suppositoty.
See formulary section for composition.

Pharmacological properties.—Lignocaine is a local anaesthetic which relieves pain whilst the cast corticosteroid, betamethasone, relieves inflammation.

Uses.—To relieve pain and inflammation in haemorrhoids as well as in anal fissure' proctitis and related conditions.

Precaution.—The presence of infection should be excluded. Prolonged use of lignocaine may cause sensitisation of the anal skin. Prolonged use of betamethasone may lead to perianal thrush.

Adverse effects.—Skin sensitisation; thrush.

Dosage.—Suppository : Insert into the rectum night and morning and after defaecation. Ointment and cream : apply night and morning and after defaecation, externally or by rectumusing a rectal nozzle.

7.4. *Anti-spasmodics.*—Anti-spasmodics reduce spasm of hollow visceral. The most commonly used antispasmodics are anticholinergic drugs which inhibit parasympathetic innervation and therefore reduce motility and contraction. For most anticholinergic drugs the dose that reduces spasm also produces other unwanted anticholinergic effects like, paralysis of accommodation, dryness of the mouth constipation, and especially in the elderly, urinary retention and glaucoma. Hyoscine butylbromide is described here as an example of antispasmodic drugs. It has only little unwanted peripheral anticholinergic effects at the dose that reduces spasm of hollow viscera. Mixture of belladonna is also commonly used. Propantheline is useful in peptic ulcer both as an antispasmodic and as an inhibitor of gastric acid secretion. However, reduction of gastric acid secretion in now better achieved by H2-antagonists.

HYOSCINE BUTYLBROMIDE

Dosage forms.—Tablet, 10mg.

Injection, 20mg/ml in 1ml ampoule.

Pharmacological properties.—Anticholinargic drug.

Uses.—Relief of gastrointestinal and colonic spasm. Relief of spasm in renal or biliary colic. Relief of spasmodic dysmenorrhoea.

Adverse effects.—Peripheral anticholinergic effects including dry mouth, blurring of vision, constipation.

Dosage.—Tablet : 20 mg 4 times daily ; children, 10mg 3 times daily.

Injection : 20mg intramuscularly or intravenously when necessary.

Others.—Belladona mixture—*See* formulary section.

7.5. *Purgatives.*—The common indications for the use of purgatives are :

(*i*) Treatment of helminthic infections of the bowel.

(*ii*) Before surgery on the colon and rectum.

(*iii*) Before radiology of the bowel and other abdominal organs.

(*iv*) In local disease of the anus or rectum such as haemorhoids or anal fissure.

(*v*) Following ingestion of poisons.

Purgatives can be classified into 3 groups depending on their mode of action : (1) bulk purgatives, (*ii*) lubricant purgatives, and (*iii*) irritant purgatives.

The bulk purgatives act by increasing the bulk of the intestinal contents, thus promoting normal peristalis and defaecation. There are many types of which the most widely used are the osmotic purgatives. These are salts having a non-absorbable ion such as magnesium in magnesium hydroxide. The salt absorbs water by osmosis, providing liquid bulk.

Liquid paraffin is the best known of the lubricant purgatives. It lubricates faecal material in the colon and rectum. However, with chronic use, it can reduce absorption of the fat soluble vitamins A and D and can produce paraffinomas in the mesenteric lymph nodes. It can also leak from the anus and soil clothing. It is therefore not recommended except for the special indication when straining is undesirable or when defaecation is painful such as after haemorrhoidectomy or in anal fissure, Even here, it can delay healing after anal surgery.

The term, 'irritant purgatives' covers a wide variety of drugs which produce purgation by direct or indirect stimulation of the wall of the small or large intesting.

Most irritant purgatives have a slow on set of action, and are usually given at night for an effect in the morning. Where rapid purgation is required, as after ingestion of a poison, an osmotic purgative is best.

As a rule purgatives should be avoided unless specifically indicated. Chronic purgation can lead to hypokalaemia, dehydration, weight loss and muscle weakness. Purgatives should never be given to a patient with undiagnosed acute abdominal pain.

MAGNESIUM HYDROXIDE

See Sectian 7.1.

BISACODYL

Dosage forms.—Tablet, 5mg.

Suppository, 10mg.

Pharmacological Properties.—Irritant purgative. Probably acts by stimulating sensory nerve endings in the mucosa of the large intestine. Tablets act within 10-12 hours, suppositories within 1 hour.

Uses.—Constipation.

Bowel evacuation before surgery, endoscopy or radiological investigations.

Adverse effects.—General adverse effects of purgatives (see above). In addition, tablets may cause gastrointestinal disturbances ; suppositories may cause local irritation.

Precaution.—Not to be taken with milk or antacids.

Dosage.—Tablet : adult, 5-10mg at night (for constipation).
Suppository ; adult, 10mg ; child 5mg usually in the morning (for constipation)

Before radiological procedures and colonic surgery : 10mg by mouth at bedtime for the 2 preceding days. If necessary, a 10 mg suppository may be given, in addition, 1 hour before a radiological examination.

Others.—Magnesium sulphate, Senna, Liquid paraffin.

7.6. *Anti-Diarrhoeals.*—The treatment of diarrhoea can be considered under the following headings :-

7.6.1. Drugs for symptomatic treatment.

7.6.2. Replacement fluids.

7.6.3. Specific anti-infective agents.

7.6.1. *Drugs for Symptomatic Treatment of Diarrhoea.*—Most diarrhoeas are viral in origin and are self-limiting. Such diarrhoeas would only require treatment for the symptomatic relief of the diarrhoea and to prevent or correct salt and water loss.

Kaolin can be given to adsorb irritants. Opiates, particularly morphine and codeine, increase smooth muscle tone in the bowel and reduce its motility. The compound kaolin and morphine mixture remains a very popular anti-diarrhoeal preparation. Diphenoxylate, a derivative of codeine, is combined with atropine in a popular antidiarrhoeal preparation. The dose of morphine in antidiarrhoeal preparations is small and there is no danger of systemic effects or dependence.

KAOLIN

Dosage form.—Mixture ; see formulary for composition.
Pharmacological property.—Adsorbent.
Uses.—Diarrhoea

Drug interaction.—Can reduce the intestinal absorption of some antibiotics, e.g. Lincomycin.

Dosage.—10-20 ml every 4 hours.

KAOLIN AND MORPHINE MIXTURE

Dosage form.—Mixture. See formulary for composition.
Pharmacological properties.—Absorbent and anticolic.
Use.—Diarrhoea.

Dosage.—10 ml every 4 hours.

Others.—Diphenoxylate plus Atropine.

7.6.2. *Replacement fluids.*—Diarrhoea is associated with varying degrees of water and electrolyte loss from the body. In some cases, particularly in children, this may be so severe that, if not promptly corrected, death may result from the salt and water loss. The traditional method for fluid replacement is by intravenous therapy. Recently, oral rehydration salts have been prepared which are readily absorbed in diarrhoea, regardless of the causative agent or the age of the patient. Oral rehydration therapy does not stop

the diarrhoea, which is usually self-limiting. Oral rehydration salts are suitable and adequate for the treatment of mild and moderate degrees of dehydration in all age groups. Severe dehydration is treated initially with an appropriate intravenous solution and then continued with oral rehydration salts.

ORAL REHYDRATION SALTS (ORS)

Dosage form.— Solids contained in sachets for 1 litre of Solution :

Glucose (anhydrous)	20g
Potassium chloride	1.5g
Sodium bicarbonate	2.5g
Sodium chloride	3.5g

Properties.—ORS solution provides adequate quantities of electrolytes to correct the deficits associated with acute diarrhoea. The bicarbonate corrects the acidosis ; the potassium and sodium replace the body losses. The absorption of sodium and water in the small intestine is greatly enhanced by glucose. This fact forms the physiological basis of oral rehydration therapy using ORS solution.

Uses.—Prevention and treatment of dehydration in diarrhoea.

Dosage.—Approximate guide. Mild dehydration : 50 ml/kg within 4 hours, Moderate dehydration : 10 ml/kg within 4 hours, followed by 10ml/kg after each loose stool for infants and children below 5 years of age, or as much as required for older children and adults.

Caution.—The above regimen is only a guide and fluid administration should depend on clinical evaluation of loss and requirements.

7.6.3. *Specific anti-infective agents.*—Several pathogenic bacteria, viruses and intestinal parasites have been identified as causes of diarrhoea. Anti-infective drugs are not indicated for the routine treatment of acute diarrhoea. Specific indications for their use include :

Cholera
Severe shigella dysentery
Amoebic dysentery
Acute giardiasis.

The drugs of choice for the treatment of these conditions are described in Section 9.

7.7. *Ulcer Healing Drugs.*—In recent years, drugs have been introduced which promote healing of peptic ulcers. The earliest of these was carbenoxolone, a synthetic derivative of glycyrrhizic acid (a constituent of liquorice). It probably acts by increasing mucus production and protecting the mucosa form acid-pepsin attack. It has anti-inflammatory and aldosterone-like effects, the latter of which include salt and water retention and hypokalaemia. It is therefore not suitable for old persons and those with cardiac or renal disease. Cimet cidine and ranitidine are H2-receptor blockers which heal peptic ulcers by reducing gastric acid output. Pirenzepine is a selective muscarinic anticholinergic drug which promotes ulcer healing. It specifically inhibits gastric acid and pepsin secretion and thus has fewer peripheral side effects than the non-selective anticholinergic drugs. There is, however, little experience of this drug in the country.

CIMETIDINE

Dosage forms.—Tablet, 200 mg ; Injection, i.m., slow i.v. injection or i.v. infusion, 100 mg/ml in 2 ml ampoule.

Mode of action.—Histamine H2-receptor antagonist.

Pharmacological properties.—Reduces gastric acid secretion ; promotes ulcer healing.

Uses.—Gastric and duodenal ulcer.

Adverse effects.—rare but include reversible impotence and gynaecomastia.

Drug interaction.—potentiates action of drugs like oral anticoagulants, phenytoin and tolbutamide by inhibiting oxidative metabolism.

Dose.—for gastric or duodenal ulcer, 200-400 mg 2 or 3 times daily in courses of 4-8 weeks. By i.m. or i.v. injection, 100-150 mg/hour for 2 hours, repeated after an interval of 4-6 hours.

Precaution.—reduce dosage in impaired renal and liver function.

RANITIDINE

Generally similar to cimetidine except :

Dosage forms.—Tablet, 150 mg (hydrochloride); Injection, i.m., slow i.v. and infusion, 25 mg (hydrochloride)/ml in 2 ml amps.

Adverse effect.—has no anti-androgenic effect.

Drug interaction.—does not inhibit hepatic drug metabolising Aldative enzymes. *Dose* 150 mg 2 or 3 times daily for 4-8 weeks, repeated if relapses occurs. By slow intravenous injection, 50 mg every 6-8 hours.

Others.—Carbenoxolone, Pirenzepine, and Propantheline.

8. ENDOCRINE SYSTEM DRUGS

Drugs in this section are discussed under the following headings :

8.1. Corticosteroids and synthetic substitutes
8.2. Androgens.
8.3. Oestrogens.
8.4. Progestogens.
8.5. Oral contraceptives.
8.6. Ovulation inducers.
8.7. Oxytocics.
8.8. Drugs used in Diabetes millitus.
8.9. Thyroid and Anti-thyroid Drugs.

8.1. *Corticosteroids and synthetic substitutes.*—The adrenal corticosteroids are of two main types : glucocorticoids and mineralocortiocoids. The most important naturally occurring glucocorticoid is hydrocortisone. Glucocorticod activity covers a wide variety of actions on fat, protein and carbohydrates metabolism, on the haemolymphatic system as well as a marked anti-inflammatory action. In addition, hydrocortisone has some mineralocorticoid activity. Prednisloone, dexamethasone and betamethasone are synthetic glucocorticoids. Prednisolone has about five times the glucocortiod activity of hydrocortisone but about the same mineralocortcoid activity. Dexamethasone and betamethasone have about thirty-five times the glucocorticoid activity of hydrocortisone with much less mineralocoticoid activity.

The most important naturally secreted mineralcorticoid is aldosterone while fludrocortisone is a well known synthetic analogue. Fludrocortisone is given with hydrocortisone in the replacement therapy of Addison's disease.

Pharmacological dose of the glucocorticoids are used :

(*i*) in the treatment of lymphomas and leukaemias.

(*ii*) as immunosuppressives to prevent rejection in tissue and organ transplantation.

(*iii*) to suppress or modify allergic reactions and therefore provide relief in asthma allergic skin diseases, nephrotic syndrome, auto-immune haemolytic anemia, thomboacy-topenic purpura, etc.

(*iv*) as anti-inflammatory therapy in a variety of conditions including rheumatoid arthristis,

(*v*) rheumatic fever, active chronic hepatitis, severe inflammatory conditions of the eye and skin, etc.

(*vi*) To save life in septicaemic shock before specific measures can take effect.

For maintenance oral treatment of conditions requiring pharmacological doses of glucocorticoids, prednisolone is the drug of choice. Dexamathasone and betamethasone are satisfactory alternatives but being more potent than prednisolone they are particularly useful where very high doses of prednisolone would have been required. They are also used in local conditions of the eye and skin.

Adverse effects.—Corticosteroids are toxic drugs and great caution should be exercised when using them because of the wide variety and potential seriousness of the adverse effects. The following adverse effects can occur with varying degrees of severity on prolonged use.

1. Superinfection and reactivation of latent infections.
2. Osteoporosis.
3. Muscle weakness and myopathy.
4. Diabetes mellitus.
5. Hypertension.
6. Salt and water retention.
7. Psychotic reaction.
8. Hirsutism and menstrual disturbances.
9. Cataracts.
10. Cushingoid appearance.
11. Retardation of growth in children.
12. Reactivation of a laten peptic ulcer.

Corticosteroid withdrawal.—Prolonged use of high doses of corticosteroids leads to suppression of the adrenal cortex due to negative feed back inhibition of corticotrophin (ACTH) secretion by the anterior pituitary. Abrupt withdrawal of a corticosteroid after long term use in high doses would therefore lead to signs and symptons of adrenocortical insufficiency. To avoid this, corticosteroids should be withdrawn gradually with progressive reduction of doses over several weeks to allow the reactivation of the pituitary-adrenal axis.

DEXAMETHASONE

Dosage forms—Tablets, 0.5mg and 4mg.
Injection, 2mg/ml in 2ml ampoules.

Pharmacological properties—Very potent glucocorticoid with minimal mineralocorticoid activity.

Uses—Suppression of inflamatory and allergic disorders.

Adverse effects—*See* above.

Precaution—*See* above.

Dosage.—Oral : 0.5-2mg daily in divided doses ; up to 15mg daily in severe diseases.

By injection : i.m., or slow i.v. injection or infusion : initially 0.5-20mg. Children, 0.2-0.5mg/kg daily.

HYDROCORTISONE

Dosage forms.—Injection, powder in 100mg vial (as sodium hemisuccinate) ; Tablets, 10,20mg.

Pharmacological properties.—Naturally occuring glucocorticoid with some mineralocorticoid activity.

Uses.—Adrenocortical insufficiency, (with fludrocortisone).
Shock.

Suppression of inflammation and allergy.

Adverse effects.—See above.

Precaution.—See above.

Dosage.—Oral : for replacement therapy only, 20-30mg daily in divided doses.

i.m. injection or slow i.v. injection or infusion : 100-500mg, 3-4 times in 24 hours or as required.

PREDNISOLONE

Dosage form.—Tablets, 1mg, 5mg.

Pharmacological properties.—Synthetic corticosteroid with high glucocorticoid but low mineralocorticoid activity.

Uses.—Suppression of inflammatory and allergic disorders. Treatment of lymphomas and leukaemias.

Adverse effects.—See above

Precautions.—See above

Dosage.—Oral : up to 45 mg daily in divided doses.

8.2. *Androgens.*—Androgens are the male sex hormones. They are produced mainly in the testes and, to a less extent, in the adrenal cortex, under the influence of interstitial cell stimulating hormone (same as follicle stimulating hormone) of the anterior pituitary. Testosterone is the main naturally secreted androgen. The unmodified compound is rapidly metabolised and is therefore unsuitable for clinical use. Esterification prolongs the duration of action.

Androgens have two main classes of action :

(*i*) development and maintenance of the male secondary sexual characteristics, the male sex organs and related structures, and

(*ii*) anabolic effects.

Androgens are used as replacement therapy in hypogonadism. They would thus induce sexual development in boys when puberty is delayed, and would restore potency and libido in adults who have developed androgen deficiency. Androgens are of no value in the treatment of impotence unless the impotence is a manifestation of hypogonadism.

Although androgens improve sexu al function in hypogonadism, fertility is not restored. Restoration of fertility is possible only if the seminiferous tubules of the testes are functional and would then need to be stimulated with gonadotrophins.

The discovery of the anabolic effects of testosterone led to the synthesis of a group of drugs known as the anabolics steroids in which the anabolic effect is predominant. Norethandrolone is a well known example of this group of drugs. They have many adverse effects including sodium retention and cholestatic jaundice. They are also subject to abuse especially by athletes. Their clinical usefulness is limited.

TESTOSTERONE

Dosage form.—Injection, 200mg (enanthate) in 1ml ampoule ; 25mg (Propionate) in 1 ml ampoule.

Pharmacological properties.—Masculinizing hormone with some anabolic effects.

Uses.—Hypogonadism.

Adverse effects.—Oedema, increase in weight, premature closure of epiphyses in early puberty, masculinization in women.

Dosage.—Enanthate : Initially 200mg every 2-3 weeks ; maintenance 200mg every 3-6 weeks, by intramuscular injection. Propionate : 10-50 mg, 2-3 times weekly, by i.m.

8.3. *Oestrogens.*—Oestrogens are the female sex hormones. They are produced mainly in the ovary and placenta. Oestrogens are responsible for the development of the female secondary sexual characteristics and have important effects on the cyclic endometrial changes that are a feature of the menstrual cycle. There are two main groups of oestrogens : (*i*) the naturally occurring steroid hormones and their semisynthetic derivatives, and (*ii*) the synthetic, non-steroid compounds with oest rogenic effects. The main naturally occurring oestrogens are oestrone, oestradiol and oestriol. They are rapidly met abolised, the resulting short duration of action making them unsuitable for use clinically. Ethinyloestradiol and mestranol are two orally active deriviatives of the natural oestrogen, oestradiol. They are longer acting than the parent compound and are widely used clinically. For example, most combined oestrogen-progesterone contraceptive pills are based on the two oestrogens.

The non-steroidal synthetic oestrogens can produce all the effects of naturally occurring oestrogens in the body. They are highly effective by mouth. The best known example is stilboestrol.

Oestrogens are widely used for menopausal and menstrual disturbances, atrophic vaginitis, carcinoma of the prostate and breast and to suppress lactation.

ETHINYLOESTRADIOL

Dosage form.—Tablets, 0.01mg and 9.02mg.

Pharmacological properties.—A semisynthetic derivative of the naturally occurring oestrogen, oestradiol.

Uses.—Menopausal symptoms. Primary amenorrhoea. Contraception (combined with a progestogen). Carcinoma of the breast and prostate.

Adverse effects.—Nausea and vomiting, weight gain, salt and water retention, jaundice, breast enlargement and tenderness, withdrawal bleeding, depression, headache.

Contraindication.—Oestrogen-dependent carcinoma, history of thromboembolism, hepatic impairment.

Dosage—0.01-0.05mg, 1-3 time daily depending on diagnosis.

8.4. *Progestogens.*—Progesterone is the main naturally occurring progestogen. It is produced by the corpus luteum and the placenta. It apparently has two main physiological roles : (*i*) it induces secretory changes in the endometrium in the luteal phase of the menstrual cycle, and (*ii*) it maintains pregnancy after implantation of the ovum. Progesterone itself is insoluble and has a short duration of action. Synthetic derivatives like norethisterone and laevonorgesteral are therefore used in practice. These compounds have some androgenic effect in addition to their progestogenic effects. They are also partly metabolised to oestrogenic substances, but this notwithstanding, they are usually administered with oestrogens to suppress ovulation for contraceptive purposes and to treat a variety of menstrual disorders.

NORETHISTERONE

Dosage form.—Tablet, 5mg.

Pharmacological properties.—Synthetic progestogen.

Uses.—Combined with oestrogens in :

(*i*) Oral contraceptives

(*ii*) the treatment of a variety of menstrual disorders, including menorrhagia, metrorrhagia, dysmenorrhoea and endometriosis.

Used alone in the treatment of :

(*i*) threatened abortion

(*ii*) Carcinoma of the uterine body.

Adverse effects.—Masculinization, liver dysfunction and jaundice, headache, depression.

Contraindication.—Pregnancy.

Caution.—Should not be used for undiagnosed vaginal bleeding.

Dosage—5-10mg, 1-3 times daily depending on the diagnosis.

8.5 *oral Contraceptives.*—Contraceptive pills are of three types :

(*i*) Progestogen-oestrogen combinations, (*ii*) Sequential oestrogen-progestogen contraceptives, and (*iii*) low dosage progestogens. The progestogen-oestrogen combinations are the most widely used and are the ones included in the Essential Drugs List. A number of effects contribute to the contraceptive action of these drugs. They include :

(*i*) inhibition of ovulation.

(*ii*) reduction in the volume and alteration in the quality of cervical mucus.

(*iii*) pseudo-decidual reaction in the endometrium.

(*iv*) alteration of the function of the corpus luteum, if ovulation occurs.

A number of adverse effects can occur with oral contraceptives. They include : nausea and vomiting, breast tenderness, weight gain, mid-cycle 'spotting', post-pill amenorr hoea and infertility, thrombo-embolaic phenomena, ischaemic cerebro vascular disorders, hypertension and jaundice. Adverse effects appear to be less with the low-oestrogen pills.

ETHINYLOESTRADIOL PLUS LAEVONORGESTREL

Dosage form.—Tablet, 0.03mg ethinyloestradiol plus 0.15 mg laevonorgestrel.

Pharmacological properties.—Low-oestrogen dose combined oral contraceptive.

Uses.—Contraception.

Adverse effects.—*See* above.

Contraindication—History of thromboembolic disease, acute and chronic liver disease, mammary carcinoma.

Caution.—Should be used with great care in the presence of hypertension, cardiac o renal disease, migraine, depression, asthma, and also in obese patients, cigarette smokers those over 35 years, breast-feeding subjects, and those with varicose veins.

Dosage.—1 tablet at the same time each day for 21 days starting on 5th day of cycle, and repeated after a 7 day interval.

ETHINYLOESTRADIOL PLUS NORETHISTERONE

Similar to ethinyloestradiol plus laevonorgestrel except :

Dosage form.—Tablet, 0.05mg ethinyloestradiol plus 1mg norethisterone.

8.6. *Ovulation Inducers.*—Ovulation inducers are drugs which can be used to induce ovulation and corpus luteum formation in certain cases of anovulatory infertility. The best known examples of this class of drugs are Clomiphene and human menopausal gonadotrophin.

Clomiphene is an antioestrogen. It stimulates pituitary gonadotrophin output in women by blocking the negative feed-back inhibition of gonadotrophin release by circulating oestrogens.

In subjects with proven hypopituitarism, ovulation and corpus luteum formation can be induced with human menopausal gonadotrophin which contains both follicle stimulating hormone and luteinizing hormone and acts directly on the ovary. Such treatment can only be given in specialised centres.

CLOMIPHENE

Dosage form.—Tablet, 50mg (citrate).

Pharmacological properties.—Antioestrogen ; stimulates the release of pituitary gonadotrophin.

Uses.—Anovulatory infertility with normal anterior pituitary.

Adverse effects,—Ovarian hyperstimulation, multiple pregnancices, menopausal symptoms

Contra-indications.—Ovarian cyst, abnormal uterine bleeding.

Dosage.—50mg daily for 5 days starting on 5th day of menstrual cycle or at any time if cycles have stopped. Maximum 6 courses.

In the absence of ovulation dose may be increased by 50mg amounts each month to a maximum of 200mg daily for 5 days.

Others.—Gonadotrophins.

8.7. *Oxytocics.*—Oxytocics are used to stimulates uterine contraction. The best known examples are oxytocin, ergometrine and prostaglandins. Oxytocin is a posterior pituntary hormone. It causes rhythmic contraction of the uterus and is used to induce labour at term or to augment uterine contraction. In larger doses it can be used at the third stage of labour to control postpartum bleeding.

Ergometrine causes sustained contraction of the uterus. Prostaglandins also cause sustained contraction of the uterus. They are useful : (*i*) in the induction of abortion, including missed abortion and hydatidiform mole, (*ii*) in induction of preterm labour in which they ere more effective than oxytocin, and (*iii*) to a less extent in the induction of abour at term.

ERGOMETRINE

Dosage forms.—Table, 05.mg. Injection, 0.5. mg/ml in 1ml ampoule.

Pharmacological properties.—Ergot alkaloid, causes sustained contraction of the uterus.

Uses.....(*i*) Prophylaxis of postpartum haemorrhage.

(*ii*) Treatment of postpartum haemorrhage.

(*iii*) Control of bleeding due to incomplete abortion.

Adverse effects.—Vasoconstriction, transient hypertension.

Contraindications.—1st and 2nd stages of labour ; vascular disease ; impaired hepatic and renal function.

Precaution.—Extra care must be taken in patients with hypertension, toxaemia, scpsis, cardiac disease and multiple pregnancy.

Dosage : Oral : 0.5-1 mg.

Intramuscular injection : 0.2-0.5 mg.

Intravenous injection : 0.1-0.5 mg.

OXYTOCIN

Dosage form.—Injection, 5 and 10 units/ml.

Pharmacological properties.—Posterior pituitary hormone. Polypeptide, therefore ineffective by mouth. Rapidly metabolished.

Uses.— (*i*) Induction and augmentation of labour.

(*ii*) Management of missed or incomplete abortion.

(*iii*) Prophylaxis of postpartum haemorrhage (with ergometrine).

(*iv*) Control of atonic postpartum haemorrhage.

Adverse effects.—High doses may cause violent uterine contraction which may lead to rupture ; subarachnoid haemorrhage.

Contraindications.—Hypertonic uterine inertia, obstructed labour, failed rial of labour, severe toxaemia, foetal distress, placenta praevia.

Precaution.—Extra care should be taken in patients with hypertension and therefore on hypotensive drugs ; multiple pregnancy ; high parity and previous caesarian section.

Dosage.—By slow intravenous infusion :

(*i*) induction and augmentation of labour : solution containing 1 unit per litre, 1-3 milliunits per minute, adjusted according to response.

(*ii*) Missed abortion : solution containing 20-40 units/litre every hour to a maximum of 200 units/litre.

(*iii*) Control of postpartum haemorrhage : 10-20 units/litre given at a rate of 15 drops/minute, adjusted according to response.

By intramuscular injection : 5 units (plus 0.5 mg ergometrine) at or after delivery of the anterior shoulder for prophylaxis of postpartum haemorrhage.

Others.—Prostaglandins.

8.8. *Drugs used in Diabetes Mellitus*—Antidiabetic drugs fall into two groups :

8.8.1. Insulins.

8.8.2. Oral hypoglycaemic agents.

8.8 1. *Insulins.*—Insulin is the hormone mostly responsible for carbohydrate metabolism in the body. It is a polypeptide and is produced in the beta cells of the pancreatic islets of Langerhans. Diabetes mellitus occurs when there is absolute or relative insulin deficiency.

A good percentage of diabetics would require treatment with insulin. These include :

(*i*) those presenting in coma or precoma.

(*ii*) those who are underweight and ketotic.

(*iii*) diabetic children and others falling under the group of juvenile-onset diabetics.

(*iv*) maturity-onset diabetics who have failed to respond to diet and oral hypoglycaemic agents.

(*v*) patients formerly controlled with diet or oral hypoglycaemic agents developing intercurrent illness or about to undergo surgery.

Insulin preparation can be sub-divided into two main groups according to their duration of action : (*i*) soluble insulin, and (*ii*) medium or long-acting insulins. Soluble insulin is short-acting. It can be given intraveneously in an emergency. Given subcutaneously, its action starts within 30 minutes and last 4-8 hours.

The medium and long-acting insulins are depot preparations from which insulin is gradually released. There are many varieties. They are longer acting than soluble insulin and so it is more convenient to stabilise patients on one or other of these preparations. They can be combined with soluble insulin, but not mixed in the same syringe.

Insulins can also be classified on the basis of their source and immunogenicity into (*i*) standard insulins, (*ii*) purified insulins and (*iii*) human insulins.

Standard insulins are derived from beef pancreas and purified by crystallisation. They are antigenic but immunological resistance to them is quite uncommon. The antigenic properties are caused mainly by small amounts of protein impurities, particularly pro-insulin, derived from the pancreas.

There are two types of purified insulins : (*i*) pro-insulin free, and (*ii*) highly purified. They have been submitted to more rigorous purification procedures to eliminate pro-insulin and other insulin precursors which are relatively more immunogenic than insulin. Highly purified insulins are obtained from pork insulin which is less immunogenic than beef insulin. Consequently, standard insulins are usually more immunogenic and slightly longer acting than their highly purified equivalents.

The dose requirements for highly purified insulins are lower than for standard insulins. Allowance should be made for this when transferring a patient from the latter to the former. Highly purified insulins provoke fewer allergic reactions ; do not cause fat necrosis at injection sites, and do not from IgG insulin antibodies which can cross the placenta and reach the foetus during pregnancy.

Recently, insulin with human amino-acid sequence has been produced by modification of the porcine insulin and by biosynthesis. Human insulins do not appear to have any advantage over highly purified insulins.

INSULIN INJECTION
(*Soluble Insulin*)

Dosage form.—Injection, 40, 80 units per millilitre.

Pharmacological properties.—Short-acting insulin.

Uses.—Diabetes mellitus ; diabetic coma.

Adverse effects.—hypoglycaemia, local reaction at injection site.

Dosage.—By subcutaneous, intramuscular or intravenous injection : variable, depending on patient's state.

INSULIN ZINC SUSPENSION (LENTE)

Dosage form.—Injection, 40, 80 units/ml.

Pharmacological properties.—Long-acting insulin made up of 3 parts of Insulin zinc suspension (Semilents) and 7 parts of Insulin zinc suspension (sultralente).

Uses.—Diabetes mellitus.

Adverse effects.—as for soluble insulin.

Dose.—By subcutaneous injection : according to patient's need.

8.8.2. *Oral Hypoglycaemic Drugs.*—There are two classes of oral hypoglycaemic drugs :

8.8.2.1. Sulphonylureas.
8.8.2.2. Biguanides.

Sulphonylureas stimulate the release of insulin from the pancreas. Some residual functional islet tissue is therefore essential for their action. Chlorpropamide is a widely used example of this group. Other sulphonylureas are satisfactory alternatives. Glibenclamide is one of the most recent of these.

The biguanides can act in the absence of residual functioning islet tissue. They promote peripheral utilisation of glucose. These compounds can lead to lactic acidosis. Of the two best known members of the group, phenformin and metformin, the former is far more likely to cause lactic acidosis and its use is no longer recommended.

Oral hypoglycaemic agents are indicated in maturity onset diabetics who have failed to respond to dietary measures alone.

CHLORPROPAMIDE

Dosage form.—Tablet, 250mg.

Pharmacological properties.—Long-acting sulphonylurea.

Uses.—Maturity-onset diabetes mellitus.

Adverse effects.—Hypersensitivity reactions ; alcohol induced facila flushing ; hypoglycaemia.

Drug interaction.—Can be displaced from protein binding sites by other drugs that are extensively protein-bound leading to potentiation of its effect.

METFORMIN

Dosage form.—Tablet, 500 mg.

Pharmacological properties.—Biguanide.

Uses.—Maturity-onset diabetes mellitus.

Adverse effects.—Lactic acidosis.

Dosage.—500 mg every 8 hours up to a maximum of 3 g per day.

OTHERS.—Glibenclamide, Gliclazide.

8.9. *Thyroid and Anti-Thyroid Drugs.*—These include :

8.9.1. Thyroid hormones.
8.9.2. Antithyroid drugs.

The thyroid gland secretes two hormones : thyroxine (T_4) and triiodothyronine (T_3). T_3 is about four times more potent than T_4, but it is more usual to use T_4 in replacement therapy of hypothyroidism.

In hyperthyroidism there is excessive production of the thyroid hormones. Treatment is aimed at reducing the synthesis and release of these hormones. This can be achieved by using a variety of drugs like potassium perchlorate which blocks the uptake of iodine by the thyroid gland or carbimazole and propylthiouracil which block the iodination of tyrosine in the gland. Iodine and iodides cause inhibition of the release of T_3 and T_4 from the gland.

This effect is transient. These drugs are therefore used in the preparation of patients previously made euthyroid with other drugs, for surgery. Radioactive iodine is also useful in the treatment of thyrotoxicosis, but it can only be used in specialised centres and is contraindicated in children and women in the child-bearing age. Carbimazole and the iodine plus potassium iodine preparation are the antithyroid drugs described here.

Beta-adrenoceptor blocking drugs like propronolol can reduce the heart rate, anxiety and other autonomic manifestations of hyperthyroidism. They are therefore useful adjuncts to treatment with antithyroid drugs.

8.9.1. *Thyroid Hormones*

L-THYROXINE

Dosage form.—Tablets, 0.05mg 0.1 mg (sodium salt)

Pharmacological properties.—Iodine—containing amino acid component of the thyroglobulin protein, responsible for the maintenance of the body's normal basal metabolic reaction rates.

Uses.—Hypothyroidism.

Adverse effects.—Arrhythmias, angina, restlessness.

Contraindications.—Breast feeding, cardiovascular disorders.

Dosage.—Oral, maintenance : 50-300 micrograms daily.

Children, 2.5-5 micrograms/kg initially.

8.9.2. *Antithyroid Drugs*

CARBIMAZOLE

Dosage form.—Tablet, 5mg.

Pharmacological properties.—Inhibits the enzyme responsible for the iodination of tyrosine in the thyroid gland.

Uses.—Thyrotoxicosis.

Adverse effects.—Rashes, blood dyscrasias.

Dosage.—Starting dose : 30-60mg daily depending on severity. Continue until patient is euthyroid, then maintenance dose : 5-15mg daily.

AQUEOUS IODINE SOLUTION

Dosage form.—Solution containing : iodine 5 per cent, potassium iodine 10 per cent in purified water, freshly boiled and cooled, total iodine 130 mg/ml.

Pharmacological properties.—Inhibits release of T_3 and T_4 from thyroid gland, and reduces vascularity of the gland thus making surgical removal easier. Effects continue for only 3-4 weeks.

Uses.—Pre-operative treatment of thyrotoxicosis.

Adverse effects.—Hypersensitivity reactions with coryza-like symptoms. Goitre in infants of mothers taking iodides.

Caution.—Iodine should not be used for long-term treatment.

Contraindication.—Breast feeding.

Dosage.—0. 1-0.3ml 3 times daily.

Others.—Propranolol, Propylthiouracil, Radioactive Sodium iodide.

9. ANTI-INFECTIVE DRUGS

Anti-infective drugs are described under the following headings :

9.1. Amoebicides
9.2. Anthelmintics
9.3. Antifilarial drugs
9.4. Antischistosomal drugs

9.5. Anti trypanosomal drugs
9.6. Antimalarial drugs
9.7. Antiflagellate drugs
9.8. Antibacterial drugs
9.9. Antileprosy drugs
9.10. Antituberculosis drugs
9.11. Systemic antifungal drugs

9.1. *Amoebicides.*—Amoebiasis is caused by *Entamoeba hystolytica.* Three clinical categories are recognised : (1) Acute amoebic dysentery due to invasion of the wall of the large bowel causing severe ulcerative lesions ; (2) Extraintestinal amoebiasis in which the amoebae find their way to the tissues causing abscesses. The most common extrainte stinal site is the liver ; less common sites are the lungs, brain and other tissues. (3) Chronic amoebiasis in which the amoebae live in the intestine without causing any symptoms. The patients are diagnosed by the passing of amoebic cysts in the stool.

Metronidazole is effective in all forms of amoebiasis. Other drugs which are currently found useful in amoebiasis are :

Chloroquine, which is particularly useful in hepatic amoebiasis and diloxanide which is used in chronic intestinal amoebiasis.

METRONIDAZOLE

Dosage form.—Tablet, 200mg ; injection, 500mg/100ml for i.v. infusion.

Pharmacological properties.—A nitromidazole with a direct action on protozoa and naerobic bacteria.

Uses.—Amoebiasis : acute invasive amoebic dysentery and extra-intestinal amoebiasis Relatively ineffective in cyst passers. Trichomoniasis : urogenital infection in both males and females.

Giardiasis.

Infections due to anaerobic bacteria : Treatment and prophylaxis of surgical and gynaecological sepsis due to colonic anaerobes, particularly *Bacteriodes fragilis.* Other conditions Successfully treated include brain abscess, osteomyelltis, necrotising pneumonia.

Adverse effects.—Metallic taste is common, otherwise metronidazole is well tolerated.

Precaution.—Alcohol should be avoided during treatment.

Drug interaction.—Disulfirman-like reaction with alcohol ; effect of oral anticoagulants potentiated.

Dose.—For amoebiasis, 400-800mg three times daily for 5-10 days. For trichomoniasis, 200mg three time daily for 7 days. For giardiasis, 2g as a single dose for 3 successive days. For anaerobic infections, 0.5g by i.v. infusion 8 hourly until oral administration is possible, then 400mg three times daily for up to 7 days.

For children : 5-10 years, ½ adult dose ; 6 months-1 year, ¼ the adult dose.

9.2. *Anthelmintics.*—The term helminth refers to nematodes (round worms) as well as trematodes and cestodes. In this discussion, however, anthelmintics will deal with drug used in predominantly intestinal helminthiasis. Drugs used in the predominantly tissue helminthiasis (i.e. filariasis and schistosomiasis) will be treated under separate headings.

The helminthic infections for which these drugs are usually indicated include :
Round worm : caused by *Ascaris lumbricoides*
Pin worm : caused by *Enterobiu vermicularis*
Hook worm : caused by *Ancylostoma-a vodenale or Necator-americanus*
Tapeworm : caused by *Taenia saginata or Taenia solium*

Thread worm : caused by *Strongyloides stercoralis*

Whip worm : caused by *Trichuris trichuria*

Guinea worm : caused by *Dracunculus medinensis*

Some of the anthelmintic drugs are specific for particular infections (e.g. niclosamide for tapeworm) while others are broad spectrum drugs effective for most of the infections (e.g. mebendazole and thiabendazole).

MEBENDAZOLE

Dosage forms.—Chewable tablet, 100mg ; suspension, 100mg/5ml.

Mode of action.—Broad-spectrum anthemintic.

Uses.—Trichuriasis, ascariasis, enterobiasis, and hookworm in single or mixed infections.

Contraindication.—Should be avoided in early pregnancy since embryotoxicity and teratogenicity have been demonstrated in animal studies.

Caution.—In heavily parasitised young children, ascaris worms are occasionally expelled through the nose and mouth during treatment.

Adverse effects.—Remarkably well tolerated at therapeutic doses.

Dose.—The same dose is used for all patients over 2 years of age. For ascariasis, a single dose of 100mg ; for hookworm and trichuriasis, 100 mg twice daily on three consecutive days ; for enterobiasis, 100mg, repeated after an interval of two weeks.

NICLOSAMIDE

Dosage form.—Chewable, tablet 500mg.

Pharmacological properties.—An anthelmintic specific for tapeworms. Parasites affected by the drug are more susceptible to the gut proteolytic enzymes, hence portions of the worm are avoided in partially digested form and the scolex is rarely identifiable. The eggs are not so affected thus exposing the patient with *T. solium* infection to the risk of cysticercosis.

Uses.—Treatment of tapeworm infections.

Dose.—A single dose of 2g in adults, 1g in children 2-6 years, 500mg in children under 2 years.

Precaution.—In T. solium infection, a purgative should be given 2 hours after dosage.

PIPERAZINE

Dosage form.—Tablet, 500mg (adipate or citrate), Elixir or syrup 500mg/5ml.

Pharmacological properties.—Anthelmintic effective in ascariasis. Paralyzes the worms by competitive antagonism of actylcholine at the neuromuscular junction.

Uses.—Ascariasis.

Adverse effect.—Transient skeletal muscle weakness may occur.

Dosage.—As a single dose, Adults 4g (hydrate) ; Children, 120mg/kg up to a maximum of 2-3g (hydrate).

PRYANTEL

Dosage forms.—Chewable tablet, 125mg (pamoate) : syrup, 125mg/ml (pamoate).

Pharmacological properties.—A depolarising neuromuscular blocker, it produces spastic paralysis in susceptible helminths.

Uses.—For single or mixed helminthic infections involving ; ascaris, enterobius and hookworm.

Precaution.—causes transient elevation of SGOT and should therefore be used with care in patients with liver disease.

Adverse effects.—Well tolerated.

Drug interaction.—may be mutually antagonistic to piperazine becasue of their opposing modes of action.

Dose.—For ascariasis, a single dose of 10mg/kg, up to 1g ; for hookworm, this dose is repeated after 24-48 hours.

THIABENDAZOLE

Dosage form.—Chewable tablet, 500mg ; syrup, 500mg/5ml.

Pharmacological properties.—Well absorbed, broad-spectrum anthelmintic ; active against adult and larval forms of some tissue nematodes.

Uses.—Strongyloidiasis, cutaneous larva migrans, dranontiasis, trichiniasis. Pyrantel and mebendazole are preferred for the other nematode worm infections because of the high incidence of adverse drug reactions to thiabendazole.

Adverse effects.— Occurs in about 50 per cent of patients. Commonly, dizziness and gastrointestinal upset. Less commonly, drowsiness, headache, pruritus and hypersensitivity reactions. Occasionally, tinnitus, collapse, disturbance of vision, hepatic dysfunction.

Contraindication.—Previous hypersensitivity reaction to thiabendazole.

Caution.—Liver and renal function should be monitored and patients should refrain from driving or operating machinery during treatment.

Dose.—For dracontiasis, 50-100mg/kg in 2 divided doses ; may be repeated after 7 days. For strongyloidiasis and trichiniasis, 25mg/kg daily in 3 divided doses for 5 days.

Others.—Other anthelmintic drugs in use are ; Bephenium hydroxynaphthoate, Levamisole and Niridazole.

9.3. *Anti-Filarial Drug.*—The filarial diseases commonly encountered in Nigeria are :

1. Onchocerciasis—caused by *Onchocerca volvulus,* is transmitted by *Simulium spp* and causes severe dermatitis and blindness.

2. Loaiasis —caused by *Loa loa* and is transmitted by *Chrysops spp.* The microfilariae are present in the circulating blood. The adult worms migrate in subcutaneous tissues causing Calabar swellings.

DIETHYLCARBAMAZINE

Dosage forms.—Tablet, 50mg (citrate).

Uses.—Loaiasis—radical cure.

Onchocerciasis—microfilaricidal effect only.

Dosage regime.—Loiasis : 9mg/kg daily for 10 days.

Onchocerciasis : 25mg initially, doubled on successive days to 100mg twice daily on day 4. Then 200mg daily until microfilatial load in the skin approaches zero.

Adverse effects.—Mazzotti reactions in onchocerciasis patients.

Precautions.—Care should be taken in bases with eye involvement. The intensity of Mazzotti reactions can be reduced by small in initial dose and steroid cover.

SURAMIN

Dosage form.....Powder for injection, 1g vial.

Pharmacological properties : Does not penetrate into the CSF. It is excreted unchanged in the urine.

Uses.—Onchocerciasis.....kills the adult worms African trypanosomiasis—early haemolymphatic stage only.

Adverse effects.....Toxic drug, poorly tolerated. Albuminuria, stomal ulceration, severe diarrhoea, prostration occur quite commonly.

Dosage regimen.....10 per cent aquenous solution given by slow i.v. injection. Onchocerciasis : successive weekly doses of 0.2, 0.4, 0.6, 0.8, 1.0 and 1.0g (i.e. total of 4.0g).

Trypanosomiasis.....1g on days 1, 3, 7, 14 and 21 followed by 1g weekly for 5 weeks. I there is CNS involvement :—250-500mg 2-4 times on alternate days before starting melarsoprol.

Precaution.....Because collapse has occasionally occurred during the first injection of the drug, a test dose of 0.2g in 2ml should be given as follows :

(*i*) inject a few microlitres and wait 1 minute.

(*ii*) inject 0.5ml and wait 1 minute.

(*iii*) inject the remainder over 1 minute.

9.4. *Anti-Schistosomal Drugs*.—In Nigeria, schistosomiasis is caused by one of two different species of *Schistosoma*. They are :

1. *Schistosoma haeatobium*.—This is the cause of urinary schistosomiasis. The adult worms lodge in the venous plexuses of the bladder wall. Some of the eggs are passed in urine, others are retained in the tissues causing irritation, ulceration, fibrosis granuloma and papilloma formation.

2. *Schistosoma mansoni*.—This is the cause of intestinal schistosomiasis. The adult worms lodge in the branches of the inferior mesenteric veins in the wall of the large bowel, and deposit many eggs there. Some of these eggs reach the bowel, lumen and are passed in the faeces. Others remain in the wall of the bowel causing inflammation, ulceration, granuloma and sometimes papilloma. Eggs that migrate to the liver induce similar irritation, provoke periportal fibrosis resulting in portal hypertension.

METRIFONATE

Dosage form.....Tablet, 100mg.

Pharmacological properties.....Organophorus anticholinesterase ; effective only against *schistosoma haematobium* infections.

Uses.—*S. haematobium* infections.

Adverse effects.—Rare ; transient reduction in true and false cholinesterase occurs.

Caution.....Use with care in patients likely to be exposed to organophosphorus insecticides.

Drug interaction.....Depolarising neuromuscular blockers may be potentiated.

Dose.....7.5mg/kg on 3 occasions at intervals of 2 weeks.

OXAMNIQUINE

Dosage form.—Capsule, 250mg.

Pharmacological properties.—A tetrahydroquinoline derivative with selective activity against *Schistosema mansoni.* Male schistosomes are more susceptible than females but residual female worms cease to lay eggs and lose pathological significance.

Use.—*S. mansoni* infections.

Adverse effects.—Mild and transient dizziness and drowsiness occurs in one third of patients. Hallucinations, psychic excitement and epileptiform convulsions have been reported very occasionally. Minor elevation of serum transaminases occur in a small proportion of cases.

Dose.—15mg/kg daily for 1-3 days.

PRAZIQUANTEL

Dosage form.—Tablet, 600mg.

Pharmacological properties.—Highly active against all species of schistosomes pathogenic to man. Induces a sustained contraction of the worms followed by a rapid liver shift and subsequent vacuolisation and disintegration of the tegument.

Uses.—Double infection with *S. haematobium* and *S. mansoni.*

Adverse effects.—Well tolerated.

Dose.—40mg/kg as a single oral dose.

Others.—Niridazole is still in use, but it is no longer a drug of choice for any form of schistosomiasis. It is also effective against guinea worm infections (dracontiasis).

9.5. *Anti-Trypanosomal Drugs*—. African trypanosomiasis (sleeping sickness) is caused by either of two Trypanosoma species *T. brucei rhodesiense* and *T. brucei gambiense.* Sleeping sickness is characterised by two distinct clinical stages. The first stage is caused by invasion of the blood stream and the reticuloendothelial system by the parasites. The clinical manifestation of this state is marked by irregular fever, lymphadenitis, tachycardia, rashes and splenomegaly. The second stage is due to invasion of the central nervous system and is characterised by personality changes, headache, apathy, somnolence, tremors, speech and gait disturbances, anorexia, malnutrition and finally coma and death. Pentamidine and suramin are used for the early stage of the disease while melarsoprol is used when CNS involvement has occurred.

PENTAMIDINE

Dosage form.—Power for injection 200mg (isethionate or mesylate) for i. m. or i. v. use.

Pharmacological properties.—Diamidine compound ; poorly absorbed from the gut, therefore given parenterally. Does not enter the cerebro-spinal fluid.

Uses.—African (*T. gambiense* and *T. rhodesiense*) trypanosomiasis—cases without CNS involvement, and prophylaxis in endemic areas. Visceral leishmaniasis (*L. donovani*) or kala-azar and cutaneous leishmaniasis-in patients who are unpresponsive to or intolerant of antimony compounds.

Adverse effects.—Occasionally, changes in blood sugar concentration and renal impairment.

Precaution.—i. v. route should be used only in exceptional situations because of the risk sudden severe hypotension.

Contraindication : Should not be used when there is also CNS involvement.

Dose.—For African trypanosomiasis : Treatment, 7-15 injections of 300mg i. m. or 4mg/kg i. m., daily or on alternate days. Prophylaxis, 300mg i.m. every 3-6 months.

MELARSOPROL

Dosage form.—Injection, 3.6% solution in propylene glycol.

Pharmacological properties.—Organic arsenical compound, insoluble in water, given intravenously. Attains trypanocidal concentrations in the CSF. Largely metabolised into non-toxic pentavalent compounds.

Uses.—African trypanosomiasis : meningoencephalitic stage.

Adverse effects.—Reactive encephalopathy ; hypersensitivity reactions.

Dosage regimen.—3.6mg/kg by slow intravenous injection, daily for 4 days. Course may be repeated once or twice at intervals of 7-10 days.

Precaution.—Parasites should first be eliminated from the haemolymphatic system with suramin before treatment with melarsoprol.

SURAMIN

See section 9.3.

9.6. *Anti-malarial drugs.*—Malaria, in Nigeria, is caused by three species of *Plasmodium*—*P. falciparum, P. malariae* and *P. ovale.* of these, *P. falciparum* is responsible for over 95 per cent of infections. *P. vivax* malaria does not occur in Nigeria.

Anti-malarial drugs are used to achieve a variety of clinical objectives.

(1) *Clinical cure.*—This refers to the cure of a clinical attack. The drugs used for this purpose are those which attack the erythrocytic stage of the parasite the so-called blood schizonticidal drugs. The main drugs under this category are the 4-aminoquinolines (exemplified by chloroquine and amodiaquine), quinine and pyrimethamine sulphadoxine-combination.

(2) *Radical cure.*—Refers to the elimination of the exo-erythrocytic forms. This is only applicable in *P. vivax* in which true relapses from hepatic hypnozoites occur. Since *P. vivax* infections are not seen in Nigeria, the need for radical cure does not arise. The drug used for radical cure is primaquine.

(3) *Prophylaxis.*—Suppressive prophylaxis is the suppression of the disease in the erythyrocytic stage. The drugs used are pyrimethamine, proguanil and those used for clinical cure.

CHLOROQUINE

Dosage forms.—Tablet, 150mg base (Phosphate or sulphate). Syrup, 50mg base/5ml (Phosphate or sulphate). Injection, 200mg in 5ml ampoule (as the sulphate).

Pharmacological properties.—A 4-aminoquinoline anti-malarial. It is active against the sexual erythrocytic stage of all Plasmodia species. It is also amoebicidal and is useful (in combination with other anti-amoebic drugs) in the treatment of hepatic amoebiasis. It has anti-inflammatory properties and is useful in the treatment of rheumatoid arthritis and discoid lupus erythematosus the treatment of which employs large doses for long periods hence associated with more adverse reactions.

Uses.—Clinical cure of malaria. Prophylaxis of malaria. Hepatic amoebiasis. Rheumatoid arthritis and discoid lupus erythematrosus.

Adverse effects.—Itching ; retinopathy in prolonged use.

Dosage.—For treatment of acute malaria : Adults : 600mg first and 2nd days, 300mg third day. It is often not necessary to continue beyond the first day. Children : 10mg/kg first and 2nd days : 5mg/kg third day.

PYRIMETHAMINE

Dosage form.—Tablets, 12.5 and 25mg.

Pharmacological properties.—An antifolate. Has weak action against primary pre-erythrocytic and erythrocytic forms of *Plasmodia.* Kills the primary exo-erythrocytic parasites.

Uses.—Prophylaxis of malaria for special groups, e.g. pregnant women, children under 5 years, sicklers.

Dose.—Adult : 25-50mg weekly. Children : 5-10 years, 12.5mg weekly. Under 5 years, 6.25g weekly.

PYRIMETHAMINE-SULPHADOXINE

Dosage form.—Tablets, 25mg pyrimethamine plus 500mg sulphadoxine ; Syrup, 25mg pyrimethamine plus 500mg sulphadoxine in 5ml ; Injection, 10mg pyrimethamine plus 200mg sulphadoxine in 2.5ml ampoule.

Pharmacological properties.—Sulphadoxine is a long-acting sulphonamide. It potentiates the anti-malarial activity of pyrimethamine, the combination being highly active against the erythrocytic forms of *Plasmodia.*

Uses.—Clinical cure of acute malaria.

Adverse effects.—Rashes, prolonged used may lead to folic acid deficiency.

Dosage.—A single dose of : Adults : 3 tablets. Children : 9-14 years, 2 tablets. 4-9 years 1 tablet, under 4 years, tablet.

Others.—Other widely used drugs, amodiaquine, proguanil, quinine, and the newly introduced drug, mefloquine, can be used as alternatives to chloroquine in the treatment of chloroquine-resistant falciparum malaria.

9.7. *Anti-flagellate Drugs.*—The two flagellate protozoa of clinical importance in Nigeria are *Trichomonas vaginalis* and *Giardia lamblia.* Metronidazole is the drug of choice for both infections. Patients who fail to respond satisfactorily to metronidazole can be given tinidazole.

METRONIDAZOLE

See section 9.1.

TINIDAZOLE

Dosage forms.—Tablet, 500mg ; Intravenous infussion, 2mg/ml in 400ml bottle.

Pharmacological properties.—Similar to metronidazole but has a longer duration of action, and can therefore be given less frequently.

Uses.—Protozoal and anaerobic infections as for metronidazole.

Precautions.—It should not be given to nursing mothers or in the first trimester of pregnancy.

Dosage.—By mouth : 2g initially followed by 1g daily, or 500mg twice daily, for 5-6 days.

By intravenous infusion : 800mg daily until treatment by mouth can be given.

9.8. *Antibacterial Drugs.*—Antibacterial drugs are agents which interfere with bacterial growth and reproduction (bacteriostatic agents) or survival (bactericidal agents) at concentrations or at doses which do not notably affect the functions of the human body. Antibacterial activity may be due to interference with processes occurring only in the bacteria, or processes occurring both in human cells and in bacteria.

Spectrum.—Every antibacterial agent is effective only against a limited number of species of micro-organisms. Ideally, therefore, antibacterial drugs should be given only after identification of the micro-organism responsible for an infection and determination of its sensitivity against antibacterial agents. In practice, however, antibacterial drugs are often given on the bases of the clinical features of an infection and the known local sensitivities of micro-organisms to antibacterial drugs. When necessary, culture and sensitivity tests should be performed to aid the choice of antibacterial drug.

Resistance.—Resistance to antibacterial drugs may develop in species and strains originally sensitive. Resistance may be due to : (1) the selection of resistant mutants in the presence of the antibacterial agent, (2) the transmission of DNA from resistant to originally sensitive bacteria by bacteriophages (transduction). (3) the incorporation into originally sensitive bacteria of resistance-conferring DNA from the environment into which this DNA may have been excreted by other bacteria (transformation), or (4) the transfer of DNA coding for resistance factors from resistant to primarily non-resistant bacteria by a sex pilus or bridge (conjugation). The last mechanism is responsible for the transfer of resistance to intestinal, mainly gram-negative bacteria.

Bacteria may also become resistant by learning to synthesize enzymes inactivating the antibacterial drug, or by developing metabolic mechanisms insensitive to a drug. Resistance may develop rapidly usually in a step-wise fashion or slowly and continuously. The development of resistance may sometimes be delayed by combining several antibacterial drugs which act on the same bacteria by different mechanisms.

Elimination.—Most antibacterial drugs are eliminated either by the kidneys or by the liver. Some are metabolised by the liver before excretion. Drugs excreted by the kidneys will accumulate in the body in renal failure and their dosage must therefore be reduced ; these drugs also may become less effective against infections of the urinary tract in the presence of renal failure because their concentration in the urine falls to low levels. Similarly, drugs mainly metabolised or excreted by the liver will accumulate in severe liver disease unless the dosage is reduced but they will also become effective against infections of the liver itself or of the biliary tract.

Combination therapy.—Different antibacterial agents are often combined in the treatment of infections. Such combinations are warranted if a patient is infected with several species of pathogenic micro-organisms. In some circumstances the combination of several antibacterial drugs may delay the appearance of resistant strains. There are, however, only a very few examples in which synergistic action of different antibacterial drugs against one species of micro-organisms has been demonstrated to be clinically significant. Thus combinations of benzylpenicillin with streptomycin are more effective than penicillin alone in enterococcal endocarditis and also in endocarditis caused by Streptococcus viridans. Pseddomonas infections in patients with neutropenia may effectively be treated with the combination of carbenicillin and an aminoglycoside antibiotic. A combination of sulphamethoxazole and trimethoprim is effective in many infections, some of which are not sensitive to either the sulphomamide or trimethoprim. Finally, the most effective treatment of brucellosis is the combination of tetracycline and streptomycin. A combination of two antibacterial agents may, however, be less effective than a single agent. For example, a combination of penicillin and chloramphenicol is less effective against pneumococcal meningitis than penicillin alone. A combination of penicillin and tetracycline is less effective than penicillin alone in severe pneumococcal pneumonia.

Elimination of one infection by antibacterial drugs may sometimes induce superinfection with either other bacteria or fungi or other micro-organisms not sensitive to the drug used.

Administration.—For practical reasons, antibacterial agents should be given *orally* whenever effective plasma concentrations can be obtained by this route. When antibacterial drugs are given by mouth, they should preferably be given on an empty stomach, i.e. sometime before meals, in order to ensure maximal absorption from the gut. Drugs which tend to irritate the stomach should be given with or after meals, even if this entails some loss of activity. Antibacterial drugs should not be given with bicarbonate or with milk in order to diminish gastric discomfort because this procedure could decrease their effectiveness due to decreased absorption.

Non-absorbed antibacterial agents should be given *parenterally*, and parenteral routes may be preferable for absorbed agents in severely ill patients. Whatever the route of administration, doses and dosage intervals are usually selected in a manner to obtain persistent, constant, bacteriostatic or bactericidal plasma concentration of the drug.

Duration of treatment.—Treatment with antibacterial agents should be continued after the disappearance of the symptoms and signs of disease until such a time when it may be reasonably expected that the pathogenic micro-organisms are eliminated. Therefore, treatment with antibacterial agents should be continued for at least some days after the disappearance of symptoms. During this time, full doses of the antibacterial agent must be given. There is no rational justification for the widespread altitude of decreasing the doses of antibacterial agents after the disappearance of symptoms of a bacterial infection.

Age.—The doses and the use, in general, of an antibacterial agent, often depend on the age of the patient. In the newborn and in infants, the mechanisms of the renal and the hepatic elimination of antibacterial drugs may be poorly developed and lower doses of the drugs may be required. Similarly, elimination of antibacterial drugs may be slowed in the elderly. Adverse effects may be due to the characteristics of a given age ; thus, tetracyclines bind to developing teeth and bone and may damage the teeth and retard bone growth. In newborn infants, sulphonamides may displace bilirubin from protein binding and induce kernicterus.

Pregnancy.—Most antibacterial agents cross the placenta. Some of them may damage the foetus. For example, streptomysin given to pregnant mothers may induce hearing loss in the child ; tetracyclines given to the mother may cause injury to their developing teeth (tetracyclines are, furthermore, particularly toxic to the pregnant female and may induce severe disease of the liver of renal damage). There are few examples in which transmission of an antibacterial agent through *breast feeding* has damaged the child : this may, however, occur more frequently than actually known. Sulphonamides given to a breast feeding mother have induced haemolysis in children with glucose-6-phosphate-dehydrogenase deficiency, and may have induced kernicterus in infants.

9.8.1. *The Penicillins.*—Generally, the penicillins are bactericidal, broad-spectrum antibiotics. They are well absorbed into body tissues and fluids, but penetrate poorly into the cerebro-spinal fluid except when the meninges are inflamed. Penicillins readily cross the placenta and also appear in breast milk.

Penicillins are susceptible to degradation in the body by two main processes : (*a*) chemical (acid or alkaline) hydrolysis and (*b*) enzymatic degradation by the bacterial penicillinase (beta-lactamase) enzymes produced by resistant bacteria. The choice of a penicillin drug is therefore usually influenced by two general consideration :

1. desired spectrum of microbial activity ;
2. stability of the penicillin.

Penicillins are thus further classiffied into (*a*) acid (gastric)—stable, penicillinase-sensitive drugs, e.g. phenoxymethyl penicillin, ampicillin and amoxycillin, and (*b*) penicillinase-resistant, also acid-stable penicillins, e.g. cloxacillin, flucloxacillin, and methicillin.

Adverse effects.—The most important adverse effect of the penicillins is hypersensitivity, which causes rashes and mild to fatal anaphylaxis. They are therefore contraindicated in patients with a history of allergic reactions to penicillin. Other serious adverse effects include encephalopathy due to cerebral irritation and gastrointestinal disorders. Cross-hypersensitivity exists between all penicillins and to a lesser extent, with the cephalosporins.

As with other broad-spectrum antibiotics, prolonged treatment with oral penicillins may lead to super infections with non susceptible bacteria or fungi, e.g. pseudomonas, proteus, candida.

AMPICILLIN

Dosage form.—Capsules, 250 and 500mg.
Powder for oral suspension, 125mg/5ml
Powder for injection, 250 and 500mg
(Sodium salt) in vials.

Pharmacological properties.—Semi-synthetic, bactericidal, broad spectrum, acid-stable, penicillinase-sensitive penicilline.

Uses.—It is active against a wide range of gram positive and gram-negative bacteria, including Salmonella typhi. It is extensively used in chest and urinary tract infections.

Adverse effects.—As for the penicillins. Additionally, maculopapular rashes, apparently not attributable to hypersensitivity or penicillin allergy, have been reported in patients with glandular fever and chronic lymphatic leukaemia.

Dosage.—Adults : Oral, 0.25-1g, every 6 hours.
Injection, I. M. or I. V., 500mg every 4-6 hours.
Children : Any route, ½ the adult dose.

BENZYL PENICILLIN

Dosage form.—Injection powder in 0.6g. (1 million units) vial.

Pharmacological properties.—The first of the penicillins. It is highly active against many gram positive and gram negative cocci. It is acid labile and penicillinase sensitive.

Uses.—Infections by streptococci, pneumococci, gonococci, meningococci, clostridium, treponema.

Adverse effects.—Hypersensitivity reactions ; encephalopthy in high doses.

Contraindication.—Known hypersensitivity to penicillins.

Dosage.—600mg, 3-4 times daily, by intramuscular injection ; Children up to 12 years : 10-20mg/kg daily. Neonates, 30mg/kg daily.

CLOXACILLIN

Dosage form.—Capsule, 250mg ; syrup 125mg/5ml ; injection, powder in 250mg and 500mg vials.

Pharmacological properties.—Semi-synthetic penicillin, acid-stable, and penicillinase-resistant.

Uses.—Cloxacillin should be reserved for serious infections due to penicillinase-producing staphylococci.

Dosage.—Oral 250mg/500mg, 6 hourly ; i.m. 500mg, every 4-6 hours ; i.v. 0.5-1g every 4-6 hours. Children : ¼-½ adult dose.

Precaution.—Solutions for injection should be used within 30 minutes and should not be mixed with blood or other protein containing fluids.

FORTIFIED PROCAINE PENICILLIN

Dosage form.—Injection, powder in 400,000 units vial, containing : procaine penicillin 300,000 units (300mg) and benzylpenicillin 100,000 units (60mg).

Pharmacological properties.—Procaine penicillin is a repository preparation of benzylpenicillin. Fortified procaine penicillin combines the rapid onset of action of benzylpenicillin with the prolonged action of procaine penicillin.

Uses.—Treatment of benzylpenicillin sensitive infections when prolonged action is required.

Dosage.—Variable, depending on the nature and severity of the infection. For acute streptococcal and pneumococcal infections, 300-600mg, i.m., 1-2 times daily for a minimum of 7 days. Higher doses are required for gonorrhoea and syphilis.

Others.—Amoxycillin and Carbenicillin.

9.8.2. *The Tetracyclines.*—The tetracyclines are bacteriostatic, broad spectrum antibiotics whose usefulness has gradually decreased as a result of increasing bacterial resistance. Absorption of tetracyclines from the gut is decreased by milk, milk products, sodium bicarbonate, antacids, aluminium, calcium, magnesium and iron salts. These act by the formation of unabsorbable complexes with tetracycline. Concomitant administration with the above should be avoided. Tetracyclines cross the placenta and are also excreted into breast milk.

The tetracyclines are deposited in growing bone and teeth, causing permanent discoloration of teeth and dental hypoplasia. They should not be given to pregnant women and to children under 12 years of age.

TETRACYCLINE

Dosage form.—Tablet or capsule, 250mg (hydrochloride)

Pharmacological properties.—Bacteriostatic, broad spectrum antibiotic.

Uses.—Active against a wide variety of infections caused by gram-positive and gram-negative micro-organisms. However, because of the high incidence of resistant organisms, the use of tetracycline should be limited to :

(*i*) Chlamydial infections—causing trachoma (in which ophthalmological tetracycline is drug of choice), psittacosis, urethritis and lymphogranuloma venereum.

(*ii*) Rickettsial infections.

(*iii*) Mycoplasma infections of the lungs and urogenital tract.

(*iv*) Brucella, in which tetracyclines are generally more effective than chloramphenicol.

Contraindications.—Pregnancy ; children under 12 years of age ; pre-existing hepatic or renal damage ; known hypersensitivity to the tetracyclines.

Precaution.—Should not be given in renal impairment. Absorption from the gut is reduced by milk, milk products, antacids, aluminium, magnesium, calcium and iron salts.

Adverse effects.—Superinfection ; hepatotoxicity especially following high doses in pregnancy ; aggravation of pre-existing renal insufficiency ; depression of bone growth and discoloration of teeth in children.

Drug interation.—Combination with penicillin results in reduced antibacterial activity in pneumoccal and possibly other infections.

Dosage.—500mg, 6 hourly.

Others.—Other tetracyclines commonly used are : oxytetracycline, chlor-tetracycline, Doxycycline and Demeclodycline.

9.8.3. *The Aminoglycosides.*—The aminoglycosides are narrow spectrum, usually bactericidal antibiotics. They are selectively active against aerobic gram-negative bacilli, including pseudomonas, proteus and most enterococci. Activity is greatly reduced in acidic and anaerobic environments.

Aminoglycosides are poorly absorbed from the gut, but better absorbed from the parenteral route and from denuded skin or wound surfaces if applied locally. They penetrate poorly into the cerebro-spinal fluid but can cross the placenta. Accumulation in body tissues may account for the ototoxicity and nephrotoxicity associated with them.

Precaution.—Ototixicity and nephrotoxicity are the most serious adverse effects of aminoglycosides therapy. These effects are most likely to occur in the elderly, dehydrated patients, patients with renal impairment, and patients receiving one of the drugs in high doses or for prolonged periods. Patients receiving an aminoglycoside (by any route of administration) should be monitored for toxicity symptoms and be under close medical supervision. The aminoglycosides are physically or chemically incompatible with many drugs including penicillins, the cephalosporins and erythromycin.

GENTAMICIN

Dosage form.—Injection, 10 and 80mg in 2ml vials.
Pharmacological properties.—As above for Aminoglycosides.

Uses :

(*i*) Empirical treatment of severe infections in combination with : carbenicilin (infections by Ps. aeruginosa and Proteus spp.), metronidazole (if anaerobes are also likely to be present as in post-bowel surgery peritonitis).

(*ii*) Enterococcal endocarditis (combined with penicillin).
(*iii*) Gram negative bacillary meningitis.
(*iv*) Urinary tract infections due to Ps. aeroginosa unresponsive to other antibiotics.
(*v*) Chest infections due to penicillin-resistant staphylococci.

Contraindication.—Pregnancy, since it crosses the placenta.

Precaution.—Should be used with extra care when renal insufficiency is present. Patients should remain well hydrated during treatment, and a urinary alkalising agent should be used in urinary infections.

Adverse effects.—Ototoxicity and nephrotoxicity.

Dosage.—Intramuscular injection : 2-5mg/kg daily in divided doses every 8 hours. Dosing interval lengthened in renal impairment. Intrathecal injection : 1mg daily, with 2-4mg/kg daily by intramuscular injection, in divided doses every 8 hours. For children Intramuscular injection up to 2 weeks—3mg/kg every 12 hours ; 2 weeks to 12 years—2mg/kg every 8 hours.

Others.—Other commonly used aminoglycoside antibiotics are : Kanamycin, Neomycin and streptomycin.

9.8.4. *Other Broad Spectrum Antibiotics*

CHLORAMPHENICOL

Dosage.—Capsule, 250mg ;
Syrup, 125mg/5ml.
Injection, powder in 1g vial.

Pharmacological properties—Broad spectrum, bacteriostatic antibiotic. Penetrates the CSF and crosses the placental barrier.

Uses.—Typoid fever.
Meningococcal and haemophilus meningitis.
Whooping cough.

Caution.—Because of bone marrow toxicity, chloramphenicol should not be used as a general purpose broad spectrum antibiotic when the condition can be effectively treated by other antibiotics. Even when indicated (*see* uses above) prolonged or repeated courses should be avoided.

Adverse effects.—Bone marrow depression leading to a-plastic anaemia ; grey baby syndrome.

Dosage.—0.5-1g, 6 hourly, orally or by i.m. or i.v. injection.

Others.—Other broad spectrum antibiotics in use are : Cephalosporins, *Erythromycin, Lincomycin and Spectinomycin.*

9.8.5. *Sulphonamides*

PHTHALYSULPHATHIAZOLE

Dosage form.—Tablet 500mg.

Pharmacological properties.—Poorly absorbed sulphonamide.

Use.—Acute diarrhoeas of bacterial origin.

Dosage.—0.5-2g 6 hourly.

Caution.—Most acute diarrhoeas are not of bacterial origin and are usually self-limiting. Essential treatment is to prevent or correct salt and water depletion by appropriate oral or intravenous fluid replacement therapy.

SULPHADIMIDINE

Dosage form.—Tablet, 500mg.
Syrup, 500mg/5ml.

Pharmacological properties.—Well absorbed, rapidly excreted sulphonamide. Bacteriostatic.

Uses.—Limited use. Bacillary dysentery and urinary tract infections.

Dosage.—Initially 2g, then lg 6 hourly, for adults.
Children : 6 months to 1 year, 1/6 adult dose
1-5 years 1/3 adult dose
6-12 years 1/2 adult dose
13-15 years 2/3 adult dose

COTRIMOXAZOLE

Dosage form.—Tablets. 400mg sulphamethoxazole plus 80mg trimethoprim ; 100mg sulphamethoxazole plus 20mg trimethoprim. Syrup, 200mg sulphamethoxazole plus 40mg trimethoprim in 5ml.

Pharmacological properties.—Combination of a long acting sulphonamide with a dihydrofolate reductase inhibitor, trimethoprim. Combination is far more active against susceptible micro-organisms than the individual drugs.

Uses.—Useful against infections caused by Streptococci, Staphylococci, Pheumococci Neisseria, E. Coli, Klebsiella, Proteus, Haemophilus, Salmonella, Shigella. It is particularly effective in urinary tract, respiratory tract and gastro-intestinal tract infections.

Dosage.—Usual adult dosage is 2 tablets of the stronger formulation, twice daily. Children 6 weeks-6 months 1/8, 6 months-6 years 1/4, 6-12 years 1/2, adult dose.

Others.—Sulphaguanidine and Sulphathiazole.

9.8.6. *Other Antimicrobial Drugs.*

METRONIDAZOLE

See section 9.1.

NITROFURANTOIN

Dosage Form.—Tablets, 50mg, 100mg.

Pharmacological properties.—A broad spectrum synthetic urinary antiseptic. It is concentrated in the renal tubules and excreted unchanged in the urine. It does not attain therapeutic concentration in the plasma or renal parenchyma.

Uses.—Urinary tract infection resistant to other drugs.

Contraindication.—Renal insufficiency.

Precautions.—Not useful in acute pyelonephritis in which renal parenchymal inflammation is also present. The urine should be acidified during therapy. Excessive fluid intake is not helpful since this reduces the concentration of nitrofurantoin in the urine.

Adverse effects.—Gastrointestinal irritation ; intravascular haemolysis especially in subjects deficient in glucose-6-phosphate dehydrogenase.

Dosage.—Adults 100mg, 6 hourly for a maximum period of 14 days. Children 0.5-1mg /kg, 6 hourly. For prophylaxis following recurrent urinary infection : 50-100mg nightly.

Others.—Nalidixic acid

9.9. *Anti-Leprosy Drugs.*—Leprosy is a communicable disease caused by *Mycobacterium leprae.* Four clinical forms are described :

(*i*) indeterminate, (*ii*) lepromatous, (*iii*) tuberculoid and (*iv*) borderline.

Three antileprosy drugs have been described here, dapsone, clofazimine and rifampicin. It is now clear that treatment with dapsone alone leads to rapid emergence of dapsone resistance. Treatment should therefore be initiated with all three drugs to prevent development of resistance. Rifampicin should be continued for at least 4 weeks, clofazimine for 1 year and dapsone for life.

In the course of treatment of leprosy especially with dapsone, reactions occur which take the form of exacerbations of the lepromatous form or of erythema nodosum leprosum in borderline or lepromatous forms. In both conditions the patient develops high fever, neuritis, malaise, arthralgia and high white blood cell count. This is referred to as Lepra Reaction, and is treated with corticosteroids or clofazimine.

DAPSONE

Dosage form.—Tablets, 50mg, 100mg.

Pharmacological properties.—Dapsone is a sulphone, chemically related to the sulphonamides. It is bacteriostatic or weakly bactericidal against *M. leprae.* Also has antimalaria activity.

Uses.—Leprosy, in combination with rifampicin and clofazimibe.

2. Malaria, as a prophylactic in a fixed dosage combination with pyrimethamine.

3. Dermatitis herpetiformis.

Adverse effects.—Intravascular haemolysis especially in patients deficient in glucose-6-phosphate dehydrogenase; Methaloglobinaemia; headache, nervousness, insomia, blurred vision paraesthesia, peripheral neuropathy, psychosis; lepra reacti s-fever, erythema nodosum, iritis, painful polyneuritis; hepatits, anorexia, nausea, vomiting; allergic dermatitis

Caution.—Monotherapy with dapsone leads to rapid development of resistant *M. leprae*

Dose.—For leprosy;

Dapsone 25-50mg twice weekly, gradually increased to 100mg daily plus Rifamplcin 600mg once monthly plus clofazimine 50mg daily Self administered) or 300mg once monthly (supervised). This regime would be continued for at least 2 years and preferably until smears are negative. For patients weighing less than 35kg, the daily dose of dapsone is adjusted to 1-2mg/kg and the dose of rifampicin to 450mg.

CLOFAZIMINE

Dosage form.—Capsule, 100mg.

Pharmacological properties.—A phenazine congener. Weakly bactericidal to M. laprae. It accumulates in tissues thus making discontinuous therapy possible.

Use.—Leprosy, in combined therapy with dapsone and rifampicin. Prevents the development of erythema nodosum leprosum (Lepra reactions).

Adverse effects.—Causes red-purple discoloration of the skin lesions and darkening of skin areas exposed to sunlight.

Dose.—For leprosy : 50mg daily. See also under dapsone.
For lepra reactions: 300mg daily for 3 months.

RIFAMPICIN

See section 9.10

9.10. *Anti-Tuberculosis Drugs.*—Tuberculosis is a communicable disease caused by *Mycobacterium tuberculosis*—Availability of modern antituberculosis drugs has made the isolation of the patient from his normal environment unnecessary. Treatment should not be regarded as sufficient when clinical symptoms or bacteriological tests have become nagative. Continuation of treatment for an extended period of 1 year or longer is often necessary. As far as possible the uninfected population, particularly children should be vaccinated against tuberculosis. The drugs described here for use against tuberculosis are: isoniazid, rifampicin, streptomycin and thiacetazone plus isoniazid combination.

Combinations of the above drugs, administered regularly in adequate doses, for an adequate period of time, should constitute effective treatment for all forms of tuberculosis.

STREPTOMYCIN

Dosage form.—Injection, 1g and 5g (sulphate) vials.

Pharmacological properties.—A member of the aminoglycoside group of antibiotics. Bactericidal; acts by inhibiting protein synthesis. Active against a wide variety of gram negative and a smaller variety of gram positive bacteria. Most widely used now for its activity against *Mycobacterium tuberculosis*. Resistance develops to it very readily as a result of mutation and acquisition of plasmids. It is not absorbed from the gut, little enters the CSF. It is excreted unchanged in the urine by glomerular filtration.

Uses.—Tuberculosis—as one of a 3 or 4 drug combination therapy.
Bacterial endocardits—in combination with benzylpenicillin.
Brucellosis—in combination with tetracycline.

Precaution.—In renal insufficiency, dose is reduced and treatment carefully monitored.
Adverse effects.—Hypersensitivity reaction-skin rashes and fever. Ototoxicity and nephrotoxicity.
Dose.—For tuberculosis: lg twice week combined with other anti-tuberculosis drugs.

ISONIAZID

Dosage form.—Tablet 100mg.
Pharmacological properties—Rapidly bactericidal against rapidly growing tubercle, bacilli. Dormant bacilli survive exposure to the drug and may subsequently multiply. The dormant organisms are however destroyed when rifampicin is combined with isoniazid. Resistant tubercle bacilli emerge rapidly if isoniazid is used alone.

Uses.—First line anti-tuberculosis drug.
Precaution.—Pyridoxine, 15-50mg daily should be given concurrently to reduce the risk of peripheral neuropathy especially in poorly nourished patients.
Adverse effects.—Hypersensitivity reactions, peripheral neuropathy and psychotic behaviour may occur.
Dosage.—Standard dosage 300mg daily, or for non-compliant patients 15mg/kg twice weekly under supervision. Tuberculous meningitis: 10mg/kg daily.
Children: Standard dosage 10-20/kg daily up to a maximum of 300mg.

THIACETAZONE PLUS ISONIAZID

Dosage form.—Tablets, Thiacetazone 50mg plus isoniazid 100mg ; and thiacetazone 150mg plus isoniazid 300mg.
Pharmacological properties.—Fixed dosage combination of isoniazid and thiacetazone helps compliance.
Uses.—Combined with a third drug in the initial treatment of tuberculosis. Adequate maintenance treatment of infection with sensitive organisms.
Dosage.—Standard adult dosage : 3 tablets of the lower strength or 1 tablet of the higher strength daily.

RIFAMPICIN

Dosage form.—Capusule or tablet, 150mg, 300mg.
Pharmacological properties.—A broad spectrum antibiotic with a potent bactericidal action against mycobacteria. Acts by inhibiting DNA synthesis. Must be used with other drugs in the treatment of tuberculosis and leprosy to prevent development of resistance. Crosses the blood-brain barrier readily.
Uses.—Tuberculosis ; leprosy, in combination with other drugs.
Contraindications.—Jaundice ; first trimester of pregnancy since it has been shown to be teratogenic in animal studies.
Precautions.—Liver and renal functions should be monitored during treatment. The drug should be withdrawn if renal impairment, haemolysis or thrombocytopenic purpura occur during treatment. Breast feeding is inadvisable during treatment since rifampicin is excreted into breast milk. Non-hormonal methods of birth control should be used by patients during treatment, as the reliability of steroid contraceptives is reduced. Para-amino salicylic acid impairs the absorption of rifampicin, hence the two drugs when used concurrently should be given at least 8 hours apart.

Adverse effects.—Gastrointestinal irritation, hypersensitivity reactions and transient rises in serum bilirubin and transaminases. Reddish discolouration of urine, sputum and tears may be produced.

Dose.—For tuberculosis : adults, 450-600mg (10mg/kg) daily or 600mg twice weekly ; children, 20mg/kg daily up to a maximum of 600mg, preferably before breakfast. For leprosy : 600mg monthly.

Drug interactions.—Para-amino salicylic acid delays the absorption of rifampicin. Being a potent inducer of hepatic microsomal enzymes, rifampicin enhances the metabolism of drugs like steroid contraceptives, other corticosteroids, oral hypoglycaemic agents, dapsone, and digitalis glycosides.

Others.—Pyrazinamide, Rifampicin plus Isoniazid.

9.11. *Systemic Anti-Fungal Drugs.*—Systemic anti-fungal drugs as used in this section refer to anti-fungal drugs which are taken and absorbed into the blood as against those which are applied locally on the affected part of the body.

Fungal infections can be divided into three groups from the therapeutic standpoint.

(*i*) *Systemic fungal infections.*—In which internal organs and tissues are affected. Systemic mycoses, e.g. histoplasmosis, are serious diseases, difficult to diagnose and difficult to treat. Amphotericin B and flucytosine are the drugs commonly used in treatment but these have not been included in the Essential Drugs List because of the specialised facilities needed for monitoring and controlling their use.

(*ii*) *Superficial fungal infections.*—Involving the skin and its appendages. Dermatophytes cause local infections of the skin (tinea, corporis, ungium or pedis), trichophytons produce different infections of the scalp or nails while epidermophytons may produce infections in the skin or its appendages. Superficial fungal infections respond well to the topical anti-fungal drugs, but occasionally systemic anti-fungals may be needed for serious or widespread skin involvement. The only systemic anti-fungal drug described here is griseofulvin.

(*iii*) *Candidiasis,* caused by *Candida albicans* may be superficial (involving the skin or mucous membranes), gastrointestinal or systemic. Treatment of superficial and gastrointestinal candidiasis is with nystatin (*see* Section 10 on Dermatological drugs) while systemic candidiasis is treated with amphotericin B and flucytosine as with other systemic fungal infections.

GRISEOFULVIN

Dosage form.—Tablet, 125mg.

Pharmacological properties.—A fungistatic antibiotic with selective activity against various dermatophytes. It has no effect on other fungi or bacteria.

Uses.—Superficial fungal infections of the skin, hair and nails due to Trichophyton, Epidermophyton or Microsporum. It is particularly valuable for infections of the hair and finger nails.

Contraindications.—Pregnancy, prophyria.

Adverse effects.—Hypersensitivity reactions.

Dosage.—Adults : 500mg-lg daily, in divided doses or as a single dose.

Children 10mg/kg daily, in divided doses. Treatment should be continued for several weeks after apparent clinical and microscopic cure.

Others.—Amphotericin, Flucytosine, Miconazole and Ketoconazole.

10. DERMATOLOGICAL DRUGS

The dermatological drugs in this section have been described under the following headings :

10.1. Anti-infective preparations (topical).

10.2. Anti-inflammatory preparations (topical).

10.3. Astringents.

10.4. Dusting powder.

10.5. Fungicides (topical).

10.6. Keratolytic preparations.

10.7. Scabicides and pediculicides.

10.8. Antiseptics.

Topical drug administration is the best method for treating many simple skin deseases but often systemic administration of drugs is necessary. Systemic drug administration is required when :

(*i*) the skin diseases has extended to deeper layers of the skin or to adjacent tissues.

(*ii*) the skin disease has a common cause and pathology with disease of internal organs (e.g. collagen vascular disease).

(*iii*) the skin disease is too widespread to permit topical drug application.

(*iv*) the drug effective against a given skin disease accumulates in cutaneous keratin (e.g. griseofulvin).

(*v*) there is evidence of blood spread (e.g. multiple pyogenic infection of skin).

Skin diseases which are manifestations of an internal disease (e.g. purpura in thrombocytopenia) do not require topical treatment. Treatment of the underlying cause would remove the skin manifestation.

The base or vehicle in which the drug is applied to the skin is of great importance. As a rule, lotions and pastes are best for weeping and wet lesions, while greasy ointments for dry lesions. Creams may be suitable for either.

10.1. *Anti-Infective Preparations*

NEOMYCIN PLUS BACITRACIN

Dosage forms.—Ointment and cream, 5mg neomycin sulphate plus 500 units bacitracin zinc per gram of ointment in 5 g and 30 g tubes. Dusting powder, 0.5 per cent neomycin sulphate plus 250 units bacitracin zinc per g.

Pharmacological properties.—Preparation containing two poorly absorbed, wide spectrum antibiotics.

Uses.—(*a*) Open superficial infections.

(*b*) Infected eczema, dermal ulcers and wounds.

Contraindications.—Known history of hypersensitivity to neomycin or bacitracin.

Caution.—Ototoxic when applied to extensive burns. Deep infective lesions (e.g. furunculosis, pyoderma, carbuncle, superficial and deep abscesses) require not topical but systemic administration of antibiotics.

Adverse effects.—Skin sensitisation ; ototoxicity if absorbed.

Dosage regimen.—It is applied to the affected surface twice daily.

10.2. *Anti-Inflammatory Preparations*

BETAMETHASONE

Dosage form.—Ointment and cream, 0.1% (valerate).

Pharmacological properties.—A potent, topical corticosteroid preparation.

Uses.—To suppress inflammatory or proliferative responses in various non-infective skin conditions, including: eczematous conditions, allergic dermatoses, seborrhoeic dermatitis intertrigo, intractable pruritus unresponsive to other treatment, discoid lupus erythematosus, lichen planus and psoriasis unresponsive to keratolytic treatment.

Contraindications.—Acne, rosacea, perioral dermatitis.

Caution.—Potentially dangerous skin conditions such as pemphigus and generalised exfoliative dermatitis should be treated with systemic corticosteroids from the onset.

Dosage.—A thin film is applied to the affected areas 2-3 times daily.

10.3. *Astringents*

CALAMINE PLUS ZINC OXIDE

Dosage form.—Calamine lotion containing calamine 15 per cent, zinc oxide 5 per cent, glycerol 5 per cent, bentonite 3 per cent, sodium citrate 0.5 per cent, liquefied phenol 0:5 per cent, in freshly boiled and purified water.

Pharmacological properties.—An anti-pruritic preparation.

Uses.—Pruritus ; Acute inflammations of skin with vascular eruptions, exudation, oozing and crusting.

Dosage regimen.—Frequent application to the affected parts.

10.4. *Dusting Powder*

ZINC, STARCH AND TALC

Dosage form.—Zinc, Starch and Talc dusting powder, containing zinc oxide 25 per cent, starch 25 per cent, purified (sterilised) talc 50 per cent.

Pharmacological properties.—Zinc oxide acts as an astringent forming a relatively impermeable film of coagulated protein on the surface treated. Talc acts as a lubricant powder but does not absorb moisture. Starch is less lubricant but absorbs moisture.

Uses.—In folds where friction may occur between opposing skin surfaces.

Contraindication.—They should not be applied to areas that are very moist as they tend to cake and abrade the skin.

Dosage.—2-3 applications to affected parts daily.

10.5. *Fungicides*

BENZOIC ACID PLUS SALICYLIC ACID

Dosage form.—Ointment and cream, 6 per cent plus 3 per cent respectively.

Pharmacological properties.—Salicylic acid acts as a keratolytic agent. Benzoic acid is a fungistatic antiseptic.

Uses.—Mild superficial fungal infections.

Dosage.—2-3 applications daily.

CLOTRIMAZOLE

Dosage form.—Ointment and cream, 1 per cent ; Spray, 1 per cent in aerosol ; Pessary, 100 mg.

Uses.—Superficial fungal infections.

Dosage.—2-3 applications daily.

NYSTATIN

Dosage form.—Oral suspension, 100,000 units/ml ; Pessary, 100,000 units/Pessary ; Tablet, 500,000 units ; Ointment or cream, 100,000 u/g.

Uses.—(*a*) Intestinal candidiasis.

(*b*) Candidiasis of skin, vagina, mucous membranes.

Dosage.—Oral administration : 500,000 units four times daily for 7-14 days.

Topical.—3 applications daily.

Vaginal pessary.—Insertion twice daily for 14 days.

10.6. *Keratolytic Preparations.*

SALICYLIC ACID

Dosage form.— Solution, topical, 12 per cent in flexible collodion.

Pharmacological properties.—A keratolytic agent that promotes desquamation of the stratum corneum.

Uses.—Hyperkeratotic conditions including : psoriasis, ichthyosis, seborrhoeic dermatitis, chronic eczema, hyperkeratosis of the palms and soles, warts, acne.

Dosage.—1 or 2 applications daily.

10.7. *Scabicides and Pediculicides.*

BENZYL BENZOATE

Dosage form.—Emulsion and lotion, 25 per cent.

Pharmacological properties.—An efficient scabicide and pediculicide. Slightly irritant to skin.

Uses.—Scabies ; pediculosis of the scalp, body and pubis.

Adverse effects.—Transient burning of the skin ; occasionally skin eruptions.

Precautions.—Should not be allowed to come in contract with the eyes. Dilute 1 : 1 (adults) or 1 : 3 (Children) with water before use.

Dosage and administration.—For scabies, the lotion is applied over the whole body below the neck after thorough washing. A second application is made without washing 24 hours later. The lotion can be washed away 24 hours after the second application.

10.8. *Antiseptic and Disinfectants.*—These are cleansing agents used to sterilise broken and unbroken skin surfaces. They are commonly used for cleansing of wounds and ulcers, as adjuncts in the treatment of infected skin conditions and in preparing the skin for surgery.

BENZOIN

Dosage form.—Compound tincture. See formulary for composition.

Uses.—Skin disinfection.

CHLORHEXIDINE

Dosage form.—Solution, 5 per cent (gluconate). To be used after appropriate dilution.

Uses.—Pre-operative skin preparation ; obstetrics and wound cleansing ; bladder irrigaiton.

Caution.—Avoid contact with mucous membranes and meninges. Bladder irrigations containing more than 0.01 per cent may cause haematuria.

CHLOROXYLENOL

Dosage form.—Solution, 5 per cent.
Uses.—Hand disinfection ; vaginal lubricant during labour ; skin disinfection.
Adverse effect.—Can cause skin irritation and sensitisation.

IODINE

Dosage form.—Solutions. See formulary for compositions.
Uses.—Skin disinfection ; antiseptic on cuts and wounds.
Adverse effects.—Pain on wounds ; stains skin and clothes.

Others.—Other preparations in common use are :

Tar (keratolytic agent) ; Lindane and Monosulphiram (scabicide and pediculicide) ; Methylated spirit—(alcohol 19 parts : methanol 1 part, tinted with gentian violet) ; Hydrogen peroxide 6 per cent w/v ; Potassium permanganate 1 per cent ; Gentian violet 0.5 per cent, and silver nitrate stick (silver nitrate 95 per cent : potassium nitrate 5 per cent) (antiseptics).

11. DRUGS ACTING ON THE EYE

The ophthalmological drugs in this section have been described under the following headings :

11.1. Anti-infective drugs.
11.2. Anti-inflammatory drugs.
11.3. Local anaesthetics.
11.4. Miotics and anti-glaucoma drugs
11.5. Mydriatics.
11.6. Others, e.g. sodium chloride eye lotion.

Eye preparations are applied locally in the form of eye drops, eye ointment, eye lotions, packs, lamellae, corneal baths and by iontophoresis and sub-conjunctival injection. All preparations must be sterile. One of the best preparations is sodium chloride (0.9 per cent w/v), eye lotion which is a useful irrigation for removing conjunctival discharges. Any lotion remaining unused after 24 hours should be discarded because of bacterial contamination. Most external bacterial infections can be controlled by proper selection of a suitable anti-bacterial agent that does not readily produce sensitization and/or that is rarely or never administered systemically (e.g. sulfacetamide, chloramphenicol). The choice of these drugs should avoid possible sensitization to commonly used systemic drugs and should discourage the development of strains of organisms resistant to commonly used agents. Intraocular infections and severe external ocular infections require intensive systemic therapy in addition to local administration.

Adrenal corticosteroids are used in the symptomatic treatment of ocular inflammatory disorders, to control inflammation and thereby reduce the amount of permanent scarring and prevent visual loss. Corticosteroids generally should be avoided in most ocular infections because the course of the disease may be worsened by the weakening of bodily defence mechanisms and also lead to ulceration of the cornea.

Eye preparations containing anti-cholinergics are used to achieve mydriasis as for example in diagnostic retinoscopy ; those containing parasympathomimetics are used as miotics in the treatment of glaucoma, and those containing local anaesthetics for the removal of foreign bodies and for routine intraocular tonometry.

Acetazolamide is administered systemically for the treatment of glaucoma. It reduces the secretion of aqueous humour by inhibiting the enzyme carbonic anhydrase, and thus lowers raised intraocular pressure.

11.1 *Anti-Infective Drugs*

CHLORAMPHENICOL

Dosage form.—Eye drops, 0.5%.
Eye ointment, 1%.
Uses.—Local treatment of a wide variety of bacterial infections of the eye.
Dosage.—Apply every 3 hours.

SULPHACETAMIDE

Dosage forms.—Eye drops, 10%, 30%.
Eye ointment, 10%.
Pharmacological properties.—Highly soluble, non-irritant sulphonamide.
Uses.—Acute and chronic bacterial conjunctivities.
Precaution.—Known hypersensitivity to sulphonamides.
Dosage.—Apply every 2-6 hours.

CHLORTETRACYCLINE

Dosage form.—Eye ointment, 1%.
Use.—Trachoma.

Caution.—For the general treatment of bacterial infection of the eye, chemotherapeutic agents like chloramphenicol and sulphacetamide which are seldom or never used for systemic infections are preferred to the tetracyclines.

Dosage.—Apply three times daily for six weeks.
Others.—Other anti-infective preparations in common use include Gentamicin eye drops, Framycetin eye drops and ointment and Idoxuridine eye drops.

11.2. *Anti-inflammatory Drugs.*

Dosage forms.—Eye drops and ointment, 0.1%.
Uses.—Iridocyclitsis ; sclerities ; other local inflammations.
Caution.—A 'red eye' may be due to *Herpes simplex virus* infection which produces a dendritic ulcer. This condition is aggravated by corticosteroids.

Adverse effects.—Prolonged application of steroid eye drops may lead to steroid glaucoma.

Dosage.—Eye drops : apply every 1-2 hours.
Eye ointment : apply 2-4 times daily.

OXYPHENBUTAZONE

Dosage form.—Eye ointment, 10%.
Pharmacological effects.—An effective anti-inflammatory drug. Does not aggravate dendritic corneal ulceration and does not cause glaucoma.
Uses.—Local treatment of eye inflammation including iridocylcitis and episcleritis.
Dosage.—Apply 1-2 drops, 2-5 times daily.

TETRAHYDROZOLINE

Dosage form.—Eye drops, 0.05%.
Pharmacological properties.—Tetrahydrozoline is an alpha-adrenoceptor agonist.
Uses.—Allergic conjunctivitis.

Dosage.—Apply 1 or 2 drops, 4-6 times daily.
Others.—Other anti-inflammatory drugs in common use are Hydrocortisone eye drops and ointment, and Prednisolone eye drops and ointment.

11.3. *Local Anaesthetics*

AMETHOCAINE

Dosage form.—Eye drops, 0.5, 1% (hydrochloride).
Uses.—Ocular local anaesthetic.
Dosage.—Instil 1 or 2 drops onto the conjunctiva.
Others.—Lignocaine with or without Adrenaline.

11.4. *Miotics and Anti-glaucoma Drugs.*

11.4.1. *Topical Preparations.*

PILOCARPINE

Dosage form.—Eye drops, 1, 2, 3 and 4% (hydrochloride).
Pharmacological properties.—A parasympathomimetic drug. Contracts the circular muscise of the iris and promotes drainage of the aqueous humour.
Uses.—Primary (narrow angle and wide angle) glaucoma.
Adverse effect.—Spasm of accommodation.
Dosage.—1-2 drops, 3-6 times daily.

PHYSOSTIGMINE

Dosage form.—Eye drops, 0.25, 0.5 per cent (sulphate).

Pharmacological properties.—A reversible anticholinesterase. Causes narrowing of the pupil and enchances drainage of the aqueous humour.

Use.—Primary glaucoma.

Dasage.—1-2 drops, 2-6 times daily.

11.4.2. *Systemic Preparations*

ACETAZOLAMIDE

Dosage form.—Tablets, 250mg.

Pharmacological properties.—Carbonic anhydrase inhibitor ; reduces the secretion of acqueous humour, leading to fall in intraocular pressure.

Use.—Primary glaucoma.

Dosage.—250mg, 6-hourly.

11.5. *Mydriatics*

HOMATROPINE

Dosage form.—Eye drops, 1, 2 per cent:

Pharmacological properties.—Anticholinergic drug, relaxes the circular muscles of the iris and reduces drainage of the aqueous humour.

Uses:—For producing mydriasis and cycloplegia for refraction.

Contraindiction:—Glaucoma.

Adverse reaction.—Loss of accommodation ; raised intraocular pressure.

Dosage.—1-2 drops.

TROPICAMIDE

Dosage form:—Eye drops, 0.5, 1 per cent.

Pharmacological properties.—Same as homatropine but shorter acting (duration of effect : tropicamide 3 hours, homatropine 24 hours).

Uses—contraindications, adverse reactions and *dosage.*—Same as Homatropine.

Others.—Other mydriatics in relatively common use are Atropine eye drops 1 per cent and Cyclopentolate eye drops, 1 per cent.

12. DRUGS ACTING ON THE EAR, NOSE AND THROAT

The drugs acting on the ear, nose and throat have been described in this section under the following headings :

12.1. *The Ear*
- 12.1.1. Anti-infective drugs.
- 12.1.2. Combined anti-infective and anti-inflammatory drugs.
- 12.1.3. Preparations for removal of ear wax.

12.2. *The Nose*
- 12.2.1. Combined Antiallergic and Nasal Decongestants.

12.3. *The Throat*.—Other Drugs.

12.1. The Ear.—Infections of the external ear should not be treated with ear drops containing antibiotics which may later be used systemically because of the danger of sensitisation.

Acute infections of the middle ear should be treated not topically, but with appropriate systemic antibiotics.

Ear wax is best removed firstly by softening with sodium bicarbonate ear drops, glycerol or warm olive oil on three successive nights and then syringing out with water.

Ear drops containing aminoglycoside antibiotics like neomycin should be avoided when the tympanic membrane is perforated because this may lead to permanent deafness.

12.1.1. *Anti-infective Drugs*

CHLORAMPHENICOL EAR DROPS

Dosage form.—Ear drops, 5 per cent.

Uses.—Bacterial infections of the external ear.

Caution.—Avoid prolonged use.

Contradiction.—Perforated ear drum.

Adverse effect.—Hypersensitivity reaction.

Dosage.—Apply 2-3 drops, 2-3 times daily.

Others.—Framycetin and Gentamicin ear drops.

12.1.2. *Combined Anti-infective and Anti-inflammatory Drugs*

HYDROCORTISONE PLUS NEOMYCIN EAR DROPS

Dosage form.—Ear drops, Hydrocortisone 1.5 per cent (acetate) plus neomycin 0.5 per-cent (sulphate).

Uses.—When bacteria infection of the external ear is associated with inflammation.

Dosage.—2-3 drops every 2-3 hours.

Contraindication.—Perforated ear drum.

Caution.—Avoid prolonged use as this can lead to fungal infection.

HYDROCORTISONE PLUS OXYTETRACYCLINE PLUS POLYMYXIN B EAR DROPS

Dosage form.—Ear drops, Hydrocortisone 1.5 per cent (acetate), oxytetracycline 0.5 per cent (hydrochloride) and polymyxin B 0.119 per cent (sulphate).

Uses.—Bacterial infection with inflammation.

Dosage.—2-3 drops, 2-3 times daily.

Others.—Dexamethasone plus Framycetin plus Gramicidin ear drops.

12.1.3. *Preparations for removing ear Wax* :

GLYCEROL PLUS SODIUM BICARBONATE

Dosage form.—Ear drops, 5mg sodium bicarbonate plus 30ml glycerol in 100ml solution.

Uses.—To soften ear wax prior to removal.

Dosage.—Introduce a generous amount of the solution into the affected ear for 3 successive nights. Syringe out with warm water.

Other Drugs.—Aluminium acetate ear drops, a local astringent used to reduce inflammation in otitis externa.

12.2. *The Nose.*—Nasal drops decongesting the mucosa often contain a vasoconstrictor. This aids drainage and gives temporary relief, but the repeated or prolonged use of sympathomimetics may cause a rebound secondary vasodilatation with recurrence of nasal congestion.

Mild cases of nasal allergy can be controlled with oral antihistamines and topica decongestants.

12.2.1. *Combined Antiallergic and Nasal Decongestant*

ANTAZOLINE PLUS NAPHAZOLINE

Dosage forms.—Nasal and drops spray, 0.5 per cent Antazoline plus 0.025 per cent Naphazoline.

Pharmacological properties.—Naphazoline is an alpha-adrenoceptor agonist whose clnical usage has been restricted to nasal decongestion. It has the advantage that its use is not associated with the rebound secondary vasodilation which occurs with adrenaline and some other sympathomimetic agents. Antazoline is an antihistamine.

Uses.—Nasal congestion of allergic origin.

Dosage.—2-3 drops or 1 spray into each nostril, 3-4 times daily.

12.3. *The Throat.*—Infections of the oropharynx such as ulcers and sore throat are best treated by the use of systemic anti-infective drugs. The use of antiseptic lozenges, etc. is of doubtful benefit in therapy. For the useful systemic anti-infective drugs—see appropriate sections of this formulary.

Other drugs used for the throat include the cleansing (oral hygiene) gargles such as Phenol and Glycerol plus Thymol gargles.

13. DENTAL DRUGS

The dental drugs in this section are described under the following headings :

13.1. Local Anaesthetics.

13.2. Mouth washes.

Drugs are used in dentistry to control infection and inflammation in lesions of the mouth, to provide oral toilet and to relieve pain.

Infection is best treated by the use of systemic anti-infective agents. The use of topical antibiotics in the oral cavity in the form of pastes and lozenges is not advised. It predisposes to the development of sensitisation in susceptible individuals and leads to the rapid appearance of resistant strains of oral micro-organisms. Oral antisepsis can be achieved by the use of antiseptic mouth washes and gargles. These also have a mechanical cleansing action and they freshen the mouth. Oral candidiasis (thrush) can be treated with mystatin mouth wash.

Symptomatic relief of pain can be achieved by the use of the antipyretic analgesics, aspirin and paracetamol. Occasionally pain from superficial lesions in the mouth can be alleviated with local anaesthetic lozenges. Local anaesthetic injections are required for dental extraction.

The systemic analgesic and anti-infective drugs, and the local antifungal drugs used in oral disease have been described in appropriate sections of this formulary.

13.1. *Local Anaesthetics*

BENZOCAINE

Dosage form.—Lozenges 10mg.

Uses.—For relieving pain in oral lesions ; to facilitate impression and for the removal of sutures in sensitive patients.

Adverse effects.—Sensitisation with sore, inflamed lips and tongue.

Caution.—Avoid prolonged use.

Dosage.—One thrice daily or as directed.

LIGNOCAINE DENTAL CARTRIDGES

Dosage form.—Dental cartridges, 2 per cent with 1:80,000 adrenaline.

Uses.—Local anaesthesia for Dental use.

Direction for use.—Administer by infiltration.

13.2. *Mouth Washes*

CLYCEROL MOUTH WASH

Dosage form.—Solution. See formulary for composition.

Uses.—Oral hygiene.

Direction for use.—To be used undiluted or diluted with 3 volumes of warm water.

PHENOL MOUTH WASH

Dosage form.—Solution. See formulary for composition.

Uses.—Oral hygiene.

Direction for use.—Use diluted with equal volume of warm water.

THYMOL MOUTH WASH

Dosage form.—Solution-tablet. See formulary for composition.

Uses.—Oral hygiene.

Direction for use.—Dissolve one solution-tablet in half a tumblerful of warm water.

Others.—Isotomic saline mouth wash. For systemic analgesics and anti-infective drugs, and local antifungal drugs used in oral disease—See appropriate sections of this formulary.

14. DRUGS FOR MUSCULOSKELETAL AND JOINT DISEASES

Drugs for musculoskeletal and joint diseases are described under the following headings :

14.1. Non-Steroidal Anti-inflammatory Drugs (NSAIDs).

14.2. Drugs used for the treatment of Gout.

The term musculoskeletal and joint diseases is used in this section to describe a variety of diseases including rheumatoid arthritis, rheumatic joint diseases, osteoarthritis, fibrositis and other types of soft-tissue rheumatism and gout.

The non-steroidal anti-inflammatory drugs relieve pain as well as reduce inflammation and they are the drugs of choice for the conditions listed above, with the exception of gout. Aspirin is the oldest and best known of these agents. Taken at the dose of 2-3 tablets 3-4 hourly, it provides relief in most cases of acute and chronic inflammatory joint disease. The other NSAIDs differ from aspirin in duration of action and tolerability and can therefore be used in patients who have failed to respond to aspirin or cannot tolerate it. This group of NSAIDs is represented in the Essential Drugs List by ibuprofen. Other examples for which there is substantial experience in this country include diflunisal, indomethacin, piroxicam and sulindac. The choice of which NSAID to use will be determined by the prescriber's experience with the drugs, acceptability by the patient, relative cost and availability and considerations of duration of action and frequency of dosage.

In some instances rheumatoid arthritis fails to respond to NSAIDs and other classes of drugs become necessary. These include corticosteroids and the anti-malarial, chloroquine. For the treatment of rheumatoid arthritis, chloroquine is given in doses of 300mg daily and above for many months or years. Such prolonged use of chloroquine carries the risk of increased toxicity, particularly to the eye.

Drugs are used to treat acute attacks of gout and for the long-term control of the disease during remission. Acute attacks of gout : Colchicine can be used as the first-line drug. Failing this, the NSAIDs, indomethacin and piroxicam have been found very useful.

Long-term control : This can be achieved with the xanthine oxidase inhibitor, allopurinol or the uricosuric agent, probenecid.

14.1. *Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)*

ASPIRIN

See section 1.1.3., Non-narcotic analgesics.

IBUPROFEN

Dosage form.—Tablet, 200mg.

Pharmacological properties.—Non-steroidal anti-inflammatory analgestic. Anti-inflammatory properties weak compared with aspirin.

Uses.—In rheumatic disease and other musculoskeletal disorders where the pain and inflammation are mild to moderate. Unsuitable for conditions where inflammation is severe like in acute gout.

Dosage.—200-400mg, 3-4 times daily, maximum 2.4g daily.

14.2. *Drugs Used for Gout.*

COLCHICINE

Dosage form.—Tablet, 0.5mg.

Pharmacological properties.—Selectively relieves the pain and inflammation of acute gout by a mechanism that is still uncertain.

Uses.—Treatment of acute gout.

Adverse effects.—Gastrointestinal disturbances such as anorexia, nausea, vomiting diarrhoea, and abdominal pain.

Dosage.—1mg initially followed by 0.5mg every 2-3 hours until relief of pain occurs or until there is nausea or vomiting. The course should not be repeated within 3 days.

ALLOPURINOL

Dosage form.—Tablet, 100mg.

Pharmacological properties.—A xanthine oxidase inhibitor. It inhibits conversion of xanthine and hypoxanthine to uric acid. Serum uric acid level falls. Urate deposition and excretion are reduced.

Uses.—Gout prophylaxis ; prevention of hyperuricaemia during treatment of leukaemias and polycythaemia.

Contra-indication. : Acute gout.

Adverse effects.—Rashes ; gastrointestinal disorders ; drowsiness.

Dosage.—Initially 100mg daily gradually increasing over a period of 1-3 weeks to a maintenance dose of 200-600mg daily.

15. DRUGS USED IN ALLERGIC DISORDERS

Drugs used in allergic disorders in this section are described under the following headings :

15.1. Anti-histamines.

15.2. Anti-anaphyactics.

15.3. Prophylactic Drugs.

The word allergy means 'altered response'. It signifies that the subject has responded in an unusual way to a substance with which he has come in contact.

All types of allergies respond to treatment. Drugs used in the treatment of allergic reactions such as acute anaphylaxis, serum sickness, hay fever, angioneurotic oedema, urticaria and asthma, fall into three pharmacologic groupings—the sympathomimetics, the anti-histamines and the corticosteroids. In addition, drugs like ketotifen and sodium cromoglycate can be used in the prophylaxis of allergic reactions.

SYMPATHOMIMETICS

Several sympathomimetic drugs are primarily used as vasoconstrictors for local application to the nasal mucous membrane or the eye. With their alpha-receptor actions, they cause marked vasoconstriction and blanching when applied to nasal and pharyngeal mucosal, surfaces. They are therefore useful in the treatment of mucosal congestion accompanying hay fever, allergic rhinitis, acute coryza and sinusitis.

Adrenaline is the drug of choice to relieve the symptoms of acute hypersensitivity reactions to drugs, (e.g. penicillin, aspirin and sulphonamides), and of other acute reactions to sera and other allergens. It readily comes to use in acute anaphylactic shock and for angioneurotic oedema, which may be temporarily very disabling around the face, or fatal if it affects the larynx. A subcutaneous injection of adrenaline, 1 ml of 1 in 1000 solution, rapidly relieves itching, urticaria, and swelling of lips, eyelids, and tongue, and the drug may be life-saving when oedema of the glottis threatens respiration. Large doses cause palpitation but may be necessary in an emergency.

THE ANTIHISTAMINES

Antihistamines are used systematically for the control of hay fever, drug rashes urticaria and angioneuroticoedema, all of which are mediated through release of histamine. However, the limitation of anti-histamines is due to the fact that other potent autocoids (e.g. 5-Hydroxytryptamine) are released in addition to histamine. It follows that the efficacy of antihistamines in countering allergic disorders will vary, depending on the degree to which symptoms are due to histamine release. Thus, since arthralgia and fever of serum sickness are not due to histamine release, they are not relieved by these drugs.

The onset of action of anti-histamines occurs within 30 minutes following an oral administration. The effects last for several hours. Their action is rapid when administered by injection. Topical use, whether on the skin or in the eyes or nose, is liable to cause sensitization.

They all cause some central sedation which may be a desirable side-effect in the treatment of hospitalised patients or patients about to retire for the night. This effect is however undesirable for ambulant patients as the slowing of reflex activity may cause accidents.

PROPHYLACTIC DRUGS

Ketotifen and sodium cromoglycate appear to act by preventing the release of pharmacological mediators of allergy and can therefore be useful in the prevention of allergic reactions.

15.1 *Anti-Histamines*

CHLORPHENIRAMINE

Dosage forms.—Injection, 10mg (Maleate) in 1 ml ampoule.
Tablet, 4mg (Maleate). Syrup, 2 mg per 5 ml.

Pharmacological properties.—An histamine H 1-receptor antagonist. Shorter acting and less sedative than promethazine. Has no antiemetic effect.

Uses.—Symptomatic relief of allergy. With adrenaline in the emergency treatment of anaphylaxis and angioneurotic oedema.

Adverse effects.—Sedation ; dryness of mouth and other anticholinergic effects ; gastrointestinal irritation.

Drug interaction.—Potentiates effects of central nervous system depressants including alcohol.

Dosage.—Adults : oral, 4mg, 3-4 times daily.
Parenteral, 10-20mg intramuscularly or in emergency by slow intravenous injection after dilution in the syringe with 10 ml of blood.

Children.—oral, up to 1 year, 1 mg twice daily ; 1-5 years, 1-2mg 3 times daily ; 6-12 years, 2-4 mg 3-4 times daily.
Intravenous injection : 0.2mg/kg diluted and given slowly.

PROMETHAZINE

Dosage forms.—Injection, 25 mg and 50 mg (Hydrochloride).
In 1 and 2 ml ampoules respectively.
Tablets, 10 mg and 25 mg (Hydrochloride).
Syrup, 5 mg per 5 ml (Hydrochloride).

Pharmacological properties.—This is a phenothiazine derivative that blocks histamine H1—receptors. It also has pronounced anti-cholinergic activity, it is markedly sedative and has a long duration of action—about 12 hours. Has a marked antiemetic effect.

Uses.—(1) As an anti-histamine, it is used in the relief of allergic reactions and as an adjunct to adrenaline in the treatment of anaphylaxis and severe angioneurotic oedema.

(2) As an anticholinergic and particularly as an artiemetic and antisialagogue in : (*i*) motion sickness and Meniere's disease, (*ii*) disorders characterised by vomiting including uraemia, malaria, drug-induced vomiting and (*iii*) premedication prior to anaesthesia and obstetrics procedures.

(3) As a sedative or hypnotic especially in children.

Caution.—Although there is at present no evidence that promethazine is embryopathic or teratogenic, it should be used during pregnancy only when it is considered unavoidable. Sufficient is excreted in the maternal breast milk to cause sedation in the breast-fed infant.

Adverse effects.—Sedation ; dry mouth ; gastrointestinal irritation ; allergic effects if used topically.

Drug interaction.—Potentiates the effect of other central nervous system depressants including alcohol.

Dosage.—Adults : Oral, 20-50mg daily in divided doses, or as a single dose at night.
Parenteral, 25-50mg intramuscularly or in emergency by slow intravenous injection after 10—fold dilution with water for injection.
Children : Daily Oral dose, as single or divided doses :
6 months—1 year, 5-10mg.
1-5 years, 5-15mg.
6-10 years, 10-25mg.
Half the oral dose may be administered parenterally, when necessary, in children aged 6-10 years.

Others.—Other commonly used anti-histamines are mepyramine and diphenhydramine.

15.2. *Anti-Anaphylactics.*

ADRENALINE

Dosage form.—Injection, 1mg (Bitartrate) in 1ml ampoule.

Pharmacological properties.—A naturally occurring catecholamine secreted by the adrenal medulla. It is inactive by mouth. Has a short duration of action when given parenterally. Its effects are similar to those of sympathetic stimulation.

Uses.—Emergency treatment of :

(*i*) anaphylactic shock induced by drugs and other allergens.

(*ii*) airways obstruction due to asthma and other causes. Selective beta 2-adrenoceptor stimulants are now preferred for this purpose.

(*iii*) cardiac arrest, following failure of physical measures and in the absence of a defibrillator.

(*iv*) prolongation of the action of infiltrated local anaesthetics.

Contraindication.—It should not be used for ring block in local anaesthesia because of the intense vasoconstriction it produces.

Adverse effects.—Anxiety, tremor, anginal pain, tachycardia, palpitations and cardiac arrhythmias.

Dosage.—Anaphylactic shock.

1 mg i.m. immediately or, in extreme urgency, 0.5mg diluted 10-fold with normal saline by slow i.v. injection.

The intramuscular dose may be repeated after 3 minutes according to the clinical condition.

Adrenaline, by raising blood pressure and reversing bronchospasm, acts as a physiological antagonist to histamine. Provided the peripheral circulation is adequate the therapeutic effect should become evident within one minute of injection.

Chlorpheniramine 10mg i.v. or other H1—receptor blocking agent, will reduce the response to further histamine release.

Hydrocortisone 100mg i.m. or i.v. may suppress the immune reaction and reduce vascular permeability.

These three drugs should be assembled as kit for immediate use wherever drugs or sera are routinely administered.

Bronchospasm.—Initially 0.1-0.5mg subcutaneously or intramuscularly subsequent injections may be given subcutaneously at 15 to 20 minute intervals as required.

Cardiac arrest and heart block with syncopal seizures (Stokes-Adams attacks)—Intracardiac injection of adrenaline may be justified *in extremis* in the absence of an electrical pacemaker or defibrillator.

Full restoration of circulation may necessitate slow intravenous infusion of adrenaline as in anaphylactic shock. However, repeated subcutaneous injection is generally preferable because of the high risk of ventricular fibrillation.

Drug treatment serves only as a temporary expedient pending availability of an electrical pacemaker.

Adequate artificial ventilation is essential.

Prolongation of infiltration anaesthesia.—The addition of adrenaline 1 : 100,000 to local anaesthetic solutions slows systemic absorption and prolongs the anaest hetic effect.

15.3. *Prophylactic Drug*

KETOTIFEN

See section 6.1.4.

16. ANTIDOTES

Antidotes in this section are described under the following headings :

16.1. Non-specific (General) Antidotes.

16.2. Specific Antidotes.

The problems of poisoning by drugs and chemicals have been described in details in Chapter 2, the Emergency Treatment of Poisoning.

This section deals with a selected number of antidotes useful in specific cases of poisoning. Antidotes fall under two categories—general and specific. A general antidote is applicable for a wide variety of poisons. The action is of a general nature like preventing absorption of the poison from the gut, e.g. activated charcoal or promoting its elimination, e.g. sodium bicarbonate for acidic poisons and ammonium chloride for basic poisons.

The specific antidotes either antagonise the poisoning agent at the receptor, for example naloxone against morphine, or are chemical antagonists, like protamine sulphate against heparin.

16.1. *Non-Specific (General) Antidote*

ACTIVATED CHARCOAL

Dosage form. —Powder 50g

Pharmacological properties.—Prevents or reduces the absorption of poisons from the gut by absorbing them.

Uses.—Treatment of ingested poisons.

Dosage.—By mouth, 5-50g as a thick suspension in water.

16.2. *Specific Antidotes*

ATROPINE

Dosage form.—Injection, 1mg (Sulphate) in 1ml ampoule.

Pharmacological properties.—Anti-cholinergic drug. Competitively antagonises acetylcholine at muscarinic receptor sites.

Uses.—(1) In anaesthetic premedication, to inhibit bronchial secretion and prevent the excessive bradycardia and hypotension caused by some of the drugs used during anaesthesia.

(2) To antagonise the muscarinic effects of over-dosage with cholinergic drugs and anti-cholinesterases.

(3) For control of muscarinic side effects of neostigmine used in reversing competitive neuromuscular block.

Adverse effects.—Any unwanted antimuscarinic effect.

Dosage.—(1) For premedication : intravenously, 0.3-0 6mg just before induction : intramuscularly, 0.3-0 6mg 30-60 minutes before induction.

(2) For cholinergic drug over-dosage : 2mg i.m. or i.v. every 20-30 minutes until signs of atropine excess appear. Pralidoxime, a specific cholinesterase regenerator in organophosphorus anti-cholinesterase poisoning is only useful if given within 24 hours of the poisoning.

(3) For preventing muscarinic effects of neostigmine used to reverse competitive neuromuscular block in anaesthesia : 0.6-1.2mg intravenously.

DESFERRIOXAMINE

Dosage form.—Injection, 500mg (mesylate) powder in vial.

Pharmacological properties.—A water soluble specific iron chelating agent. It is not absorbed from the intestine and blocks the absorption of iron. In the blood, it removes iron from ferritin and transferrin but not from haemoglobin.

Uses.—Iron poisoning.

Dose.—Orally, 5-10g in 50-100ml of liquid after gastric lavage. I.M. injection, 2g in 8-12ml of water for injection every 3-12 hours.

I.V. infusion, up to 15mg/kg/hour up to a maximum of 80mg/kg in 24 hours.

Adverse effects.—Pain at site of i.m. injection : anaphylactic reactions and hypotension when infused too rapidly.

Precaution.—give i.v. infusion very slowly.

DIMERCAPROL

Dosage form.—Injection, 50mg/ml in 2ml ampoule.

Pharmacological properties.—It is a dithiol compound which combines with metals to form complexes which are not toxic to the body.

Uses.—Poisoning by antimony, arsenic, bismuth, gold and mercury.

Adverse effects.—In high doses, it can combine with metal-containing enzymes and inhibit them. Other adverse effects include, pain at site of injection, weakness, nausea, salivation, hypertension.

Dose.—By i.m. injection, 2-3mg/kg, every 4 hours for 2 days, then 1-4 times daily until recovery.

NALOXONE

Dosage form.—Injection, 0.4mg (Hydrochloride) in 1 ml ampoule.

Pharmacological properties.—Narcotic antagonist. Competitively antagonises morphine and other opiates and narcotic analgesics. Respiratory depressant effects of these drugs are antagonised before the analgesic effect. It has a short duration of action.

Uses.—Over-dosage with morphine-like compounds.

Adverse effects.—Will precipitate withdrawal syndrome in morphine addicts.

Dosage.—0.4-2mg repeated every 2-3 minutes to a maximum of 10mg subcutaneously, ntramuscularly or intravenously.

PROTAMINE SULPHATE

Dosage form.—Injection, 10mg/ml in 5ml ampoule.

Pharmacological properties.—Combines chemically with heparin milligram for milligram to block its anticoagulant effect.

Use.—Over-dosage with heparin.

Adverse effects.—Can itself cause anticoagulant effect if given in excess.

Dosage.—By slow intravenous injection. 1mg protamine sulphate for every 100 units of heparin. Less protamine is required if a longer time has elapsed after heparin over-dosage. Maximum dose 50 mg.

VITAMIN K1 (PHYTOMENADIONE)

Dosage form.—Injection 10mg/ml in 1ml ampoule.

Pharmacological properties.—Vitamin K is necessary for the production of prothrombin by the liver. Its deficiency leads to haemorrhage. Liver disease causes impaired synthesis of prothrombin and oral anticoagulants also cause hypoprothrombinaemia by interferring with vitamin K metabolism. Vitamin K1 is a fat-soluble preparation of vitamin K.

Uses.—Hypoprothrombinaemia with or without haemorrhage caused by over-dosage with oral anti-coagulants or by liver disease.

Dosage.—Slow intravenous injection, 2.5-20mg.
Oral.—10-20mg.

Others.—Other commonly used antidotes are :

Disodium calcium edetate for poisoning by heavy metals, particularly lead ;

Penicillamine for copper poisoning, and Pralidoxime for organophosphorus poisoning.

17. DRUG USED FOR CANCER CHEMOTHERAPY

Drugs used for cancer chemotherapy, also called the anti-neoplastic and immunosuppressive drugs are described in this section under the following headings.

17.1. Alkylating Agents.
17.2. Anti-metabolites.
17.3. Cytotoxic Antibiotics.
17.4. Vinca Alkaloids.
17.5. Hormones and synthetic Substitutes.

Treatment of cancer requires the judicious use of surgery, radiotherapy, cytotoxic and endocrine drugs, analgesics, antibiotics and blood products. A few tumour types can be managed in secondary institutions but most can be satisfactorily managed only in specialised institutions where the above modalities of treatment are available as well as laboratory facilities to monitor the biological effects of the treatment.

Only in exceptional cases is chemotherapy alone curative for cancer. More often drugs are used in combination with surgery or radiation therapy.

Anti-cancer drugs are mostly toxic drugs. Many cause unpleasant side effects such as nausea, vomiting, diarrhoea, alopecia and myelosuppression which may cause fatal infections or haemorrhage. Many of the drugs are also expensive.

The principles of cancer chemotherapy can be summarised as follows—

(*i*) For most drug-sensitive tumours, a combination of drugs, each used at an optimal dose, is likely to be more effective than sequential single drug therapy.

(*ii*) The first therapy employed is often the most important in determining patient survival.

(*iii*) Treatment should not be delayed nor should a suboptimal treatment programme be given as a trial, if the tumour is potentially curable.

(*iv*) The use of toxic multi-drug combinations for an incurable cancer in the doubtful hope of palliation is probably inappropriate.

From the point of view of chemotherapy, cancers can be divided into the following groups:

Group 1.—Tumours for which there is evidence that the use of one drug of a combination of drugs, alone or in conjunction with other therapeutic modalities, will result in cure or a significant prolongation in the survival of some patients with this tumour :

Acute lymphoblastic leukaemia.
Acute non-lymphoblastic or myelogeneous leukaemia.
Hodgkin's Disease.
Burkitt's lymphoma.
Gestational/trophoblastic cancers.
Germ cell cancers of the testis and ovary.
Wilm's tumour.
Ewing's sarcoma.
Paediatric soft tissue sarcomas.
Lung cancer—small cell type.
Kaposi's sarcoma.

Group 2.—Tumours for which there is controversial evidence that treatment may prolong life.

Breast cancer early stages with only histological node involvement in premenopausal women.

Group 3.—Tumours in which drugs will cause tumour shrinkage and improvement in quality of life. Whether prolongation of life occurs is uncertain.

Chronic lymphocytic leukaemia.
Chronic myelogeneous leukaemia.
Multiple myeloma.
Ovarian carcinoma.
Endometrial carcinoma.
Prostate cancer.
Neuroblastoma.

Group 4.—Tumours for which there is evidence that tumour shrinkage may occur but it is not clear whether clinical benefit outweighs drug toxicity.

Gastric cancer.
Head and neck cancers.
Primary cancers of the central nervous system.
Osteosarcoma; Adrenal cell aancer; Hepatoma.

Group 5.—Tumours for which there are no effective drugs :

Lung epidermoid, adenocarcinoma, and large cell type—
Oesophageal carcinoma.
Colorectal carcinoma.
Pancreatic carcinoma (non-endocrine).
Cervical carcinoma.
Penile carcinoma.
Bladder carcinoma.
Nephroblastoma.
Melanoma.

The drugs described here are not inclusive of all those agents which might be effective in every case. However, practically all curable tumours and all those in which the cost/benefit ratio clearly favours drug treatment can be managed appropriately using them. It should also be noted that information given here is not meant to substitute for formal training and experience in cancer man-

In the classified information on the individual drugs that follows, tumours for which a drug is useful are divided into 2 categories.

Category 1.—Tumours for which there is evidence that the drug, alone or in combination with other drugs :

(*i*) effects a cure, or

(*ii*) prolongs survival of the patient.

Category 2.—Tumours for which there is evidence that the drug, alone or in combination with other drugs :

(*i*) causes shrinkage and improves quality of life.

(*ii*) may marginally prolong survival of patient.

17.1. *Alkylating Agents*

BUSULPHAN

Dosage form.—Tablets, 2mg.

Pharmacological properties.—An alkylating agent with selective depressant action on bone marrow. Readily absorbed from the gut.

Uses.—Category 1 : None.

Category 2 : Induction and maintenance of remission in chronic myelogeneous leukaemia and other myeloproliferative conditions like polycythaemia vera and myelofibrosis with myeloid hyperplasia.

Adverse effects.—*See* above. Also, hyperuricaemia, hyperpigmentation, diffuse pulmonary fibrosis cataracts.

Dosage.—For induction of remission, 2-4mg daily. May be raised cautiously to 6mg daily.

Maintenance dose of 0.5-2mg daily may be given to maintain a white cell count of 10-15,000mm.

Precautions—During induction of remission :

(*i*) Full blood counts should be done weekly.

(*ii*) Treatment should be suspended if white cell count falls below 20-25,0003mm^3 or platelets below 100,000mm^3.

At least 4 weeks should elapse between a previous course of cytotoxic therapy or irradiation and the use of busulphan.

CHLORAMBUCIL

Dosage form.—Tablets, 2mg, 5mg.

Pharmacological properties.—Alkylating agent. Action similar to, but slower than, cyclophosphamide. Frequently used for its immunosuppressive effects in non-malignant conditions.

Uses.—Category 1 : Breast cancer, testicular cancer, Hodgkin's disease, non-Hodgkin's lymphomas, Burkitt's lymphoma.

Category 2 : Ovarian carcinoma, chronic lymphocytic leukaemia.

Adverse effects.—*See* general remarks above.

Precautions.—*See* busulphan

Dosage.—5-10mg daily for 3-6 weeks, for induction of remission.

CYCLOPHOSPHAMIDE

Dosage forms.—Injection, powder in 100mg and 500mg vials.
Tablets, 25mg and 50mg.

Pharmacological properties.—Alkylating agent : requires metabolic conversion of active substance in the body ; action is similar to, but more intense than, that of chlorambucil. Readily absorbed from the gut.

Uses.—Category 1 : To induce and maintain remission in : Hodgkin's disease, non-Hodgkin's lymphomas, Burkitt's lymphoma, Lung cancer, small cell type, Breast cancer, Ewing's sarcoma, Paediatric soft tissue sarcomas. Category 2 : Ovarian carcinoma, neuroblastoma, chronic lymphocytic leukaemia, chronic myelogeneous leukaemia, multiple myeloma, acute lymphoblastic leukaemia.

Adverse effects.—Haemorrhagic cystitis : See general notes above.

Precautions.—Adequate fluid intake is important : 3-4 litres/day.

Dosage.—Can be given orally, intramuscularly, intravenously, intrapleurally, intraperitioneally. Intravenous doses are usually administered over a period of 2-3 minutes into the tubing of a free-flowing infusion of sodium chloride or dextrose. Dose is determined by the nature of the tumour being treated.

17.2. *Anti-Mertabolities*

6—MERCAPTOPURINE

Dosage form.—Tablet, 50mg

Pharmacological properties.—Analogue of the naturally occurring purine bases, hypoxanthine and guanine. Acts as an anti-metabolite. It is both cytotoxic and immunosuppressive.

Uses.—Category 1 : Acute lymphoblastic leukaemia

Category 2 : Acute non-lymphoblastic leukaemia
Acute myelogeneous leukaemia.

Also : As an immuno-suppressant,

(*i*) to prevent transplant rejection

(*ii*) to treat a variety autoimmune and collagen disease inadequately responsive to corticosteroids alone or when steroids are contraindicated.

Adverse effects.—*See* general notes aboves ; hyperuricaemia.

Drugs interaction.—Allopurinol inhibits conversion of 6—mercaptopurine to 6-thiouric acid, thus enhances its toxicity.

Dosage.—Oral, initially 2.5mg/kg daily.

METHOTREXATE

Dosage forms.—Injection, power in 50mg vial.
Tablet, 2.5mg.

Pharmacological properties—Folic acid analogue ; competitively inhibits dihydrofolate reductase.

Uses.—Category 1 : Acute lymphoblastic leukaemia, Burkitt's lymphoma, breast cancer, gestational/trophoblastic cancers.

Category 2 : Head and neck cancers.

Adverse effects.—*See* general notes above.

Precaution.—Reduce dose if renal insufficiency is present.

Dosage.—Can be given orally, intramuscularly, intravenously and intrathecally : 10-25mg weekly. *See* manufacturer's literature.

17.3. *Cytotoxic Antibiotics*

BLEOMYCIN

Dosage form.—Injection, powder in 15mg vial (as Sulphate)

Pharmacological properties. —Antibiotic, selectively toxic to the lungs and skin.

Uses.—Category 1 : Hodgkin's disease, non-Hodgkin's lymphoma germ-cell cancers of the testis and ovary.

Category 2 : Kaposi's sarcoma.

Adverse effects.—*See* general notes above ; also, pulmonary toxicity, acute anaphylaxis, rash, fever.

Precautions.—Test dose is advisable to prevent anaphylaxis.

Contraindications—Acute chest infection ; grossly impaired lung functions.

Dosage.—Can be given subcutaneously, intramuscularly or intravenously.
Standard dose when used alone is 0.25—0.5mg/kg
(10—20mg/m) weekly or twice weekly up to a maximum of 300mg.

DACTINOMYCIN (ACTINOMYCIN D)

Dosage.—Injection, powder in 0.5mg vial.

Pharmacological properties.—Cytotoxic antibiotic.

Uses.—Category 1 : Gestation/trophblastic cancers, germ-cell cancers of the testis, Kaposis sarcoma, Wilm's tumour, Ewing's sarcoma, paediatric soft tissue sarcomas.
Category 2 : Neuroblastoma

Adverse effects.—Local extravasation necrosis.

Dosage.—Given intravenously ; dose determined by diagnosis and response 0.5mg daily for maximum of 5 days.
Dosage interval, 2-4 weeks. *See* manufacturer's literature.

DOXORUBICIN (ADRIAMYCIN)

Dosage form.—Injection, powder in 10mg and 50mg vials (as hydrochloride).

Pharmacological properties.—Cytotoxic antibiotic.

Uses.—Category 1 : Acute non-lymphoblastic leukaemia, acute myelogeneous leukaemia, Hodgkin's disease, non-Hodgkin's lymphomas, lung cancer-small cell type, breast cancer, Ewing's sarcoma, paediatric soft tissue sarcomas. Category 2 : Gastric cancer ovarian cancer, multiple myeloma, germ cell cancer of the testis, osteosarcoma, neuroblash toma, hapatoma.

Adverse effects.—Local extravasation necrosis, caadiomyopathy, hyperpigmentation, red discoloration of urine.

Precautions.—Cumulative dose of 500mg/m^2 should not be exceeded. Dose should be reduced in patients with moderate liver or cardiac disease.

Dosage.—Given intravenously. Best administered through the tubing of a free-flowing intravenous infusion of sodium chloride or dextrose. Initial dosage, when used alone : 1.2-2. 4mg/kg (37.5-75mg/m^2) 3 times weekly. It should not be added to an alkaline infusion fluid. It should not be mixed with other drug.

Drug interaction.—Will precipitate in intravenous lines if administered with heparin.

17.4. *Vinca Alkaloids*

VINCRISTINE

Dosage form.—Injection, powder in 1mg and 5mg vial (as Sulphate).

Pharmacological properties.—Cytotoxic alkaloid of *Vinca rosea*

Uses.—Category 1 : Vincristine given with prednisolone is the treatment of choice for the induction of remission in acute lymphoblastic leukaemia of childhood. Other Category 1 tumours are : Hodgkin's disease, non-Hodgkin's lymphomas, Burkitt's lymphoma, long cancer-small cell type, germ cell tumours of the testis and ovary, Kaposi's sarcoma, paediatric soft tissue sarcomas.

Adverse effects.—Neuropathy, extravasation necrosis, severe constipation, depression

Dosage.—Given intravenously. Best given through the tubing of a freely running intravenous infusion of sodium chloride or dextrose. Dosage determined individually by response and toxicity : At weekly intervals, 0.05mg/kg (Or 2mg/m^2) weekly.

17.5. *Hormones and Synthetic Substitutes*

PREDNISOLONE

Dosage form.—Tablet, 5mg

Pharmacological properties.—Corticosteroid : Can be replaced by other members of the group such as, prednisone, dexamethasone, betamethasone and hydrocortisone.

Uses.—Category : 1 Acute lymphoblastic leukaemia, Hodgkin's disease, non-Hodgkin's lymphomas. Category 2 : Chronic lymphocytic leukaemia, breast cancer multiple myeloma.

Adverse effects.—Metabolic. *see* also section 8.1.

Precautions.—Should be used with caution when infection is present or suspected *see* also section 8.

Contraindications.—Peptic ulcer, diabetes mellitus.

Dosage.—Prednisolone is given orally. Intramuscular or intravenous dosage forms are available for hydrocortisone if the routes are desired. Initial dosage, usually 40-60mg prednisolone orally. This is gradually reduced to the lowest dose compatible with control of the tumour.

STILBOESTROL

Dosage form.—Tablets, 1mg and 5mg.

Pharmacological properties.—non-steroidal synthetic compound with oestrogenic actions. Can be substituted with other oestrogenic compounds, particularly ethinyloestradiol. Well absorbed from the gut.

Uses.—Category 1 : None.
Category 2 Postmenopausal breast cancer ; prostate cancer.

Adverse effects.—Nausea, fluid retention, venous and arterial thrombosis ; gynaecomastia and impotence in the male ; withdrawal bleeding in the female ; hypercalcaemia and a transient increase in bone pain may be seen in some breast cancer patients with bone metastases.

Precaution.—Not effective in premenopausal women.

Contraindications.—Severe vascular disease.

Dosage.—For breast cancer : 10-20mg daily. For prostate cancer : 1-3mg daily.

TAMOXIPHEN

Dosage form.—Tablets, 10mg and 20mg (as citrate).

Pharmacological properties.—Synthetic oestrogen receptor antagonist. Now preferred to oestrogens as the drug of choice for postmenopausal metastatic breast cancer.

Uses.—Category 1 : None.
Category 2 : Breast cancer.

Adverse effects.—Postmenopausal bleeding, hypercalcaemia, transient increase in bone pain in patients with bone metastases.

Dosage.—Initially, 10mg twice daily.

18. IMMUNOLOGICAL PRODUCTS

18.1. Sera and Immunoglobulins.

18.2. Vaccines.

There are three types of immunological products :

1. Immunoglobulins which are antibodies of human origin.
2. Sera (or antisera), are antibodies prepared in animals.

Vaccines are antigens given to induce specific antibodies against a particular disease.

Vaccines may be (1) live attenuated forms of an infective agent e.g. poliomyelitis and measles vaccines and BCG ;

(2) inactivated preparations of the infective agents as in pertussis and cholera vaccines or,

(3) extracts of, or endotoxins produced by, a micro-organism as in tetanus vaccine.

The immunity induced by attenuated vaccines appears more quickly and is more long lasting than immunity induced by inactivated vaccines. With the exception of live attenuated poliomyelitis vaccine which is given by mouth, vaccines are given by injection.

Adverse reactions to vaccines are variable and depend on the type of vaccine. Tolerability can be improved if certain precaution are taken when using vaccines.

Vaccination should be avoided in febrile subjects or if an active infection is known or suspected to be present. Live attenuated virus vaccines should not be given to pregnant women or to subjects with impaired immune responsiveness.

Immunoglobulins and *sera,* being antibodies, provide immediate passive immunity against an infection. Because of the risk of serum sickness after administration of sera, immunoglobulins are now used, as much as possible, for passive immunity.

The condition of storage is very important for immunological products. These are usually specified for each product by the manufacturer. As a general rule these products need to be refrigerated but not frozen, storage. Temperatures being usually in the range of 2-8° C.

18.1. *Sera and Immunoglobulins*

Anti-Dimmunoglobulin (human).

Anti-rabies hyperimmune serum.

Snake venom antiserum.

Tetanus antitoxin (Anti-Tetanus Serum).

ANTI-D IMMUNOGLOBULIN (HUMAN)

Dosage form.—Injection.

Effects.—Combines with the D (Rhesus) antigen on Rhesus-positive red blood cell.

Uses.—Given to a Rhesus-negative mother to prevent formation of anti-bodies to foetal rhesus-positive red cells which may pass into the maternal circulation during childbirth or abortion. Any further child is thus protected against the risk of intravascular haemolysis.

Precaution.—To be effective, it must be given within 72 hours of the birth or abortion.

Dosage.—250-500 units by intramuscular injection.

ANTI-RABIES HYPERIMMUNE SERUM

Dosage form.—Injection, 1000 units in 5ml ampoules. It is a purified concentrate prepared from the serum of actively immunised animals, usually horses.

Uses.—Post-exposure prophylaxis of rabies.

Adverse reaction.—Serum sickness.

Dosage.—Not less than 40 units per kg all at once partly by local infiltration into the areas of the bite and the remainder by intramuscular injection.

TETANUS ANTITOXIN

Dosage form.—Injection, 1000 u and 3000 u/ml.

Uses.—Post-exposure prophylaxis and treatment of tetanus.

Adverse reaction.—Hypersensitivity reactions.

Dosage.—Prophylaxis—1500 units after test dose. Treatment : 20,000 units intravenously or intramuscularly after test dose.

SNAKE VENOM ANTISERUM (POLYVALENT)

Dosage form.—Freeze-dried venom-neutralising globulins obtained from the serum of healthy horses immunized against venoms of different species of pit vipers.

Uses.—Treatment of snake bite.

Adverse effects.—Hypersensitivity reactions.

Dosage.—100 ml of reconstituted anti-venom intravenously after test dose.

18.2. *Vaccines*

18.2.1. *Vaccines for Universal Immunisation*

BCG vaccine (dried)

Diphtheria-Pertussis-Tetanus vaccine

Measles vaccine

Poliomyelitis (Live attenuated) vaccine

Tetanus vaccine

BCG VACCINE (DRIED)

Dosage form.—Dried vaccine, reconstituted just before use into a solution for intrader mal or percutaneous injection.

Pharmacological properties.—Freeze-dried preparation of live attenuated bacilli of the Calmette-Guerin strain.

Uses.—Active immunisation against tuberculosis.

Dose.—0.1 ml. (adults), 0.05 ml (neonates), The first dose to be given at 6 weeks of life.

DIPHTHERIA, PERTUSSIS AND TETANUS VACCINE

Dosage form.—Injection, 0.5 ml ampoule, 5 ml vial. Prepared from Diphtheria formol toxoid, Tetanus formol toxoid and pertussis vaccine.

Uses.—For primary immunisation of children against whooping cough, diphtheria and tetanus.

Dosage.—0.5 ml by intramuscular or deep subcutaneous injection. Three doses are required at intervals of not less than 4 weeks. The first dose to be given at 6 weeks of life.

MEASLES VACCINE

Dosage form.—Injection, 0.5 ml vial.

Properties.—Freeze-dried, stabilised aqueous suspension of live-attenuated measles virus strain.

Uses.—Active immunisation against measles.

Adverse effects.—Mild measles—like syndrome and neurological complications can occur.

Dosage.—0.5 ml by subcutaneous or intramuscular injection. The first dose to be given at 9 months of life.

POLIOMYELITIS VACCINE (LIVE ATTENUATED)

Dosage form.—Oral, suspension of suitable live attenuated strains of poliomyelitis virus, types 1, 2 and 3. Single does and ten-dose containers.

Uses.—Active immunisation against poliomyelitis.

Dosage.—3 drops. For primary immunisation, three doses are required at intervals of not less than 4 weeks. The first dose to be given at 6 weeks of life.

TETANUS VACCINE

Dosage form.—Injection, tetanus formol toxoid, 0.5 ml ampoule or 5 ml vial. Also available combined with diphtheria vaccine or with diphtheria and pertussis vaccines.

Uses.—Active immunisation against tetanus.

Dosage.—0.5 ml by intramuscular or deep suboutaneous injection. The initial injection should be followed by a booster dose at 6-12 weeks and a second booster dose at 4-12 months.

18.2.2. *Vaccines For Specific Indications*

Cholera vaccine
Meningococcal vaccine
Rabies vaccine
Yellow fever vaccine.

CHOLERA VACCINE

Dosage form.—Injection, contains 2 or more killed serotypes of *Vibrio cholera*, 1.0, 1.5 ml ampoules; 10, 50 ml vials.

Uses.—Protection against cholera.

Dosage.—0.5 ml by intramuscular or deep subcutaneous injection. Repeated every six months for those living in or travelling to endemic areas.

RABIES VACCINE

Dosage form.—Injection, inactivated suspension of suitable strains of rabies virus grown in cell cultures, 1.0 ml vial.

Uses.—Pre-and post-exposure prophylaxis of rabies.

Adverse effects.—Common; particularly allergic manifestations.

Dosage.—1.0 ml subcutaneously daily for about 14 days.

YELLOW FEVER VACCINE

Dosage form.—Injection, consists of live attenuated yellow fever virus (17D strain) grown in developing chick embryos. The vaccine is made up from the dried state with saline and must be used within 30 minutes.

Uses.—Active immunisation against yellow fever.

Adverse effects.—In children, encephalitis may occur.

Contraindications.—Children under 9 months, pregnant women, patients sensitive to eggs, patients with impaired immune responsiveness.

Dosage.—0.5 ml by subcutaneous injection. Immunity appears 10 days after primary vaccination and lasts for at least 10 years. Revaccination at 10 yearly intervals.

19. DIGNOSTIC AGENTS

These are described under the following headings :

19.1 Diabetes mellitus
Glucose oxidase reagent .. .. Clinistix (R)

19.2 Gastric function .. .. Dextrostix (R)
Histamine
Pentagastrin

19.3 Myasthenia Gravis
Edrophonium

19.4 Opthalmology
Fluorescein

19.5 Radiocontrast Agents

19.5.1 Alimentary tract
Barium sulphate

19.5.2 Oral Cholecystography
Iopanic acid .. .. Telepaque (R)

19.5.3 Intravenous Cholecystography and cholangiograph
Meglumine Iodipamide .. .. Biligrafin (R)

19.5.4 Urography
Meglumine diatrizoate .. .. Urografin (R)
Sodium diatrizoate .. .. Hypaque (R)

19.5.5 Angiography
Meglumine iothalamate .. .. Conray (R)
Sodium iothalamate .. .. Angio-Conray (R)

19.5.6 Myelography
Iophendylate .. .. Myodil (R)

19.1. *Diabetes Mellitus*

GLUCOSE OXIDASE REAGENT

Dosage form.—Impregnated, coloured, cellulose strip. (Clinistix (R), Dextrostix (R).

Properties.—The strips contain glucose oxidase, orthotolidine and a peroxidase.

Uses.—To detect sugar (glucose) in urine. In the presence of glucose, the red colour of the strip changes to a light, medium or dark purple colour, with increasing concentrations of glucose from less than 0.25 *per cent* to over 0.5 *per cent*.

Precaution.—The test is essentially qualitative not quantitative. It does not reliably detect urine sugar concentrations in excess of 0.5 *per cent*.

(R)=Brand Name

False negative may occur :

(*i*) when large amounts of ascorbic acid are present in the urine.

(*ii*) following parental administration of antibiotics which use ascorbic acid as a preservative (e.g. oxytetracycline, tetracycline).

Method of use.—Dip strip briefly into urine sample.

19.2. *Gastric function*

HISTAMINE

Dosage form.—Injection, solution containing 2.75 mg (phosphate) per millilitre in 1m ampoule.

Pharmacological properties.—Histamine possesses a wide variety of effects on tissues all over the body. It has two types of receptors H1 and H2. Its stimulant action on gastric acid secretion is mediated via H2—receptors.

Uses.—Diagnostic test for gastric acid secretion :

1. In pernicious anaemia, atrophic gastritis, gastric cancer.
2. In Duodenal ulcer, post-operative stomal ulcer, Zollinger-Ellison syndrome.
3. After vagotomy or gastric resection.

Adverse effects.—Headache, tachycardia, nervousness, flushing, bronchospasm and a variety of other pharmacological effects of histamine.

Precaution.—Care should be taken in patients with history of asthma or allergy, and in elderly patients.

Dosage.—0. 3-0.5 mg base subcutaneously (1mg base is equivalent to 2.75 mg phosphate) following the administration of a large dose of an antihistamine.

PENTAGASTRIN

Dosage form.—Injection, 0.25 mg per ml in 2 ml ampoules.

Pharmacological properties.—Synthetic analogue of the natural polypeptide hormone, gastrin. Produces the same effects as the natural hormone. In particular, it stimulates the secretion of gastric acid.

Uses.—To evaluate gastric secretion (*see* histamine above).

Adverse effects.—Fewer and milder than those produced by histamine. They include abdominal cramps, nausea, vomiting, palpitation.

Precaution.—Should be used with care in patients with pancreatic, hepatic or biliary tract disease High doses can inhibit gastric acid secretion.

Contraindication.—Known hypersensitivity to the drug. Patients with acute, penetrating or bleeding peptic ulcers.

Dosage.—0.006 mg/kg subcutaneously.

19.3. *Mysthenia Gravis Edrophonium* (Tensilon (R)

Dosage form.—Injection, 10mg (chloride) in 1 ml ampoule.

Pharmacological properties.—Synthetic, short-acting, reversible anticholinesterase. After intravenous injection action starts within 30-60 seconds and lasts about 5 minutes.

Uses.—Diagnosis of myasthenia gravis.

To distinguish between myasthenic crisis and cholinergic crisis.

Adverse effects.—Some patients may experience cholinergic reactions.

Dosage.—10mg by intravenous injection over 1 minute.

Overdosage.—Treat with atropine.

19.4. *Ophthalmology*

FLUORESCEIN

Dosage form.—Eye drops, 2 per cent (sodium salt).
Paper strips impregnated with the dye.

Pharmacological properties.—Fluorescein is a dye applied to the eye. Paper strips impregnated with the dye are safer than the 2 per cent solution because of the transfer of infection related to the use of the latter. Ulcers of the cornea stain green, whereas the normal cornea does not retain the dye. The dye is washed out after the examination of the eye.

Uses.—Diagnosis of corneal lesions.
Detection of foreign bodies embedded in the cornea.
Dosage.—Apply to the eye.

19.5. *Radiocontrast Agents*

The radiocontrast agents are used as aids in the disgnosis of diseases involving the gastrointestinal, biliary, urogenital, cardiovascular, neurological and respiratory systems. In this section the radiocontrast agents are discussed in groups. Because this is an area in which it is customary not to use the generic names, proprietary names have been given side by side with the generic names. Not to do this could make the list of little practical value to expected users.

19.5.1. *Alimentary Tract*

BARIUM SULPHATE

Dosage form.—Powder, in 125, 250, 500g jars.
Pharmacological properties.—Insoluble, white powder, not absorbed, not toxic.
Uses.—Radiography of the alimentary tract.
Dosage.—200-750g suspended in 1-3 parts of water.

19.5.2. *Oral Cholecystography*

Radiocontrast media administered orally for radiological examination of the biliary tract include Iopanoic acid (Telepaque (R)), Iocetamic acid (Cholebrine (R)) Calcium ipodate (Biloptin (R)) and sodium ipodate (Solubiloptin (R)). Iopanoic acid is included in the Essential Drugs List as a representative of the group without prejudice to institutional preferences for other members of the group.

IOPANOIC ACID (Telepaque (R)

Dosage form.—Tablets, 500mg.
Pharmacological properties.—Absorbed from the gut, conjugated in the liver, excreted in the bile and concentrated in the gall bladder.

Uses.—Oral cholecystography.
Adverse effects.—mild gastrointestinal disturbances.

Contraindication.—Uraemia.

Dosage.—3g orally with plenty of water, 10 hours before the scheduled X-ray examination.

19.5.3. *Intravenous Cholecystography*

Radiocontrast media can also be injected intravenously to produce X-ray definition of the gall bladder and biliary tract. Meglumine iodipamide and sodium iodipamide are the commonest agents used for this purpose. They are similar in most respects but the meglumine salt, being more soluble can be given in a more concentrated solution.

MEGLUMINE IODIPAMIDE (Biligrafin (R)

Dosage form.—Injection 52 per cent in 20 ml ampoules and vials.

Pharmcological properties.—Radio—opaque organic iodine compound containing 49.4 *per cent* iodine. Freely soluble in water and rapidly excreted by the liver.

Uses.—Cholecystography and cholangiography.

Adverse effects.—Anaphylactic reaction in hypersensitive subjects.

Precaution.—A test dose of 1ml of the solution should be given slowly, intravenously, before the full dose is given.

Contraindications.—Patients hypersensitive to iodides ; patients with hyperthyroidism ; severe impairment of renal function.

Dosage.—Normal adult dose is 20 ml of a 52 per cent solution.

19.5.4. *Urography*

Radiocontrast media used in urography include meglumine diatrizoate, sodium diatrizoate and meglumine iothalamate. They can be administered intravenously for intravenous urography. They can also be used for retrograde pyelography and injected into a ureteral catheter.

MEGLUMINE DIATRIZOATE (Urografin (R)

Dosage form.— Injection, 60 *per cent* in 25ml ampoules and 30ml vial.
Injection, 76 *per cent* in 20ml ampoules and vial.
Injection, 85 *per cent* in 50ml vial.
Injection, 34.3 *per cent* with sodium diatrizoate 35 *per cent* in 25ml *and* 50ml vials.
Injection, 50 *per cent* with sodium diatrizoate 25 *per cent* in 20ml *and* 50ml vials.
Injection, 60 *per cent* with sodium diatrizoate 30 *per cent* in 20ml *and* 50ml vials.

Pharmacological properties.—Rapidly circulates through the vascular system and excreted unchanged by the kidney.

Uses.—Excretory urography.
Retrograde pyelography.
Peripheral arteriography.
Venography.
Cerebral angiography.
Aortography.
Angiocardiography.
Hysterosalpingography.

Adverse effects.—Anaphylaxis ; gastrointestinal disturbances ; dyspnoea, headache, dizziness, flushing.

Precaution.—Care should be taken if administered to patients with severe cardiovascular disease, hypertension, asthma. A 1ml test dose should be given before the full dose.

Contraindications.—Severe renal or hepatic disease, hyperthyroidism, known hypersensitivity to iodides.

Dosage.—Preparation and dose varies with the procedure.

SODIUM DIATRIZOATE (Hypaque (R)

Similar to Meglumine diatrizoate.

19.5.5. *Angiography*

Radio-contrast media which are used for angiography include the following which are also used for urography : meglumine diatrizoate, sodium diatrizoate and meglumine iothalamate. In addition, sodium iothalamate is used only for angiography but this compound should not be used for cerebral angiograph.

MEGLUMINE IOTHALAMATE (Conray (R)

Dosage form.—Injection, 60 *per cent* in 20ml and 30ml vials and 30ml ampoules.

Pharmacological properties.—Radio-opaque iodine-containing compound. It is an isomer of meglumine diatrizoate. Rapidly transported throughout the vascular system and excreted unchanged in the urine.

Uses.—Cerebral angiography.

Peripheral arteriography and venography.

Excretory urography.

Adverse effects.—Similar to meglumine diatrizoate.

Precautions.—Similar to meglumine diatrizoate.

Contraindications.—Similar to meglumine diatrizoate.

Dosage.—Dose depends on procedure.

SODIUM IOTHALAMATE (Angio-Conray (R))

Similar to meglumine iothalamate, except :

Dosage form.—Injection, 80 *per cent* in 20ml and 50ml vials.

Uses.—Angiocardiography, aortography, excretory urography.

Contraindications.—Should not be used for cerebral angiography.

19.5.6. *Myelography*

Only one radio-contrast substance is included in the Essential Drugs List for the radiological examination of the spinal canal : Iophendylate.

IOPHENDYLATE (Myodil (R))

Dosage form.—Injection, 1ml, 3ml, and 6ml ampoules.

Pharmacological Properties.—Absorbable iodized fatty acid compound designed specially for myelography and particularly for the study of the lumbar region.

Uses.—Myelography.

Adverse effects.—Headache ; transient elevation of temperature.

Precaution.—Care should be taken to ensure that the needle point is in the subarachnoid space.

Contraindications.—Should not be used :

(*i*) when lumbar puncture is contraindicated.

(*ii*) within ten days of a previous lumbar puncture.

Dosage.—2-5ml, injected slowly intrathecally by lumbar puncture technique, usually between the 3rd and 4th lumbar segmentss.

19.6. *Tuberculosis*

TUBERCULIN (PURIFIED PROTEIN DERIVATIVE, PPD)

Dosage form.—Injection, 1 TU, 5 TU or 250 TU per 0. 1ml ; *See* formulary for details of composition.

Pharmacological properties.—Sterile solution derived from the concentrated, soluble growth products of the tubercle bacillus. In sensitized individuals, it produces a delayed hypersensitivity reaction manifested as erythema and an area of induration at the site of injection.

Uses.—As an aid in the diagnosis of tuberculosis. A positive reaction to tuberculin may be indicative of hypersensitivity to the antigenic protein mixture as a result of past or present infection with tubercle bacilli.

Dosage.—Mantoux Test : 0.1ml of appropriate concentration is injected intradermally. Multiple Puncture Test : As in the manufacturer's information sheet.

CHAPTER 4

THE FORMULARY SECTION

1. CENTRAL NERVOUS SYSTEM DRUG

1.1. ANALGESTICS

1.1.1. *Narcotic Analgestics*:

Drug Name (*Generic*)	*Presentations*			
	Tablets/Capsules	*Injections*	*Oral mixtures/syrups/suspensions*	*Other dosage form*
MORPHINE		*Morphine HCl Injection* : A sterile solution of Morphine hydrochloride in water for injection. Usual strength : 10g, 15g, 20mg.	*Morphine HCl Solution* : Contains : Morphine HCl 1g. Dilute Hydrochloride acid. 2ml. Alcohol (90%) 25 ml. Freshly boilded and cooled water to 100ml. Dose : 0.5—2ml.	*Morphine Suppositories* About 1.5g of Morphin hydrochloride displaces 1g of Theobroma oil. Store in a cool place.
PETHIDINE	*Pethidine Tablets* : Usual strength : 50mg, 100mg.	*Pethidine Injection* : Usual strength : 25mg, 50mg, 75mg, 100mg. *Compound Injection of Pethidine* : Pethidine HCL 2.5g. Chlorpromazine HCL 625mg. Promethazine HCL 625mg. Sodium Sulphite 40mg. Sodium metabisulphite. 80mg water to 100ml.		
PETHILORPHAN		*Pethilorphan Injection* : Pethidine hydrochloride 50mg. Levallorphan tartrate 0.625mg/ml referred to as Pethilorphan 50mg. Pethilorphan 100mg is present as above is 2ml.		

Drug Name (*Generic*)	*Presentations*			
	Tablets/Capsules	*Injections*	*Oral Mixtures/Syrup/ Suspensions*	*Other Dosage Forms*
CODEINE	*Codeine Phosphate Tablets :* Usual strength : 15mg, 30mg, 60mg.	*Codeine Phosphate Injection :* Codeine phosphate 60mg in 1ml.	*Codeine Phosphate Syrup* Codeine phosphate 15mg in 5ml.	
DIHYDROCODEINE	*Dihydrocodeine Tartrate Tablets :* Usual strength : 30mg.	*Dihydrocodeine Tartrate Injection :* Dihydrocodeine tartrate 50mg in 1ml.	*Dihydrocodeine Tartrate Elixir :* Dihydrocodeine Tartrate 10mg/5ml. Diluent Syrup without preservative. Diluted Elixir to be used within 14 days.	
LEVORPHANOL	*Levorphanol Tartrate Tablets :* Usual strength 1.5mg Dose : 1.5-4.5mg. 1–2 times daily.	*Levorphanol tartrate Injection :* 2mg in 1ml. Dose : 1m injection 2-4mg repeated when necessary I. V. injection 1–2mg administered slowly. Repeat when necessary.		
PENTAZOCINE	*Pentazocine Hydrochloride Tablets :* Usual strength 25mg. *Pentazocine Hydrochloride Capsules :* Strength : 50mg.	*Pentazocine Lactate Injection :* Pentazocine Lactate 30mg in 1ml and 60mg in 2ml.		*Pentazocine Lactate Suppositories :* Pentazocine Lactate 50mg.

Drug Name (Generic)	Presentations			
	Tablets/Capsules	Injectons	Oral Mixtures Syrup/Suspensions	Other Dosage forms
1.1.2. *Narcotic Antagonists :* NALOXONE LEVALLOPHAN NALORPHINE		*Naloxone HCL Injection :* Strength : 0.02mg in 1ml and 2ml ampoules. Also 0.4mg in 1ml ampoule. *Levallophan Tatrate Injection :* Levallorphan Tartrate 1mg in 1ml. *Nalorphine Hydrochloride Injection :* 10mg per ml in 5ml via 1.		
1.1.3. *Non-Narcotic Analgesics :*				
ACETYLSALICYLIC ACID	*Acetylsalicylic Acid Tablets :* Strength 75mg and 300mg. *Soluble Acetylsalicylic Acid Tablets :* Each tablets contains : Acetylsalicylic Acid 300mg. Anhydrous citric Acid 30mg Calcium carbonate 100mg. Saccharin sodium 3mg Store in air tight containers. Dose : 1–3 tablets.		*Acetylsalicy Acid Mixture for Infants :* Containing : Acetylsalicylic acid 125mg Pulv. Tragacanth Co. 60mg. Raspberry Syrup 1ml. Amaranth Solution 0.05ml. Water to 5ml. *Note :* This mixture is for children above 1 year of age. It deteriorates rapidly and must be freshly prepared.	
	Paediatric Soluble Acetylsalicylic Acid Tablets Each tablet contains : Acetylsalicylic Acid 75mg.			

Drug Name (Generic)	Presentations			
	Tablets/Capsules	Injections	Oral Mixtures/ Syrup/Suspensions	Other Dosage forms
	Anhydrous citric acid 7.5mg. Calcium carbonate 25mg. Saccharin sodium 0.75mg. Store in air tight containers. Dose : Children : 1-2 years : 1-2 tablets. 3-12 years : 3-4 tablets, 3-4 times daily.			
PARACETAMOL	*Paracetamol Tablets* : Usual Strength : 500mg.		*Paracetamol Syrup* : Containing : Paracetamol 120mg. Alcohol 0.5ml Propyleneglycol 0.5ml. Raspberry syrup 0.125ml. Amaranth Solution 0.01 ml. Invert syrup 1.375 ml. Glycerol to 5ml. Protect from light. Dose : Children : 5-10ml.	
	1. 2. ANTI-MIGRAINE DRUGS			
ERGOTAMINE	*Ergotamine Tartrate Tablets* : Strength : 1mg and 2mg.			
CLONIDINE	*Clonidine Hydrochloride Tablets* : Strength 0.025mg.			

Drug Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injections*	*Mixtures/Syrup*	*Other Dosage forms*
PIZOTIFEN	*Pizotifen Hydrogen malate Tablets :* Strength : 0.5mg.			
	1. 3. HYPNOTICS AND SEDATIVES			
1.3.1. *Benzodiazepines*				
DIAZEPAM	*Diazepam Tablets or Capsules :* Strength : 2mg and 5mg Protect from light.	*Diazepam Injection :* A sterile solution of diazepam in propylene glycol, 5mg, 1ml in 2ml ampoules. Protect from light.	*Diazepam Syrup (Elixir)* Contains 2mg of Diazepam in 5ml syrup or sorbitol solution. Diluted syrup to be used within 14 days.	
NITRAZEPAM	*Nitrazepam Tablets or Capsules :* Strength : 5mg			
1.3.2. *Barbiturates (Not Recommended).*				
1.3.3. *Other Hypnotics and Sedatives :*				
CHLORAL HYDRATE			*Chloral Hydrate Syrup :* Containing : Chloral hydrate lg Water lml Syrup to 5ml Should be recently prepared.	

Drug Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injections*	*Oral Mixtures Syrup/Suspension*	*Other Dosage Forms*
PARALDEHYDE			*Paraldehyde Draught* : Containing : Paraldehyde.....4ml Liquorice Liq. extr., 3ml Syrup.....8ml Water to.....50ml Should be recently prepared.	*Paraldehyde Enema* : (Rectal paraldehyde) Containing : Paraldehyde..... 10ml Sod. Chloride Soln to 100ml Must be freshly prepared.

1.4. ANTI-CONVULSANTS (ANTI-EPILEPTICS)

1.4.1. *Barbiturates* : (*Use only as Anti-Convulsants*)

PHENOBARBITONE	*Phenobarbitone Tablets* : Strengths : 15, 30 and 60mg	*Phenobarbitone Sodium Contains Injection* : Phenobarbitone Sodium 20% in propylene glycol (90%) and water for injection (10%).	*Phenobarbitone Elixir* Contains : Phenobarbitone 30mg Orange Spirit Co. 0.24ml Tartrazine Soln Co. 0.1ml Alcohol (90%) 4ml Glycerol 4ml Water to 10ml Project from light. Dose : 5-10ml.	

1.4.2. *Hydantoins* :

PHENYTOIN SOD	*Phenytoin Sodium Tablets or Capsules* : Strength : 50mg and 100mg			

1.4.3. *Succinimides :*

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Mixtures/Syrup*
ETHOSUXIMIDE	*Tablets or Capsules :* Strength-250mg		

1.4.4. *Benzodiazepines :*
DIAZEPAM-*see* 1.3.1.

1.4.5. *Others :*

CARBAMAZEPINE	*Carbamazepine Tablets :* Strength-200mg		
PARALDEHYDE		*Paraldehyde Injection :* Sterile paraldehyde in 5 and 10ml ampoules. Sterilised by filtration. *Note :* Store at 15-20°c in complete darkness. Avoid contact with rubber and plastics.	
SODIUM VALPROATE	*Sodium Valproate Tablets :* Strength-200mg		

1.5. ANTI-DEPRESSANTS

1.5.1. *Tricyclic Anti-depressants*

Drug Name (Generic)	*Presentations*	
	Tablets/Capsules	*Mixtures/Suspension/Syrup*
AMITRIPTYLINE	*Amitriptyline Hydrochloride Tablets :* Strengths : 25 and 50mg	
IMIPRAMINE	*Imipramine Hydrochloride Tablets :* Strengths : 10 and 25mg	

1.5.2. *Monoamine Oxidase Inhibitors* (MAOIs)

Drug Name (Generic)	*Presentations*	
	Tablets/Capsules	
PHENELZINE	*Phenelzine Sulphate Tablets :* Strength : 15mg	
ISOCARBOXAZID	*Isocarboxazid Tablets :* Strength : 10mg	

1.6. ANTI-PSYCHOTICS (MAJOR TRANQUILLISERS)

1.6.1. *Phenothiazines*

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Mixture/Syrup/Suspension*
CHLORPROMAZINE	*Chlorpromazine Hydrochloride Tablets :* Strengths : 25, 50 and 100mg	*Chlorpromazine HCL Injection :* 25mg/ml in 2ml ampoules.	*Chlorpromazine syrup*: containing : 25mg of Chlorpromazine Hydrochloride in 5ml diluent Syrup without preservation. Diluted elixir to be used within 14 days. Protect from light.
FLUPHENAZINE	*Fluphenazine hydrochloride Tablets :* Strength : 2.5mg	*Fluphenazine Injection :* Depot injection As Enanthate or Decanoate : 25mg in 1ml ampoules.	

1.6.2. *Butyrophenones*

HALOPERIDOL	*Haloperidol Tablets :* Strengths : 1.5 and 5mg	*Haloperidol Injection :* 5mg/ml in 1ml and 2ml ampoules	

1.6.3. *Others :*

Drug Name (Generic)	*Presentations*	
	Tablets Capsules	*Injection*
CLOZAPINE	*Clozapine Tablets :* Strengths : 50 and 100mg	
LITHIUM CARBONATE	*Lithium Carbonate Tablets :* Strengths : 250 and 300mg	

1.7. ANTI-PARKINSONISM DRUGS

1.7.1. *Anti-Cholinergics*

BENZHEXOL	*Benzhexol Tablets :* Strengths : 2mg and 5mg		
BIPERIDEN	*Biperiden Tablets :* Strength : 2mg	*Biperiden Lactate Injection :* 5mg/ml in 1ml ampoules.	

1.7.2. *Dopaminergic Drugs*

Drug Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injections*	*Oral Mixtures/Syrup/ Suspensions*	*Other Dosage Forms*
LEVODOPA	*Levodopa Tablets or Capsules :* Strength 250mg			

1.7.3. *Dopa Decarboxylase Inhibitor :*

CARBIDOPA	*Carbidopa + Levodopa Combination Tablets :* Strengths : Carbidopa 10mg + Levodopa 100mg Carbidopa 25mg + Levodopa 250mg.			

1.7.4. *Others* :

AMANTADINE	*Amantadine Capsules* : Strength : 100mg		*Amantadine Syrup* : Amantadine Hydrochloride 50mg/5ml. Diluent Syrup.	
BROMOCRIPTINE	*Bromocriptine Tablets or Capsules* : Strength : 2.5mg or 10mg.			

2. ANAESTHETIC DRUGS

2.1. GENERAL ANAESTHETICS AND OXYGEN
2.2. PREMEDICATION DRUGS
2.3. ADJUNCTS TO GENERAL ANAESTHESIA
2.4. LOCAL ANAESTHETICS

2.1.1. *Inhalation Anaesthetics*

Drugs Name (Generic)	*Presentation*
	Inhalation
ETHER ANAESTHETIC	*Ether Anaesthetic.*—Is a volatile liquid for inhalation anaesthesia. It is deigthyl ether to which an appropriate quantity of a suitable non-volatile antioxidant may have been added as stabiliser. Usually, not more than 0.002 per cent W/V of a suitable stabilizer is added to retard the formation of ether peroxides. Propyl gallate and hydroxyquinone are among the substances used as stabilisers. Keep securely closed and protect from light at a temperature not exceeding 15°. Anaesthetic Ether remaining in a partially filled container may deteriorate rapidly. Label should state nature and quantity of any added antioxidant.
HALOTHANE	*Halothane.*—is a volatile liquid for inhalation anaesthesia. It contains 0.01 per cent W/W of thymol as a preservative. Anaesthesia may be induced with 1.5 to 3 per cent V/V of halothane in oxygen or mixture of nitrous oxide and oxygen. Anaesthesia is maintained with concentrations of 0.5 to 1.5 per cent V/V.

Drug Name (Generic)	*Presentation*
	Inhalation
NITROUS OXIDE	*Nitrous Oxide.*—Nitrous oxide (gas) is an anaesthetic administered by inhalation. Deep anaesthesia is produced when administered without air or oxygen in about one minute. To prevent hypoxia due to prolonged anaesthesia, induction usually carried out with 20 per cent oxygen and maintenance with 30 per cent. It should be stored at not more than 36° under compression in an approved metal cylinder. The metal container is painted blue and carries a label stating the name of the gas. In addition the name of the gas or the symbol 'N20' is stencilled in paint on the shoulder of the cylinder.
OXYGEN	*Oxygen.*—Oxygen (gas) is administered by inhalation as adjunct to nitrous oxide anaesthesia and also in nitrous oxide—oxygen mixtures as vehicle for other inhalation anaesthetics. Concentration ranging from 30-50 per cent may be employed. In conditions not associated with the retention of carbon dioxide, concentrations of up to 100 per cent may be administered. Store under compression in an approved metal cylinder. Cylinders of oxygen are painted black with a white shoulder. Label should state the name of the gas and the symbol 'O^2' stencilled in paint on the shoulder of the cylinder.

2.1.2. *Intravenous Anaesthetics* :

Drug Name (Generic)	*Presentation*
	Injection
THIOPENTIONE SODIUM	*Thiopentone Sodium Injection.*—Containing 0.5g and 1g sterile powder in vials for intravenous injection.

2.2. PREMEDICATION DRUGS

2.2.1. *Anti-Cholinergic Drugs* : ATROPINE	*Atropine Injection.*—Containing 1mg of atropine sulphate in 1ml ampoule.
2.2.2. *Miner Tranquilliser* : DIAZEPAM	Diazepam Injection—Containing 10mg of Diazepam in 2ml ampoules.

2.3. Adjuncts to General Anaesthetics

2.3.1 *Anti-cholinesterase* :

Drug Name (Generic)	*Presentation*
	Injection
Neostigmine	*Neostigmine Injection.*—Containing 2.5mg of Neostigmine methylsulphate per ml in 1ml ampoule.

2.3.2. *Depolarising Muscle Relaxant* :

Suxamethonium	*Suxamethonium Injection.*—Containing 50mg of suxamethonium chloride per ml in 2ml. ampoule.

2.3.3. *Non-Depolarising Muscle Relaxants* :

Tubocurarine	*Tubocurarine Injection.*—Containing 10mg of Tubocurarine chloride/ml in 1.5ml ampoules.
Pancuronium	*Pancuronium Injection.*—Containing 2mg of Pancuronium bromide/ml in 2ml ampoules.

2.4. Local Anaesthetics

Drug Name (Generic)	*Presentations Injection*	*Topical*
Lignocaine	*Lignocaine Injection.*—Containing 1 per cent and 2 per cent Lignocaine Hydrochloride per vial. *Lignocaine Injection with Adrenaline.*—containing 1 per cent and 2 per cent of Lignocaine Hydrochloride in Adrenaline 1 in 200,000 pervial. Dose : 200-500mg by infiltration, should not be exceeded when given with adrenaline. *Lignocaine Dental Cartridges.*—containing 2 per cent Lignocaine Hydrochloride in adrenaline 1 in 80,000. Administered by infiltration.	*Lignocaino Topical* (gel) containing : Lignocaine Hydrochloride 1 per cent or 2 per cent Chlorhexidine gluconate solution 0.25 per cent (or Hydroxybenzoates) in a sterile lubricant water-miscible basis. For surface anaesthesia.

Drug Name (Generic)	*Injection Presentations*	*Topical*
BUPIVACAINE	*Bupivacaine Injection.*—Containing Bupivacaine Hydrochloride 0.25-0.5 per cent in 10ml ampoule. It is a long acting local anaesthetic and 2–4 times more potent than Lignocaine. It is also used with adrenaline. (*a*) Bupivacaine Hydrochloride 0.25 *per cent* (2.5mg/ml) Adrenaline. Hydrochloride 1 in 4000,000 (0.25mg/100ml) Water for Injection 10ml. (*b*) Bupivacaine Hydrochloride 0.5 *per cent* (5mg/ml) Adrenaline Hydrochloride 1 in 200,000 (0.5mg/100ml) Water for Injection 10ml.	

3. CARDIOVASCULAR SYSTEM DRUGS

3.1. CARDIAC GLYCOSIDES

3.1.1. *Digitalis Glycosides* :

DRUG NAME (GENERIC)	*Presentations*		
	Tablets/Capsules	*Injections*	*Oral Mixtures/ Syrup/Suspensions*
DIGOXIN	*Digoxin Tablets* Strength 0.25mg	*Digoxin Injection* Contains 0.25mg/ml in 2ml ampoules	*Digoxin Elixir Paediatric :* Contains 0.05mg/ml Do not dilute. Measure with pipette.

3.2. ANTI-ARRHYTHMIC DRUGS

3.2.1. *Membrane Stabilizers* :

LIGNOCAINE		*Lignocaine Injection* Contains lignocaine hydrochloride, 20mg/ml in 5ml ampoules.	

3.2.2. *Beta-Adrenoceptor Blockers* :

PROPRANOLOL	*Propranolol Tablets* Contains propranolol hydrochloride usual Strength—10mg 40mg.	*Propranolol Injection* Contains propranolol hydrochloride Strength—1mg/ml in 1ml ampoule.	

3.2.3. *Other Anti-arrhythmic Drugs* :

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	
PROCAINAMIDE	*Procainamide Slow Release Tablets* : Usual Strength—500mg. *Procainamide Tablets (Plain)* : Contains procainamide hydrochloride. Strength—250mg Also available as capsules of 250 and 500mg strength.	*Procainamide Injection* : A Sterile solution of procainamide hydrochloride strength—100mg/ml in 10ml vials.	
QUINIDINE	*Quinidine Sulphate Tablets* : Strengths : 200mg and 300mg (200mg of sulphate is equivalent to 250mg of bisulphate).		
PHENYTOIN	*Phenytoin Tablets or Capsules* : *See* 1.4.2.		

3.3. ANTI-HYPERTENSIVE DRUGS

3.3.1. *Thiazide Diuretics*

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Oral Mixtures/Syrup/Suspensions*
BENDROFLUAZIDE	*Bendrofluazide Tablets* : Strengths : 2.5mg and 5mg		

3.3.2. *Direct Vasodilatrors* :

HYDRALAZINE	*Hydralazine Tablets* : Strengths : 25 and 50mg	*Hydralazine Hydrochloride* : Injection : 20mg/ml in 1ml ampoules.	
PRAZOSIN	*Prazosin Tablets* : Tablets containing prazosin hydrochloride Strength—1mg, 2mg and 5mg.		

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	
DIAZOXIDE		*Diazoxide Injection* Strength—15mg/ml ampoules	
MINOXIDIL	*Minoxidil Tablets* : Strengths : 2.5, 5 and 10mg.		
SODIUM NITROPRUSSIDE		*Sodium Nitroprusside Injection* Strength : 50mg vials	

3.3.3. *Alpha-Adrenoceptor Blockers* :

PRAZOSIN	*See* 3.3.2. (Direct Vasodilators)		
PHENOXYBENZAMINE	*Phenoxybenzamine Capsules* Contains Phenoxybenzamine Hydrochloride, 10mg	*Phenoxybenzamine Injection* : Containing phenoxybenzamine hydrochloride Strength—50mg/ml in 2ml ampoules.	

3.3.4. *Beta-Adrenoceptor Blockers* :

PROPRANOLOL	*See* 3.2.2. (Beta-Adrenoceptor *Blockers*)	

3.3.5 *False Neurotransmitter* :

OC-METHYLDOPA	*Methyldopa Tablets* : Usual Strengths : 250 and 500mg	

3.3.6. *Other Anti hypertensive Drugs* :

RESERPINE	*Reserpine Tablets* : Usual Strengths, 0.1mg, 0.25mg and 0.5mg	*Reserpine Injection* Strength—5mg/2ml

CLONIDINE	*Clonidine Tablets* : Containing Clonidine Hydrochloride Usual Strengths, 0.025mg, 0.1mg and 0.3mg	*Clonidine Injection* : Clonidine hydrochloride Strength—0.15mg/ml in 1ml
BETHANIDINE	*Bethanidine Tablets* : Containing Bethanidine Sulphate Strengths—10 and 50mg	
LABETALOL	*Labetalol Tablets* : Containing Labetalol Hydrochloride Usual Strength—100mg and 200mg	*Labetalol Injection* : Containing Labetalol hydrochloride Strength—5mg/ml in 20ml ampoules.

	Presentations		
Drug Name (Generic)	*Tablets/Capsules*	*Injections*	*Other Dosage forms*
PINDOLOL	*Pindolol Tablets* Strengths, 5mg, 15mg		

3.4. ANTI-ANGINA DRUGS

3.4.1. *Nitrates and Nitrites* :

GLYCERYL TRINITRATE	*Glyceryl Trinitrate Tablets* : Sublingual tablet Strength—0.5mg		
AMYL NITRITE			*Amyl Nitrite Inhalation* : Amyl Nitrite in crushable glass capsules, contains a suitable stabilizer (To be crushed between finger and thumb, and vapour inhaled). Usual amounts 0.18ml and 0.3ml

Drug Name (Generic)	Presentations	
	Tablets/Capsules	*Injections*
ISOSORBIDE DINITRATE	*Isosorbide Dinitrate* : Containing Isosorbide dinitrate. Sublingual tablets. Strengths—5mg and 10mg	

3.4.2. *Beta-Adrenoceptor Blockers* :

PROPRANOLOL	*See* 3.2.2.	

3.4.3. *Others* :

VERAPAMIL	*Verapamil Tablets* : Containing Verapamil Hydrochloride Strength—40mg	*Verapamil Injection* : Containing Verapamil hydrochloride Strength—2.5mg/ml in 2ml ampoules.
LIDOFLAZINE	*Lidoflazine Tablets* : Strength—120mg	

4. DIURETICS

4.1. THIAZIDE DIURETICS

Drug Name (Generic)	Presentations	
	Tablets/Capsules	*Injections*
BENDROFLUAZIDE	*See* under 3.3.1.	
HYDROCHLOROTHIAZIDE	*Hydrochlorothiazide Tablets* : Strengths : 25 and 50mg.	
HYDROFLUMETHIAZIDE	*Hydroflumethiazide Tablets* : Strength : 50mg	

4. DIURETICS—*Continued*

POLYTHIAZIDE	*Polythiazide Tablets* : Strength : 1mg and 2mg.	
CLOPAMIDE	*Clopamide Tablets* : Strength : 20mg.	

4.2. LOOP DIURETICS

Drug Name (*Generic*)	*Presentations*	
	Tablets/Capsules	*Injections*
FRUSEMIDE	*Frusemide Tablets* : Strengths : 20 and 40mg.	*Frusemide Injection* : A Sterile solution of Frusemide in water for injection, PH 8 to 9.3. Strength : 10mg/1ml in 2ml ampoules.
BUMETANIDE	*Bumetanide Tablets* : Strength : 1mg and 5mg.	*Bumetanide Injection* : Injection containing 250 micrograms per ml in 2ml and 4ml ampoules

4.3. OTHER DIURETICS

4.3.1. *Osmotic Diuretics* :

MANNITOL		*Mannitol Injection* : A sterile solution of Mannitol in water for Injection, PH 4.5. to 7. Strength : 20 per cent Solution and 25% Solution (Crystal deposits at lower temperatures should be dissolved by warming before use).

4.3.2. *Potassium-sparing Diuretics* :

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	
AMILORIDE	*Amiloride Tablets* : Containing Amiloride Hydrochloride Strength-5mg		
TRIAMTERENE	*Triamterene Capsules* : Strengths-50mg, 100mg		

4.3.3. *Aldosterone Antagonists* :

SPIRONOLACTONE	*Spironolactone Tablets* : Strengths-25mg, 100mg		

4.3.4. *Combined Diuretics* :

AMILORIDE PLUS HYDROCHLOROTHIAZIDE	*Amiloride plus Hydrochlorothiazide Tablets* : Contains : Amiloride hydrochloride, 5mg Hydrothlorothiazide, 50mg *Dose* : 1-2 tablets daily		
TRIAMTERENE PLUS HYDROCHLOROTHIAZIDE	*Triamterene plus Hydrochlorothiazide Tablets* : Contains : Triamterene, 50mg Hydrochlorothiazide, 25mg *Dose* : 1-2 tablets daily.		
FRUSEMIDE PLUS POTASSIUM CHLORIDE	*Frusemide plus Potassium Chloride Tablets* : Contains : Frusemide, 40mg Potassium Chloride, 10 mmol (potassium).		

5. BLOOD AND NUTRITION

5.1. HAEMATINICS

5.1.1 *Iron Preparations* :

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Mixture/Syrups/Suspensions*
FERROUS FUMARATE	*Ferrous Fumarate Tablets* : Strength : 200mg		
FERROUS GLUCONATE	*Ferrous Gluconate Tablets* : Strength 300mg.		
FERROUS SULPHATE	*Ferrous Sulphate Tablets* : Strength 200mg		
FERRIC AMMONIUM CITRATE			*Ferric Ammonium Citrate Mixture (B.P.C.)* : Ferric Ammonium Citrate 2g Suitable preservative Water To.....10ml. Should be recently prepared. *Ferric Ammonium Citrate Peadiatric Mixture* : Ferric Ammonium Citrate 400mg Compound Orange Spirit 0.01ml Syrup .....0.5ml Suitable presentative

5.1.2. *Folic Acid*

FOLIC ACID	*Folic Acid Tablets* Strength—5mg		

5.1.3. *Cyanocobalamine (Vitamin B12)* :

CYANOCOBALAMINE		*Cyanocobalamine Injection* : Strength : 1mg/ml in 1ml ampoule.	

5.2. Anti-Coagulants

5.2.1. *Parntral Anti-coagulants* :

Heparin		*Heparin Injetion* : A sterile solution of Heparin calcium or Heparin sodium in water for injection. The pH of the solution may be adjusted with a suitable alkali. Strengths : 5,000 units/ml in 5ml ampoules, and 25,000 units/ml.	

5.2.2. *Oral Anti-coagulants* :

Drug Name (Generic)	*Presentation*	
	Tablets/Capsules	*Injections*
Warfarin	*Warfarin Sodium Tablets* : Containing Warfarin Sodium Strengths : 1mg and 5mg	
Dicoumarol	*Dicoumarol Tablets or Capsules* : Containing Dicoumarol Strengths : 25, 50 and 100mg.	

5.3. Plasma Substitutes

Dextran 70		*Dextran Injection* : A sterile 6 per cent W/V solution of Dextrans of average molecular weight of about 70,000 in Dextrose injection or in sodium chloride injection.

5.4. Plasma Fraction for Specific Use

Human Albumin		*Human Albumin Injection* : A Sterile solution of human albumin 20 per cent, in water for injection. It contains no added bactericide or antibiotic. It is a clear amber to deep orange—coloured liquid, pH 6.7 to 7.3., containing 15-25 per cent of protein and not more than 15mg of potassium and 30mg of sodium citrate per gram of protein. It must not be used if solution is turbid or contains deposits.

RETINOL (VITAMIN A)	*Retinol Tablets or Capsules* Strengths : 1.5mg (5000 Units)-7.5mg (25,000 Units)	
THIAMINE (VITAMIN B1)	*Thiamine Hydrochloride Tablets* : Containing Thiamine Hydrochloride Strengths : 25mg and 50mg	*Thiamine Hydrochloride Injection.* : A Sterile solution in water for injection PH 2.8 to 3.4. Strength 25mg/ml ampoule.
PYRIDOXINE (Vitamin B6)	*Pyridoxine Tablets* : Containing Pyridoxine Hydrochloride Strengths—10mg.	
VITAMIN B COMPLEX	*Compound Vitamin B Tablets* : Each Tablet Contains : Nicotinamide—2mg, Thiamine HCL—5mg, Riboflavine—2mg, Pyridoxine—25mg	
ASCORBIC ACID (VITAMIN C)	*Ascorbic Acid Tablets* : Strength : 100mg and 500mg	
ERGOCALCIFEROL (VITAMIN D)	*Calciferol Tablets or Capsules* : Containing : Calciferol 0.25mg (10,000 Units) or Calciferol 1.25mg (50,000 Units)	
Other Vitamins : ALPHA-TOCOPHEROL (VITAMIN E)	*Vitamin E Tablets* : Containing : Alpha-Tocopherol Acetate 30mg- *Vitamin E Capsules* : Alpha-Tocopherol) Acetate 30mg	
PHYTOMENADIONE (VITAMIN K1)	*Phytomenadione Tablets or Capsules* : Strength—10mg	*Phytomenadione Injection* : 10mg/ml in 1ml ampoule

5.6. Minerals

Drug Name (Generic)	*Presentations*		
	Tablets	*Injection*	*Oral Solutions*
Calcium Gluconate		*Calcium Gluconate Injection* Available as a solution. Containing 10% of Calcium Gluconate.	
Calcium Lactate	*Calcium Lactate Tablets* : Strength : 300mg		
Sodium Fluoride	*Sodium Fluoride Tablets* Strengths : 0.5, 11 and 2.2mg.		*Sodium Fluoride Mouth Wash* Containing 2% Sodium Fluoride.

5.7. Oral Rehydration Salts

Oral Rehydration Salt			*Oral Rehydration Salts* : Contained in Sachets : For 1 litre of water : Glucose (Dextrose) 20mg Potassium Chloride 1.5g Sodium Bicarbonate 2·5g Sodium Chloride 3.5g

5.8. Parenteral I.V. Fluids

Drug Name (Generic)	*Presentation*	
	Tablets/Capsules	*Injections*
Glucose		*Dextrose Injection* : A 5% Sterile solution of anhydrous Dextrose in water
		Strong Dextrose Injection : A Sterile 50% solution of anhydrous dextrose (or an equivalent of dextrose for an equivalent of dextrose monohydrate for parenteral use) in water for injection, PH 3.5 to 6.5 in 50ml ampoule.

GLUCOSE WITH SODIUM CHLORIDE		*Dextrose and Sodium Chloride Injection* : A Sterile solution of sodium chloride and anhydrous dextrose in water for injection. Strength—Sodium Chloride 0.18%, Anhydrous Dextrose 4.3%
POTASSIUM CHLORIDE	*Potassium Chloride Slow-Release Tablets* : Strength—600mg (8m mol of of K+, CL–	*Potassium Chloride Injection* : Strength—10% and 20%
SODIUM BICARBONATE		Sodium Bicarbonate Intravenous infusion. Usual strength 1.4% (14g, 167mmol each of Na+ and HCO_3/Litre)
SODIUM CHLORIDE		*Sodium Chloride Injection (Normal Strength)* : A Sterile solution of Sodium Chloride in water for injection. Strength—Sodium Chloride 0.9%.
		Sodium Chloride Injection (Half-Normal Strength) A Sterile Solution of Sodium Chloride, Containing 0.45 per cent of Sodium Chloride in water.
SODIUM LACTATE		*Compound Sodium Lactate Injection* : Contains the following ions (in mmols/Litre) : Na+131, K+5, Ca+2, HCO3 (as lactate) 29, Cl-1 1 1
WATER FOR INJECTION		*Water for Injection* : Prepared by distillation. Pyrogen free. Available in 2, 5, 10, 20, 50 and 100ml packs.

5.9. PERITONEAL DIALYSIS SOLUTION
Presentations

Drug Name (Generic)	*Solution*	
PERITONEAL DIALYSIS SOLUTION	*Sterile Solution* : Containing/litre : Sodium Chloride.....5.56g Sodium Acetate.....4.76g Calcium Chloride.....0.22g	Giving the following/litre : Sodium ions 130.0 mmol. Chloride ions 100.0 mmol.

Drug Name (Generic)	Presentations			
	Tablets/Capsules	*Injections*	*Oral Mixtures/Syrup Suspensions*	*Other Dosage Forms*
	Magnesium Chloride.....0.152g. Sodium Metabisulphite 0.15g. Anhydrous Dextrose 17.0g.	Acetate ions 35.0 mmol. Calcium ions 1.5mmol. Magnesium ions 0.75mmol.		
HAEMODIALYSIS FLUID	*Haemodialysis Concentrate* (35 *x*) To be diluted (1 litre of concentrate with 34 litres of purified water) before use. *Containing/litre* : Sodium Chloride.....194.6g. Sodium Acetate.....166.6g. Calcium Chloride.....7.7g. Potassium Chloride.....2.6g. Magnesium Chloride..... 5.32g. Anhydrous Dextrose.....70.0g.	Giving the following/litre after dilution. : Sodium ions 140.0mmol. Calcium ions 1.5mmol Potassium ions 1.0mmol. Magnesium ions 0.75 mmol. Acetate ions 35.0 mmol.		

6. RESPIRATORY SYSTEM DRUGS

6.1. ANTI-ASTHMATIC DRUGS

6.1.1. *Methylxanthines* :

AMINOPHYLLINE	*Aminophylline Tablets* : Strength—100mg and 200mg.	*Aminophylline Injection* : Strength—25mg/ml in 10ml ampoules.		
THEOPHYLLINE	*Theophylline Tablets* : Strength—100mg and 200mg.			

6.1.2. *Corticosteroids* :

BECLOMETHASONE				*Beclomethasone Aerosol* : Beclomethasone dipropionate, 50 micro grams /metered Inhalation, in 200-dose unit.

Drug Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injections*	*Mixtures/Syrup*	*Other Dosage Forms*
HYDROCORTISONE	*Hydrocortisone Tablets* : Strength-10mg and 20mg.	*Hydrocortisone Injection* : Containing Hydrocortisone sodium succinate. Strength—100mg and 500mg.		

6.1.3. *Adrenoceptor Stimulants.*
6.1.3.1. *Selective Beta.—Adrenoceptor Stimulants.*

SALBUTAMOL	*Salbutamol Tablets* : Strength—2mg and 4mg. (as Sulphate).		*Salbutamol Syrup* : Strength-2mg/5ml (as Sulphate).	*Salbutamol Aerosol* : Strength—0.1mg per metered inhalation in 200 dose unit.
TERBUTALINE	*Terbutaline Tablets* : Strength—5mg. (as sulphate).	*Terbutaline Injection* : Strength—0.5mg/ml (in 1ml ampoule).	—	*Terbutaline Aerosol* : Strength—0.25mg per metered inhalation in 400 dose unit.
FENOTEROL			—	*Fenoterol Aerosol* : Fenoterol hydrobromide 0.18mg/metered inhalation in 200 dose unit.

6.1.3.2. *Non-selective Adrenoceptor Stimulants* :

ADRENALINE	—	*Adrenaline Injection* : 1mg/ml in 1ml ampoule (as bitartrate).	—	—
ORCIPRENALINE	*Orciprenaline Tablets* : Strength—20mg. (as sulphate).	*Orciprenaline Injection* : 0.5mg/ml in 1ml ampoule (as sulphate).	*Orciprenaline Syrup* : 10mg/5ml (as Sulphate).	*Orciprenaline Aerosol* : 5% w/v Solution in bottles of 7.5ml.

6.1.4. *Prophylactic Drugs*

Drug Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injection*	*Oral Solution*	*Other Dosage Form*
KETOTIFEN	*Ketotifen Tablets/Capsules* : (As hydrogen fumarate) Strength-1mg.		*Ketolifen Syrup* : (As hydrogen fumarate) 1mg/5ml.	
SODIUM CROMOGLYCATE				*Aerosol Inhalation* : Sodium Cromoglycate 1mg/metered inhalation in 200 dose unit.

6.1.5. *Fixed Dosage Combinations* :

EPHEDRINE + HYDROXYZINE + THEOPHYLLINE	*Tablets* : Containing/Tablet : Ephedrine 25mg. Hydroxyzine 10 mg. Theophylline 30mg.		*Syrup* : As for tablet per 5ml syrup.	

6.2.1. *Opiates* :

6.2. ANTI-TUSSIVES

CODEINE	*Codeine Linctus.*—Containing 15mg of Codeine Phosphate in 5ml : Codeine Phosphate .. .. 15mg. Lemon Syrup .. .. 1ml. Benozic Acid Solution .. 0.1ml. Suitable preservative Compound Tartrazine Solution 0.05ml. Syrup to 5ml. Diluted syrup should be used within 14 days.
METHADONE	*Methadone Linctus.*—Containing 2mg of Methadone Hydrochloride in 5ml : Methadone Hydrochloride .. .. 2mg. Water .. .. 0.6ml. Compound Tartrazine Solution 0.04ml. Glycerol .. .. 1.25ml. Tolu Syrup to .. .. .. 5ml.

6.3. *Expectorants* :

Drug Name (Generic)	*Presentations*
	Linctus/Mixture/Syrup
GEES LINCTUS	*Gees Linctus or Compound Squill Linctus :* Composition : Squill Oxymel .. .. 300ml Camphorated Opium Tineture .. 300ml Tolu Syrup .. .. 300ml To be diluted before use. The Lincture should be sipped and swallowed slowly. It should be used for a few days and should not be given to children under 1 year without medical advice.
AMMONIA WITH IPECACUANHA ..	*Ammonia with Ipecacuanha Mixture* Composition : Ammonium Bicrabonate .. .. 20mg Ipecauanha Tincture .. .. 30ml Concentrated anise water .. .. 5ml Concentrated Camphor water .. .. 10ml Liquorice Liquied Extract .. .. 50ml Suitable preservative water to .. .. 1000ml Do not use for more than a few days without medical advice.
CODEINE, EPHEDRINE AND PROMETHAZINE LINCTUS	*Codeine—Ephedrine and Promethazine Linctus* Composition : Codeine Phosphate .. .. .. 9mg Ephedrine Hydrochloride .. .. 7.2mg Promethazine Hydrochloride .. .. 3.6mg Syrup 5ml

7. GASTRO—INTESTINAL DRUGS

7.1. ANTACIDS

ALUMINIUM HYDROXIDE ..	*Aluminium Hydroxide Tablets :* contains 500mg of dried aluminium hydroxide gel flavoured with sugar and peppermint. Strength 500mg.	*Aluminium Hydroxide Suspension* Strength : Aluminium Hydroxide 320mg/5ml.

Drug Name (Generic)	*Presentations*	
	Tablets/Capsules	*Mixtures/Syrup/Suspension*
MAGNESIUM HYDROXIDE	*Magnesium Hydroxide Tablets :* Strength—500mg of magnesium hydroxide. *Magnesium hydroxide + Aluminium Hydroxide Tablets :* Strength—dried aluminium hydroxide 400mg. magnesium hydroxide 400mg.	*Magnesium Hydroxide Mixture.* Strength—250mg/5ml. *Magnesium Hydroxide + Aluminium Hydroxide Mixture :* Strength-dried aluminium hydroxide 220mg/ magnesium hydroxide 195 mg per 5ml.
MAGNESIUM TRISILICATE	*Magnesium Trisilicate Tablets :* contains magnesium trisilicate .. 500mg. *Magnesium Trisilicate Compound Tablets :* contains magnesium trisilicate .. 250mg. Dried aluminium hydroxide gel .. 120mg. Peppermint Oil .. 0.003ml.	*Magnesium Trisilicate Mixture :* Magnesium Trisilicate .. .. 500mg. Light Magnesium Carbonate .. 500mg. Sodium Bicarbonate .. .. 500mg. Concentrated Peppermint Emulsion 0.25ml. Suitable Preservative Water to .. 10ml.

7.2. ANTI-EMETICS

CHLORPROMAZINE	*Chlorpromazine Tablets :* Strength—25 and 50mg of the hydrochloride.	*Chlorpromazine Injection :* Strength—25mg/ml of hydrochloride in 1ml and 2ml ampoules.	*Chlorpromazine Elixir :* (*Syrup*) Contains 25mg/ml of hydrochloride. Diluent syrup.
PROMETHAZINE	*Promethazine Tablets :* Strength—10mg, 25mg of promethazine hydrochloride.	*Promethazine Injection :* Strength-25mg/ml of hydrochloride in 1ml and 2ml ampoules.	*Promethazine Syrup :* Strength—5mg/5ml.

7.3. Anti-haemorrhoidals

Drug Name (Generic)	Presentations		
	Tablets/Capsules	*Mixtures/Syrups/Suspension*	*Other Dosage Forms*
LIGNOCAINE+ BETAMETHASONE			Other Dosage Forms *Lignocaine+Betamethasone Suppository* : Containing : Betamethasone 500mg Lignocaine hydrochloride 40mg Phenylephrine hydrochloride 2mg *Lignocaine Betamethasone Ointment* : Containing : Betamethasone 0.05% Lignocaine hydrochloride 2.5% Phenylephrine hydrochloride 1.1%

7.4. Anti-spasmodics

HYOSCINE	*Hyoscine Butyl Bromide Tablets* : Strength, 10mg		
BELLADONA		*Belladona Mixture Paediatric* : Belladona Tincture.....0.15ml Simple Syrup.....1.0ml Glycerol.....0.5ml Benzoic acid solution.....0.1ml Compound Orange Spirit.....0.01ml Water to.....5ml	

7.5. Purgatives

Drug Name (Generic)	Presentations		
	Tablets/Capsules	*Injections*	*Lotion/Cream/Ointment*
Bisacodyl	*Bisacodyl Tablets* : Strength— 5mg		*Bisacodyl Suppositories* : Strength— 10mg
Magnesium Hydroxide		*Magnesium Hydroxide Mixture* : Hydrated Magnesium oxide 550mg/10ml	
Magnesium Sulphate		*Magnesium Sulphate Mixture* : Containing : Magnesium Sulphate 4.0g Light Magnesium Carbonate 0.5g Peppermint Emulsion Conc. 0.25ml Suitable Preservative Water to.....10ml	
Senna	*Senna Tablets* : Containing the powdered pericarp of senna fruit. Equivalent to about 30mg of total sennosides.	*Senna Syrup* : Contains Senna Liquid extract 25% v/v in diluent syrup.	

8. ENDOCRINE SYSTEM DRUGS

8.1. Adrenal Hormones and Synthetic Substitutes

Hydrocortisone	*Hydrocortisone Tablets* : Strength—10mg and 20mg	*Hydrocortisone Injection* : As sodium succinate Strength—100mg vial with diluent ; or as sodium phosphate Strength—100mg/ml ampoules.	*See* 10 (Dermatological Drugs)
Prednisolone	*See* 17.5		
Dexamethasone	*Dexamethasone Tablets* : Strength—0.5mg and 4mg	*Dexamethasone Injection* : As sodium phosphate or phosphate 2mg/ml in 2ml ampoules.	

8.2. Sex Hormones

8.2.1. *Androgens* :

Drug Name (Generic)	*Presentations*	
	Tablets/Capsules	*Injections*
Testosterone	*Testosterone Tablets/Capsules* : Sublingual Tablets—10mg Capsules—As undecanoate, 40mg.	*Testosterone Injection/Implants* : As propionate Injection—25mg/ml As enanthate injection—200mg/ml As Testosterone Implants—100, 200mg.

8.2.2. *Oestrogens* :

Ethinyloestradiol	*Ethinyloestradiol Tablets* : Strengths—0.01mg and 0.02mg.	
Oestradiol	*Oestradiol Valerate Tablets* : Strength—1mg and 2mg	*Oestradiol Injection* : As benzoate—1mg/ml and 5mg/ml
Stilboestrol	*Stilboestrol Tablets* : Strength—1mg and 5mg	

8.2.3. *Progestogens* :

Norethisterone	*Norethisterone Tablets* : Strength—5mg	
Laevonorgestrel	*Laevonorgestrel Tablets* : Strength—0.15 and 0.25mg	
Medroxyprogesterone	*Medroxyprogesterone Tablets* : Strength—5mg (as acetate)	*Medroxyprogesterone Injection* : Strength—50mg/ml in vials.

8.3. Oral Contraceptives

Drug Name (Generic)	*Presentations*	
	Tablets/Capsules	*Injections*
Ethinyloestradiol + Laevonorgestrel	Ethinyloestradiol + Laevonorgestrel 0.03mg + 0.15mg	
Ethinyloestradiol + Norethisterone	Ethinyloestradiol + Norethisterone 0.03mg + 1mg 0.03mg + 4mg	

8.4. Ovulation Inducers

Clomiphene	*Clomiphene Citrate Tablets* : Strength—50mg	
Chorionic Gonadotrophin		*Chorionic Gonadotrophin Injection* : Strength—500 Unit and 1,000 Unit ampoules.

8.5. Oxytocics

Oxytocin	*Oxytocin Injection* : Strengths—5 and 10 Units/ml.	
Ergometrine	*Ergometrine Maleate Tablets* : Strengths—0.25 and 0.5mg	*Ergometrine Maleate Injection* : Strength—0.5mg/ml in 1ml ampoule.

8.6. Drugs used in Diabetes Mellitus

8.6.1. *Insulins*

Drugs Name (Generic)	*Presentations*	
	Tablets/Capsules	*Injections*
Insulin Zinc Suspension (lente)		*Insulin Zinc Suspension Injection* : Strengths—40 units and 80 units/ml in 10ml vials. Store in a cool place, preferably a refrigerator.
Soluble Insulin		*Soluble Insulin Injection* : Strengths—40 units and 80 units/ml in 10 ml vials. Store in a cool place, preferably a refrigerator.

8.6.2. *Oral Hypoglycaemic Drugs* :

Chlorpropamide	*Chlorpropamide Tablets* : Strengths—100 and 250mg	
Metformin	*Metformin Tablets* : Strength—500mg	
Glibenclamide	*Glibenclamide Tablets* : Strength—2.5. and 5mg	
Gliclazide	*Gliclazide Tablets* ; Strength—40mg.	

8.7. Thyroid and Anti-thyroid Drugs

8.7.1. *Thyroid Hormones* :

L-thyroxine	*Thyroxine Sodium Tablets* : Strengths—0.05mg and 0.1mg	

8.7.2. *Anti-Thyroid Drugs* :

Carbimazole	*Carbimazole Tablets* : Strength—5mg	
Iodine+Potassium Iodine	Solution, containing 5 *per cent* Iodine and 10 *per cent* Potassium Iodide in purified water.	
Propylthiouracil ..	*Propylthiouracil Tablets* : Strength—50mg	

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	
RADIO-ACTIVE .. .. SODIUM IODIDE	Solution of radio-active Sodium Iodide (131 I). Suitable for oral administration.	*Sodium Iodide* (131 1) *Injection :* Sterile Solution of radio-active Sodium Iodide (131 I) with sodium thiosulphate as reducing agent.	

9. ANTI-INFECTIVE DRUGS

9.1. AMOEBICIDES

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Other Dosage Forms*
METRONIDAZOLE	*Metronidazole Tablets :* *Strengths*—200 and 400mg	*Metronidazole Injection :* Strength—5mg in 5ml in 100ml bottles	*Suppositories :* Strength—0.5 and 1g
CHLOROQUINE	*See* 9.6.		
TINIDAZOLE	*Tinidazole Tablets :* Strength—500mg	*Tinidazole Injection :* Strength—2mg/ml in 400ml infusion bottles	

9.2. ANTHELMINTIC DRUGS

MEBENDAZOLE	*Mebendazole Tablets :* Strength—100mg	*Mebendazole suspension :* Strength—100mg/5ml	
NICLOSAMIDE	*Niclosamide Tablets :* Strength—500mg.		
PIPERAZINE	*Piperazine Tablets :* Adipate or Citrate—500mg	*Piperazine Citrate Elixir :* Piperazine Citrate—937.5mg. Peppermint Spirit—0.025ml Green Sand Tartrazine Soln. —0.075ml Glycerol—0.5ml Syrup —2.5 ml Water to—5.0ml Contains the equivalent of 750mg Piperazine hydrate per 5ml.	

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Mixtures/Syrup/Suspensions*
PYRANTEL	*Pyrantel Pamoate Tablet* Strength—125mg	*Pyrantel Pamoate Syrup* ; Strength—125mg/5ml	
THIABENDAZOLE	*Thiabendazole Tablets* : Strength—500mg	*Thiabendazole Suspension* : Strength—500ml	
OTHERS			
BEPHENIUM HYDROXYNAPHTHOATE			*Bephenium Granules* : *Strength—2.5g/5g Sachets.*
LEVAMISOLE	*Levamisole Tablets* : Strength—40mg as hydrochloride	*Levamisole Syrup* : Strength—40mg as hydrochloride	
NIRIDAZOLE	*Niridazole Tablets* : Strengths—100 and 500mg		

9.3 ANTI-FILARIAL DRUGS

DIETHYLCARBAMAZINE	*Diethylcarbamazine Tablets* : Strength—50mg	*Diethylcarbamazine Injection* : Strength—200mg/ml in 1ml ampoules	
SURAMIN SODIUM		*Suramin Sodium Injection* : Strength—1g powder in vial. Dissolved in 10ml water for injection before use.	

9.4 ANTI-SCHISTOSOMAL DRUGS

METRIFONATE	*Metrifonate Tablets* : Strength—100mg		
OXAMNIQUINE	*Oxamniquine Capsules* : Strength—250mg	*Oxamniquine Syrup* : Strength—250mg/5ml	
PRAZIQUANTEL	*Praziquantel Tablets* : Strength—600mg		

9.5. Anti-Trypanosomal Drugs

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Mixtures/Syrup/Suspension*
Melarsoprol	—	3.6% w/v Solution	
Pentamidine	—	200mg as isothionate or mesylate	
Suramin Sodium	—	*see* 9.3.	

9.6. Anti Malaria Drugs

Chloroquine	*Chloroquine Tablets :* Strength—as Phosphate—250mg as Sulphate—200mg Equivalent to 150mg of base	*Chloroquine Injection :* Phosphate—67mg/ml in 5ml amp. Sulphate—50mg/ml in 5ml amp. Equivalent to 40mg of base	*Chloroquine Elixir :* Phosphate-80mg/5ml Sulphate-67mg/5ml Equivalent to 50mg of base.
Pyrimethamine	*Pyrimethamine Tablets :* Strengths—12.5 and 25mg		
Pyrimethamine Plus Sulphadoxine	Tablets Containing : Pyrimethamine-25mg Sulphadoxine-500mg	Injection Containing/ml Pyrimethamine-10mg Sulphadoxine-200mg in 2.5ml ampoules.	Syrup Containing/5ml : Pyrimethamine-25mg Sulphadoxine-500mg

9.7. Anti-Flagellates : Metronidazole and Tinidazole—*See* 9.1

9.8. Anti Bacterial Drugs

9.8.1. *The Penicillins*

Benzyl Penicillin	*Tablets :* 250mg (400,000 units) *Mixture/Elixir :* 125mg (200,000 units)/5ml 250mg (400,000 units)/5ml.	*Benzyl Penicillin Sodium* Injection : powder in vials. 300mg (500,000 units) 600mg (1 mega Unit) 3g (5 mega units)	Benzyl Penicillin *Eye Drops :* Benzyl penicillin-15mg Sodium Citrate-50mg Phenyl mercuric nitrate-0.002%

	Benzathine Penicillin Tablets : 150mg (200,000 Units) *Penicillin G Potassium Tablets :* 125mg (200,000 units) 250mg (400,000 units) 500mg (800,000 units) of Benzyl penicillin	6g (10 mega units) *Fortified Benzathin Penicillin Injection :* Injection ; powder in vials. 1.2 mega units contains : Benzathine Penicillin—450mg (600,000 units) Benzyl Penicillin Potassium— 190mg (300,000 units) Procaine Penicillin—300mg (300,000 units)	Water for Injection to 10ml Prepared aseptically. *Eye Ointment* Benzyl penicillin-q.s. Liquid paraffin—5g White soft paraffin—95g *Penicillin Ointment :* Benzyl penicillin—q.s. Liquid paraffin—5g White soft paraffin—95g

Drug Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injections*	*Mixtures/Syrup*	*Other Dosage Forms*
Ampicillin	*Ampicillin Trihydrate Tablets :* 125 and 250mg of base *Capsules :* 250 and 500mg	*Ampicillin Sodium (Salt)* Injection : Powder for reconstitution with water for injection, in vials : 250 and 500mg. of base *Ampicillin plus Cloxacillin* Injection : Containing : Ampicillin—250mg Cloxacillin—250mg (as the Sodium salt) *Ampicillin plus Cloxacillin Neonatal Injection :* Ampicillin—50mg Cloxacillin—25mg (as the Sodium salt)	*Ampicillin Suspension :* Powder for reconstitution with water for preparation, in bottles : *Usual strength :* 125mg/5ml. *Strong Suspension :* 250mg/5ml. (as the Trihydrate) *Ampicillin plus Cloxacillin Neonatal Suspension :* Ampicillin—60mg/0.6ml (as trihydrate) Cloxacillin 30mg/0.6ml (as Sodium salt) Powder for reconstitution	*Eye Drops :* Ampicillin Sodium—1% Phenyl mercuric—nitrate—0.002% Water for injection to 100% Sterilised by filtration *Eye Ointment :* Ampicillin Sodium 2% Liquid Paraffin 25% White Soft Paraffin to 100%
CLOXACILLIN	*Cloxacillin Capsules :* Strengths—250 and 500mg	*Cloxacillin Injection :* Strength—250mg (as Sodium salt)	*Cloxacillin Syrup :* Strength—125mg/ml (as Sodium salt) Powder for reconstitution	*Cloxacillin Ear Drops :* Containing : Cloxacillin Sodium 1% Phenylmercuric nitrate—0.002% OR Methyl hyroxy—benezoate—0.1%

CLOXACLLIN				Sodium Citrate-0.5% Water for Injection to 100% Sterilised by filtration. *Note :* the addition of glycerol or propylene glycol would decrease the stability.
FORTIFIED PROCAINE PENICILLIN		*Injection :* Containing : Proc. Penicillin—5parts Benzyl Penicillin Potassium or Sodium 1 part		
CARBENICILLIN		Strength—2g in vial (as Sodium salt)		
AMOXYCILLIN	Strengths—250,500mg (as trihydrate)	Strengths—250, 500mg (as trihydrate)	*Amoxycillin Syrup* Strength—125mg/5ml	

9.8.2 *The Tetracycline*

	Presentations		
Drug Name (Generic)	*Tablets/Capsules*	*Mixtures/Syrup/Suspensions*	*Other Dosage Form*
TETRACYCLINE	*Tetracycline Hydrochloride Tablets or Capsules.*—250, 500mg.	*Tetracycline Hydrochloride Syrup*—125mg/5ml	*Tetracycline Eye Ointments.* 1% (as hydrochloride)
OXYTETRACYCLINE	*Oxytetracycline Tablet* 250mg (as dihydrate) *Oxytetracycline Capsules*—250mg (as hydrochloride)	*Oxytetracycline Syrup*—125mg/5ml (as Calcium salt)	
CHLORTETRACYCLINE	*Chlortetracycline Capsules.*—250mg (as hydrochloride)		*Chlortetracycline Eye Ointment*—1 (as hydrochloride)
DEMECLOCYCLINE	*Demeclocycline Capsules*—150mg (as hydrochloride)	*Demeclocycline Syrup*—75mg/5ml.	
DOXYCYCLINE	*Doxycycline Capsules.*—100mg (as hydrochloride)	*Doxycycline Syrup*—50mg/5ml (as calcium chelate)	

9.8.3. *The Aminoglycosides* :

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Other Dosage Forms*
GENTAMICIN		*Gentamicin Injection.*— 80mg in 2ml vials, (as sulphate) *Gentamicin Inj. Paediatric.*— 10mg in 2ml vials.	*Gentamicin Sulphate— Eye Drops/Ointment*— 0.3% in suitable basis Sterile *Gentamicin Hydrocortisone Ointment/Cream*— *Gentamicin Sulphate* 0.3% *Hydrocortisone acetate* 1.0%
STREPTOMYCIN		*Streptomycin Sulphate Injection*— 1g and 5g in vials.	
NEOMYCIN	*Neomycin Sulphate Tablets*— Strength—500mg.		
KANAMYCIN		*Kanamycin Sulphate Injection*— Strength—250mg/ml in 4ml vials.	

9.8.4. *Other Broad Spectrum Antibiotics.*

Drug Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injections*	*Mixtures/Syrup*	*Other Dosage Forms*
CHLORAMPHENICOL	Strength—250mg.	Strength—1g in vial (as sodium succinate) Powder for reconstitution	Strength—125mg/5ml (as palmitate)	*Eye Drops*— Strength—0.5% *Eye Ointment* ; Strength—1% *Ear Drops.*— Strengths—5 and 10% In suitable basis. *Eye Ointment*— 5mg/g in suitable basis. *Erythromycin Ointment*— 10mg/g in suitable basis.
ERYTHROMYCIN	*Tablets.* 250, 500mg (as *stearate*) *Capsules*— 250mg (as estolate)	Strength—0.5 and 1g (as lactobionate) Powder for reconstitution.	*Syrup*—125mg/5ml and 250mg/5ml (as ethyl succinate, stearate or estolate)	
LINCOMYCIN	*Capsules*—500 mg (as hydrochloride)	*Injection*—500mg (as hydrochloride)	*Syrup*—250mg/5ml (as hydrochloride)	
SPECTINOMYCIN		*Injection*—2g in vial (as hydrochloride)		
CEPHALOSPORINS e.g. Cefotaxime Cefuroxime Cephalexin	Cephalexin, 250, 500mg	Cefotaxime—1, 2g vials. Cefuroxime—750mg, 1.5g Cephalexin—250, 500mg	Cephalexin *Syrup*— 125mg/5ml.	

9.8.5. *The Sulphonamides* :

Drug Name (Generic)	*Presentations*		
	Tablets/ Capsules	*Injections*	*Mixtures/Syrup/ Suspensions*
PHTHALYLSULPHATHIAZOLE	*Tablets* : Strength—500mg		
SULPHADIMIDINE ..	*Tablets* : Strenth—500mg	*Sulphadimidine Sodium Injection* : Strength—333mg/ml in 3ml ampoules.	
SULPHAMETHOXAZOLE .. Plus TRIMETHOPRIM .. .. (Co-Trimoxazole)	*Co-trimoxazole Tablets* : Strength— Sulphamethoxazole 400mg Trimethoprim 80g *Paediatric Tablets* : Sulphamethoxazole 100mg Trimethoprim 20mg	*Co-trimoxazole Injection* : Containing (480mg) in 5ml Sulphamethoxazole 400mg Trimethoprim 80mg Each 5ml to be diluted to 125ml with glucose or Sodium chloride infusion before use.	*Co-trimoxazole Mixture* : Containing per 5ml : Sulphamethoxazole—400mg Trimethoprim—80mg In suitable flavoured base. *Parediatric Mixture* : Containing per 5ml : Sulphamethoxazole—200mg Trimethoprim—40mg In suitable flavoured base.
SULPHAGUANIDINE	*Tablets* : Strength—500mg		*Suspension* Strength—500mg/5ml

9.8.6. *Other Antimicrobial Drugs* :

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Mixtures/Syrup/Suspensions*
METRONIDAZOLE ..	See 9.1		
NITROFURANTOIN	*Nitrofurantoin Tablets* : Strengths—50 and 100mg *Nitrofurantoin Capsules* : Strengths—50 and 100mg		*Nitrofurantoin Mixture* Strength—25mg/5ml
NALIDIXIC ACID	*Nalidixic Acid Tablets* : Strength—500mg		*Nalidixic Acid Mixture* : Strength—300mg/5ml

9. 9. Anti-Liprosy Drugs

Drug Name (Generic)	Presentations		
	Tablets/Capsules	*Injections*	*Mixtures/Syrup/Suspensions*
Clofazimine	*Capsules*—100mg		
Dapsone .. .. (*Restricted use*)	*Tablets*—50 and 100mg	*Injection*—20 per cent w/v Suspension	
Rifampicin	*Capsules*—150 and 300mg		*Mixture*—100mg/5ml

9.10 Anti-Tuberculosis Drugs

Isoniazid	*Tablets*—50,100 and 300mg	*Injection*—25mg/ml in 2ml ampoules	*Elixir*—50mg/5ml
Rifampicin	*Capsules*—150 and 300mg		*Mixture*—100mg/5ml
Rifampicin plus Isoniazid	*Rifampicin+Isoniazid Tablets* : Rifampicin 150mg Isoniazid 100mg Rifampicin 300mg Isoniazid 150mg		
Thiacetazone plus Isoniazid	*Thiacetazone + Isoniazid* Thiacetazone 50mg plus Isoniazid 100mg and Thiacetazone 150mg plus Isoniazid 300mg		
Streptomycin		*Streptomycin Sulphate Injection :* Strength—1g and 5g vials.	
Pyrazinamide	*Pyrazinamide Tablets :* Strength—500mg		

9.11. Systemic Anti-Fungal Drugs

Drugs Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injections*	*Mixtures/Syrups*	*Other Dosage Forms*
Griseofulvin	*Griseofulvin Tablets* : 125, 250 and 500mg		*Griseofulvin Suspension* 125mg/5ml	
Others				
Amphotericin	*Amphotericin Tablets* : Strength—100mg	*Amphotericin Injection* : Strength—50mg vial (as Sodium deoxycholate) powder for reconstitution.	*Amphotericin Mixture* : Strength—100mg/ml To be measured with pipette.	*Amphotericin Pessaries* : 50mg in a suitable base.
Ketoconazole	*Tablets* : Strength—200mg			
Miconazole	*Tablets* : Strength—250mg	*Injection:* Strengnth—10mg/ml in 20ml ampoules.	*Oral Suspension:* 25mg/ml	*Cream/Pessaries* : Cream—2% Pessaries—100mg (as nitrate)

10. DERMATOLOGICAL DRUGS

10.1. Anti-Inffective Drugs

Drug Name (Generic)	*Presentations*	
	Cream/Ointment/Lotion/Solution	*Powder*
Neomycin + Bacitracin	*Neomycin and Bacitracin Ointment* : Barcitrascin Zinc 500,000 Units, Neomycin Sulphate—500mg Liquid paraffin—10mg White soft paraffin to—100g	*Neomycin and Bacitracin Powder* : Bacitracin— 500mg Neomycin Sulphate—250mg Sterilised absorption dusting Powder—99.25g

10.2. Anti-Inflammatory Drugs

Drug Name (Generic)	*Presentation*	
	Cream/Ointment/Lotion/Solution	*Powder*
Betamethasone	*Betamethasone Cream* : A freshly prepared cream containing usually 0.01 or 0.1% Betamethasone. *Betamethasone valerate lotion* : Contains 0.1% betamethasone in a suitable anhydrous greasy base.	

10,3. Astringents

Calamine+Zinc Oxide	*Calamine Lotion* : Calamine—15% Zinc Oxide—5% Bentonite—3% Sodium Citrate—0. 5% Liq. Phenol—0.5% Glycerin—5ml Freshly boiled and cooled purified water to 100ml.	

10.4. Dusting Powder

Zinc + Starch + Talc		*Dusting Powder* Zinc Oxide 250g starch 250g Purified Talc (Sterilised) 500g

10.5. Fungicides

Benzoic Acid + Salicylic Acid	*Benzoic Acid Ointment* : Benzoic acid in fine powder 60g Salicylic acid in fine powder 30g Emulsifying oint 910g	
Clotrimazole	*Clotrimazole Cream* : clotrimazole 1% in a water miscible basis.	

Drug Name (Generic)	*Presentations*	
	Cream/Ointment/Lotion/Solution/Paint/Paste	
NYSTATIN	*Nystatin Ointment* : A dispersion of Nystatin of specified particle size in a polyethylene mineral oil base or other suitable anhydrous base. Usual strength : 100,000 units per g.	*Nystatin Powder* : Containing 100,000 units per g of Nystatin.

10.6. KERATOLYTIC DRUGS

SALICYLIC ACID	(*a*) *Salicylic acid lotion* : Salicylic acid 2g Castor Oil 1ml Alcohol or industrial methylated Spirit to 100ml (*b*) *Salicylic acid ointment* : Salicylic acid 20g Wool alcohol ointment 980g.	
TAR	(*a*) *Coal Tar Cream* : Containing : Coal Tar——2g Cetomacrogol (1000)——5g Isopropyl myristate——22g Wool fat——15g Emulsifying Wax——5g Water to——100g (*b*) *Coal Tar Ointment* : Coal Tar——1g Polysorbate (80)——0.5g Zinc Oxide Paste——98.5g (*c*) *Coal Tar Paint* : Coal Tar——10g Xylene of Commerce——45ml Acetone to——100ml	(*d*) *Coal Tar Paste* : Containing : Coal Tar——1g Castor Oil——1g Compound Zinc Paste——98g (*e*) *Coal Tar and Steroid Cream* : Coal Tar Solution——3% Hydrocoritisone——0.25% In a water-miscible non-greasy basis. *OR* Coal Tar Solution 2% Hydrocortisone 0.5% In a water-miscible non-greasy basis.

* *Note* : Coal tar solution is prepared by extracting 20g Coal tar with 5g Polysorbate (between) 80 and 70ml alcohol, filtered, and then Volume adjusted to 100ml with more alcohol.

10.7. Scabicides and Pediculicides

Drug Name (Generic)	Presentations	
	Cream/Ointment/Lotion/Solution	Powder
Benzyl Benzoate	*Benzyl Benzoate Lotion.* Benzyl Benzoate 25 ml Triethanolamine 500ml Oleic acid 2g Water 75mls *(b) Benzyl Benzoate Application :* Benzyl Bensoate 25% w/v with emulsifying wax and water	
Lindane	*(i) Gamma Benzene Hexachloride Cream* Gamma Benzene Hexachloride 1% in a suitable croambasis. *(ii) Gamma Benzene Hexachloride Lotion :* Gamma Benzene Hexachloride 1% in a suitable aqueous vehicle.	
Monosulfiram	*Monosulfiram Solution :* Monosulfiram 25% in industrial methylated spirit.	

10.8 Antiseptics

Benzoin	*Compound Benzoin Tincture* Prepared by macerating the following with 90% alcohol. Sumatra Benzoin 10% Prepared storax 7.5% Tolu Balsam 2.5% Aloes 2%	
Chlorhexidine	*Chlorhexidine Gluconate Solution :* 20% Solution of Chlorhexidine Gluconate.	

	Presentations	
	Cream/Ointment Lotion	*Powder*
CHLOROXYLENOL	*Chloroxylenol Solution* : Chloroxylenol 50g Potassium Hydroxide 13.6g Oleic acid 7.5ml Castor oil 63.0g Terpineol 100ml Alcohol 5% 200ml Purified water to 1000ml	
IODINE	*Aqueos Iodine Solution* : Iodine—5gm Pot. Iodine—10gm Water to—100 ml *Iodine Tincture* : Iodine—25gm Pot. Iodine—2.5 gm Purified water 2.5ml Alcohol (90%) to 1000ml	
METHYLATED SPIRIT	*Methylated Spirit* : Methylated Spirit (containing ethanol) 19 part and methanol 1 part)	
HYDROGEN PEROXIDE	*Hydrogen Peroxide Solution* : Consists of Hydrogen Peroxide 6% (20 vols)	
POTASSIUM PERMANGANATE	*Potassium Permanganate Solution* 1% Potassium Permanganate 10g water to 1000mls It is used as a 1 in 1000 solution in water.	
GENTIAN VIOLET	*Gentian Violet Paint* (0.5%) Crystal Violet 500mg water to 100m	
SILVER NITRATE	*Toughened Silver Nitrate* : Silver Nitrate 9% Potassium Nitrate 5% —fused together and suitably moulded	

11. EYE DRUGS

11.1. Anti-Infective Drugs

Drug Name (Generic)	*Presentations*	
	Cream|Ointment|Lotion	*Eye|Ear|Nose|Drops*
CHLORAMPHENICOL	*Chloramphenicol Eye Ointment* : (*See* 9.8.4.) *Chloramphenicol Eye Drops* : (*See* 9.8.4.)	
SULPHACETAMIDE	*Sulphacetamide Eye Ointment* : Usual Strength 10 *per cent*	*Sulphacetamide Eye Drops* : Usual Strengths 10 and 30 *per cent*
CHLORTETRACYCLINE	*Chlortetracycline Eye Ointment* : *See* 9.8.2. (Other Tetracyclines)	

Other Anti-Infectives :

GENTAMICIN		*Gentamicin Eye Drop* : Gentamicin-0.3 *per cent* (as Sulphate)
FRAMYCETIN	*Famycetin Eye Ointment* : Strength 0.5 *per cent* in a sterile greasy base.	*Framycetin Eye Drops* Containing 0.5 *per cent* of Framycetin Sulphate in Suitable basis.
IDOXURIDINE	*Idoxuridine Eye Ointment* : Idoxuridine Eye Ointment 0.5 *per cent* (in a soft paraffine base)	*Idoxuridine Eye Drops*

11.2. Anti-Inflammatory Drugs

Drug Name (Generic)	*Presentations*	
	Cream/Ointment/Lotion	*Eye/Ear/Nose/Drops*
Betamethasone		*Betamethasone Eye Drops* Strength 0.1 *per cent.*
Oxyphenbutazone	*Oxyphenbutazone Eye Ointment* : Oxyphenbutazone 10 *per cent.*	
Tetrahydrozoline		*Tetrahydrozoline Hydrochloride Eye Drops* Strength 0.5 *per cent.*
Hydrocortisone	*Hydrocortisone Eye Ointment* : Hydrocortisone Acetate 2.5 *per cent* (in suitable sterile basis)	*Hydrocortisone Eye Drops* : Strength 1 *per cent*
Prednisolone	*Prednisolone Eye Ointment* : Containing 0.5 *per cent* of Prednisolone in suitable basis	*Prednisolone Eye Drops* : Strength 0.5 *per cent.*
Amethocaine	11.3. Local Anaesthetics	*Amethocaine Eye Drops.* Strength : 1 *per cent.*
Lignocaine		*Lignocaine Eye Drops* Strength : 4 *per cent.*

11.4 Miotics and nti-Glaucoma Drugs

11.4.1. *Toaical Prepprations*		
Pilocarpine		*Pilocarpine Eye Drops* : Strength 1, 2, 3 and 4 *per cent.*
Physiostigmine		*Physiostigmine Eye Drops.* Strengths : 0.25 and 0.5 *per cent*

11.4.2. *Systemic Preparations :*

Drug Name (Generic)	*Presentations*	
	Tablets/Capsules	
ACETAZOLAMIDE	*Acetazolamide Tablets :* Containing Acetazolamide 250mg.	

11.5. MYDRIATICS

Drug Name (Generic)	*Presentations*	
	Cream/Ointment/Lotion	*Eye/Ear/Nose/Drops*
HOMATROPINE		*Homatropine Eye Drops* Containing 1 or 2 *per cent* of Homatropine Hydrobromide
TROPICAMIDE		*Tropicamide Eye Drops.* Containing 0.5 and 1 *per cent* of Tropicamide
ATROPINE CYCLOPENTOLATE		*Atropine Eye Drops :* Atropine Sulphate 1 *per cent* *Cyclopentolate Eye Drops :* A sterile solution containing Cyclopentalate Hhydrochloride 1 *per cent*

11.6. OTHER EYE PREPARATIONS

SODIUM CHLORIDE	*Sodium Chloride Eye Lotion* Containing 0.9 *per cent* of sterile solution of Sodium chloride in water	

12. EAR, NOSE AND THROAT DRUGS

12.1. DAYS ACTING ON THE EAR

12.1.1. *Anti-Infactives*

CHLORAMPHENICOL		*Chloramphenicol Ear Drops* (See 9.8.4)
FRAMYCETIN		*Framycetin Ear Drops* Strength : 0.5 %

12.1.2. *Combined Anti infective and Anti inflammatory preparations*

HYDROCORTISONE PLUS NEOMYCIN		*Hydrocortisone and Neomycin Ear Drops* Containing Hydrocortisone 0.5g Neomycin Sulphate 0.5g orpylene glycol to 100ml
HYDROCORTISONE PLUS OXYTETRACYCLINE PLUS POLYMYXIN B		*Hydrocortisone and Oxytetracycline and Polymyxin B Ear Drops* Containing Hydrocortisone Acetate 1.5 *per cent*, Oxytetracycline Hydrochloride 0.5 *per cent*, Polymyzin B Sulphate 0.119 *per cent*.
DEXAMETHASONE PLUS FRAMYCETIN PLUS GRAMICIDIN		*Dexamethasone and Framycetin and Gramicidin Eye/Ear/Drops* : Containing Dexamethasone Sodium Metasulphobenzoate 0.05% Framycetin Sulphate 0.5% Gramicidin 0.005%

12.2 DRUGS ACTING ON THE NOSE

12.2.1. *Anti-allergic and Nasal Decongecesant.*

ANTOZOLINE PLUS NAPHAZOLINE		*Antazoline and Naphazoline Nasal Drops* Containing Antazoline Sulphate 0.5% Naphzolinne 0.025% Also available as spray.

12.3. DRUGS ACTING ON THE THROAT

12.3.1. *Gargles*

Drug Name (Generic)	*Presentations*
	Solution
GLYCEROL PLUS THYMOL (COMPOUND THYMOL GLYERINE)	*Glycerol and Thymol mouthwash* Thymol .. .. Containing 0.5g. Glycerol .. .. 100 ml. Carmin .. .. 0.30.

GPLLYCEROLUS THYMOL
(COMPOUND THYMOL GLYEINE)

Glycerol and Thymol mouthwash

	Containing
Menthol	0.30g
Sodium Metabisulphite	0.35g
Sodium Salicylate	5.20g
Sodium Benzoate	8.00g
Sodium Bicarbonate	10.00g
Borax	20.00g
Methy Salicylate	0.30ml.
Pumiliopine oil	0.50ml.
Dilute Ammonia solution	0.75ml.
Cineole	1.30ml.
Alcohol 90 per cent	25.00ml.
Water to	1000.00ml.

When used as a gargle or mouthwash it should be diluted with about 3 timesits volume of warm water. Do not swallow. Diluted solution to be used immediately Discard unused portion.

13. DENTAL DRUGS

13.1, LOCAL ANAESTHETICS

Drug Name (*Generic*)	*Presentations*		
	Lozenges/Tablets/Injections	*Cream/Ointment/Lotion*	*Solutions*
BENZOCAINE	*Compound Benzocaine Lozenges*—Each Lozenge weighs about 1g and contains : Benzocaine 100mg Menthol 3mg		
LIGNOCAINE	*Lignocaine Hydrochloride Injection.*—*See* 2.4.	*Lignocaine Ointment :* Contains Lignocaine 2–4 *per cent* in a water miscible basis.	

13.2. MOUTH WASHES

GLYCEROL* THYMOL			*Compound Glycerol-Thymol Solution :* Containing Glycerol 10 *per cent* Thymol 0.05 *per cent* with colouring and flavouring.

13.3. OTHER DENTAL DRUGS

Analgesics and Anti-infectives—*See* relevant sections.

14. 1. Drugs For Musculo-Skeletal and Joint Diseases

14. Non Steroidal Anti-Inflammatory Drugs (Nsaid)—For Acetylsalicylic Acid—*See* 1.1.3.

Drug Name (Generic)	*Presentations*			
	Tablets/Capsules	*Injections*	*Mixtures/Syrup/Suspension*	*Other Dosage Forms*
Ibuprofen	*Ibuprofen Tablets* (Sugar-coated) Strength—200mg		*Ibuprofen Elixir* Contains : Ibuprofen 100mg/5ml. Diluted syrup to be used within 14 days.	
Indomethacin	*Indomethacin Capsules* : Strengths—25 and 50mg *Indomethacin Slow-Release Capsules* Strengths—25 and 50mg		*Indomethacin Suspension* Strength—25mg/5ml Do not dilute.	*Indomethacin Suppository* Contains : 100mg Indomethacin in a suitable basis.
Diflunisal	*Diflunisal Tablets* Strength—250, 500mg			
Piroxicam	*Piroxicam Capsules* Strength 10mg			
Sulindac	*Sulindac Tablets* Strength—100, 200mg			

14.2. Drugs Used For Gout

Allopurinol	*Allopurinol Tablets* Strengths—100mg and 300mg	
Colchicine	*Colchicine Tablets* Strengths—0.25 and 0.5mg	
Probenecid	*Probenecid Tablets* : Strength—500mg.	

15. ANTI-ALLERGIC DRUGS

15.1 Anti-Histamines

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules	*Injections*	*Mixtures/Elixir/Suspensions*
CHLORPHENIRAMINE	*Chlorpheniramine Maleate Tablets* Strength—4mg.	*Chlorpheniramine Injection* Strength—10mg/ml in 1ml ampoule	*Chlorpheniramine Elixir* Strength—2mg/5ml. In a suitable coloured, flavoured vehicle. *Chlorpheniramine expectorant. Mixture For Infants* Chlorpheniramine Maleate 500mg Potassium Iodide 60mg Belladona Tincture 0.04ml. Ephedrine Hydrochloride 8mg Liquorice Liq. Extract 0.5ml Syrup 0.5ml Water to 5.0ml
PROMETHAZINE	*Promethazine Hydrochloride Tablets :* Strength—10 and 25mg	*Promethazine Injection* Strength—25mg/ml in 1ml and 2ml ampoules.	*Promethazine Elixir* Strength—5mg/5ml Diluent Syrup. Orange flavoured.
MEPYRAMINE	*Mepyramine Maleate Tablets :* Strengths-50mg and 100mg	*Mepyramine Injection* Contains Mepyramine maleate. Strength-25 and 50mg. In Iml and 2ml ampoules.	*Mepyramine Elixir :* Contains Mepyramine-maleate, 25mg/5ml. Diluent syrup.
DIPHENHYDRAMINE	*Diphenhydramine Hydrochloride Capsules :*	*Diphenhydramine Injection :* Sterile solution of Diphenhydramine hydrochloride in water for injection. Strength-10mg and 50mg/ml.	*Diphenhydramine Elixir :* Contains Diphenhydramine hydrochoride in a suitable coloured, flavoured vehicle.

a suitable coloured,

Drug Name (Generic)	*Presentations*		
	Tablets/Capsules/Granules	*Injections*	*Other Dosage Forms*
	15.2. ANTI-ANAPHYLACTICS		
ADRENALINE		*Adrenaline Injection* : Contains 0.18% of Adrenaline acid tartrate (equivalent to Adrenaline 1 in 1000) with sodium metabisluphite and sodium chloride in water for injection.	
	15.3. PROPHYLACTINE DRUGS		
KETOTIFEN	*See* 6.1.4.		

16. ANTIDOTES

16.1. NON-SPECIFIC (GENERAL) ANTIDOTES

CHARCOAL ACTIVATED	*Charcoal Tablets* : Contains : Charcoal.....250mg; Sucrose.....150mg; Lactose.....100mg; Wheat Starch.....100mg; Tragacanth.....20mg; Bentomite.....70mg; Water.....480mg		
	Universal Antidote : Contains : Charcoal .....2g; Tannic acid.....1g; Magnesium Oxide.....1g; *Dose* 15g in a tumblerful of water or milk after gastric lavage.		
	Charcoal Powder/Granules : 5g sachets. Effervescent granules		

Drug Name (Generic)	*Presentations*	
	Injection	*Other Dosage Forms*
ATROPINE (*see* 2.2.1) DESFERRIOXAMINE	*Desferrioxamine Injection* : Sterile solution of Desferrioxamine mesylate in water for injection. Prepared immediately before use by dissolving the contents of a sealed container in water for injection. Strength—500mg vials. Powder for re-constitution.	*Desferrioxamine Ophthalmic Ointment* : % Desferrioxamine .. .. 5.0 Cetyl alcohol .. .. 0.4 Wool fat .. .. 4.6 White soft paraffin .. .. 65.0 Liquid Paraffin .. .. 30.0 *Desferrioxamine Eye-drops* : Sterile Desferrioxamine .. .. .. 500mg Methylecelulose (4000) .. .. .. 0.5% Benzyl Alcohol .. .. 1.0% Water for Injection to 1ml
DIMERCAPROL	*Dimercaprol Injection* Sterile 5% W/V solution of Dimercaprol in Benzylbenzoate and Arachis oil. *Dimercaprol Injection* 10% Dimercaprol .. .. 10g Benzyl benzoate .. .. .. 20g Arachis oil to .. .. 100ml PH adjusted to 6.8-7.0 with alcoholic ammonia solution.	
NALOXONE	*Naloxone Hydrochloride Injection* : Strength 0.4mg/ml in 1ml ampoule.	
PROTAMINE SULPHATE	*Protamine Sulphate Injection* : Strength—10mg/ml in 5ml ampoules. Store in a cool place.	

Drug Name (Generic)	Presentations		
	Tablets/Capsules	Injections	Other Dosage Forms
PHYTOMENADIONE (VITAMIN K1)		*Phytomenadione Injection* : Strengths—2mg and 10mg/ml in 1ml ampoule.	
SODIUM CALCIUM EDETATE	*Sodium Calcium Edetate Tablets* : Strength—500mg of anhydrous Calcium Edetate	*Sodium Calcium Edetate Injection* : Sterile 20% W/V solution of sodium calcium edetate (anhydrous) in water for injection ; PH 6.5-8. Dilute with sodium Chloride injection or Dextrose injection before use.	*Sodium Calcium Edetate Eye Drops* : Sodium Calcium Edetate 4.1g Chlorhexidine Acetate 10mg water for injection 100ml.
PRALIDOXIME	*Pralidoxime Chloride Tablets* : Strength—500mg	*Pralidoxime Injection* Sterile 5% solution of Pralidoxime chloride ; PH 3.5-4.5	

17. DRUGS USED FOR CANCER CHEMOTHERAPY

17.1. ALKYLATING AGENTS

Drug Name (Generic)	Presentations	
	Tablets/Capsules	Injections
BUSULPHAN	*Busulphan Tablets* : Strength—0.5 mg and 2mg	
CHLORAMBUCIL	*Chlorambucil Tablets* : Strength—2mg and 5mg	
CYCLOPHOSPHAMIDE	*Cyclophosphamide Tablets* : Strength—25mg and 50mg	*Cyclophosphamide Injection* Contains the equivalent of the anhydrous substance—100mg, 200mg, 500mg and 1g vial.

17.2. Anti—Metabolities

6-Mercaptopurine	*Mercaptopurine Tablets* : Strength—50mg	
Methotrexate	*Methotrexate Tablets* : Strength—2.5mg	*Methotrexate Injection* : Strengths 2.5mg/ml and 25mg/ml in 2ml ampoules (sodium salt). Powder for re-constitution, 50mg, 500mg, and 1g vial.

17.3. Cytotoxic Antibiotics

Drug Name (Generic)	*Presentations*	
	Tablets/Capsules	*Injections*
Actinomycin-D		*Antinomycin-D Injection* : Strength—Powder for reconstitution 0.5 mg with mannitol), vials.
Adriamycin (Doxorubicin)		*Adriamycin* (Doxorubicin Hydrochloride) : Strength—Powder for reconstitution 10mg and 50mg (with lactosevials.)
Leomycin		*Bleomycin Injection* : Strength : Powder for reconstitution (as sulphate) 5mg and 15mg vials.

17.4. Vinca Alkaloids

Vincrestine		*Vincristine Sulphate Injection* : Strength—1mg and 5mg (with lactose) vials.

17.5. STEROIDS

Drug Name (*Generic*)	*Presentations*	
	Tablets/Capsules	*Injections*
PREDNISOLONE	*Prednisolone Tablets* : Strength—1 and 5mg	*Prednisolone Injection* : Strength—16mg/ml (as sodium phosphate and mg ml as acetate.
STILBOESTROL	*Stilboestrol Tablets* (*Diethylstilboestrol*) Strength—1,5 and 25mg.	
TAMOXIFEN	*Tamoxifen Tablets* ; Strength 10 and 20mg (as Citrate).	

18. IMMUNOLOGICALS

18.1. SERA AND IMMUNOGLOBULINS
18.2. VACCINES

18.2.1. Vaccines for Universal Immunization.

18.2.2. Vaccines for Specific Indications.

Note.—For dosage forms and strengths—*See* the manufacturer's literature. All vaccines should comply with the World Health Organisation's requirements for biological substances.

19. DIAGNOSTIC AGENTS

19.1. GENERAL DIAGNOSTICS

EDROPHONIUM	*Edrophonium Injection* : Sterile solution of Edrophonium chloride in water for injection. PH 5-6. Strength 10mg/ml in 1ml ampoules.	
TUBERCULIN PURIFIED PROTEIN DERIVATIVE (PPD)	*Tuberculin PPD Injection* : Contains the active principle of Old Tuberculin prepared from the fluid medium.	

Drug Name (Generic)	Presentations: Injections	Presentations: Other Dosage forms
	on which the tubercle bacilli have been grown. The liquid contains 100,000 units per ml, and the freeze-dried powder contains 30,000 units per mg. Not more than 0.5 *per cent* phenol is added. Diluted solutions are less stable and should be used immediately. Store at 2-10° C.	
19.2. Ophthalmic Agents		
Fluorescein	*Fluorescein Injection* : Sterile solution in water for injection. May contain sodium bicarbonate. PH 8-9.8. Strength—50 and 100mg/ml.	*Fluorescein Eye Drops* : Fluorescein sodium 250mg Phenylmercuric nitrate 4mg Water for Injection to 100ml. *Fluorescein Eye Drops* 2% Sterile solution of 2 per cent fluorescein sodium in water, with 0.002 *per-ecnt* of Phenyl mercuric nitrate as preservative.
19.3. Radio-Contrast Media		

(Generic) Drug Name	Presentations: Tablets/Capsule	Presentations: Injections	Presentations: Mixtures/Suspension/Elixir
Barium Sulphate			*Barium Sulphate Suspension* : Barium Sulphate 35g Sodium carbo ymethyl cellulose 2g (low viscosity grade) 70 *per cent* solution of dioctyl sodium sulphosuccinate 16ml Flavour 0.5ml Saccharin sodium 50mg 70 *per cent* solution of sorbitol 15ml Water to 100ml

Drug Name (Generic)	Presentations		
	Tablets/Capsules	*Mixtures/Syrup/Suspensions*	*Other Dosage Forms*
			Barium Sulphate Powder for Mixtures : Powder containing up to 100 *per cent* w/w of Barium sulphate with suitable flavouring and suspending agents. For preparing suspensions and mixtures containing up to 100 *per cent* w/v of Barium sulphate.

19.4. Gastro-Enterology Agents

Drug Name (Generic)	Presentations		
	Tablets/Capsules	*Injections*	*Mixtures/Suspensions*
Pentagastrin		*Pentagastrin Injection :* Sterile solution of Pentagastrin in water for injection. Strength—0.25mg/ml in 2ml ampoules.	

19.5. Other Diagnostic Agents

Iopanoic Acid	*Iopanoic Acid Tablets* Strength—500mg.	*Meglumine Iothalamate and Sodium Iothalamate Injections :* Strength : Meglumine Iothalamate 60% Sodium Iothalamate 80% In 20ml ampoules.	
Iothalamic Acid			
Meglumine and Sodium Diatrizoates		Meglumine Diatrizoate Injection 60% Sodium Diatrizoate Injection 50% In 20ml ampoules.	

INDEX

INDEX

INDEX

Made at Lagos this 13th day of December 1989.

GENERAL I. B. BABANGIDA
President, Commander-in-Chief of the Armed Forces, Federal Republic of Nigeria.

EXPLANATORY NOTE

(*This note does not form part of this Decree but is intended to explain its purport*)

This Decree prescribes a National Drug Formulary and Essential Drug List for the Country and prohibits the importation into and manufacture in Nigeria of anydrug not in the List.

The Decree also establishes a Review Committee to review the List from time to time.

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