Introduction to Pharmacology

Chandan Shrestha, PhD

Pharmacology: The Study of Medicine

- Derived from two Greek Word
  - *Pharmakon*- drug
  - *Logos*- study
- The science that deals with the study of drugs and its effect on biological system.
- An expansive subject ranging from understanding how drugs are administered, to where they travel in the body, to the actual responses produced.
- Utilizes concepts from human biology, pathophysiology, and chemistry.

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Branches of Pharmacology

1. **Pharmacokinetics**
   What body does to the drug?
   - ✓ *Study the fate of the drugs once ingested*
   - ✓ *Includes absorption, distribution, metabolism and excretion of drugs.*

2. **Pharmacodyanamics**
   What drug does to the body?
   - ✓ *Study the mechanism by which Drugs act*
   - ✓ *Physiological and biochemical effects of drugs*

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What is Drug?

- French: Drogue- a dry herb
- It is the single active chemical entity present in a medicine that is used for diagnosis, prevention, treatment/cure of a disease.
- WHO --- 1996 --- "Drug is any substance or product used or intended to be used to modify or explore the physiological state or pathological condition for the well being of the recipient"

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What are Drugs for?

- SYMPTOMATIC: To relieve symptoms of diseases. Example Aspirin.
- PREVENTIVE: To prevent getting diseases such as Influenza Flu Virus, Hepatitis, or Chicken Pox. Example vaccine.
- DIAGNOSTIC: Some drugs such as those that has radioactive traces are used for diagnosis purposes.
- CURATIVE: E.g. Antibiotics
- MAINTENANCE: used to maintain a certain desirable health level such as weight management issues, heart problems, diabetes, so on.
- CONTRACEPTIVE: used to prevent fertilization

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What makes ideal drugs?

- EFFECTIVENESS
- SAFETY
- SELECTIVITY
- FREEDOM FROM DRUG INTERACTIONS
- LOW COST
- CHEMICALLY STABLE
- EASY TO ADMINISTER

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Essential Drug

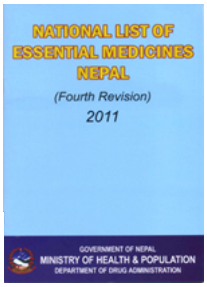
WHO definition…..

"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 appropriate dosage forms, at a price the community can afford."

- The WHO has published a model list of essential medicines.
- The "WHO Model List of Essential Medicines" has been updated every two years since 1977.
- The current version, the 22th, was published in 2021.

National List of Essential Medicines, NEPAL

- First published in 1999.
- Sixth Revision: 2021.



	Main List	Complementary List	Dosage Form
7.	**Antimigraine Medicines**		
7.1	**For Treatment of Acute Attack**		
	Paracetamol		tablet, 500 mg
	Ergotamine		tablet, 1 mg (tartrate)
7.2	**For Prophylaxis**		
	Propranolol		tablet 20 mg, 40mg (hydrochloride)

Prescription Verses Over The Counter drug

Prescription Drug: classifications of drugs which is accessible only by prescription from a licensed practitioner.

(Hypnotic drug, Narcotic drugs, habit forming drugs, drug given by injection, unsafe drugs which needs supervision of a licensed practitioner)

Advantages

- ✓ Opportunity to examine the patient and determine a specific diagnosis
- ✓ Maximize therapy by ordering the proper drug (amount and frequency of drug) for the patient's condition.
- ✓ Educate the patient on proper use of the drug and expected side effect.

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Prescription Verses Over The Counter drug

OTC drug do not require a physician's order.

Drugs available to the public without prescription.

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Pharmacopoeia

- An official code containing a selected list of established drugs and medical preparation with description of their physical properties and test for their identity, purity and potency.
- Examples- British Pharmacopoeia (BP), United States Pharmacopoeia (USP), Indian Pharmacopoeia (IP).

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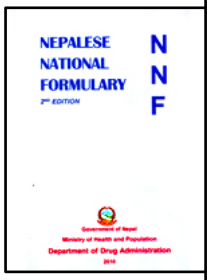
National Formulary

- The book published as product information on drugs available to prescribers.
- Examples: British National Formulary (BNF), Nepalese National Formulary (NNF)
- NNF is meant to provide information on medicines and their dosage forms available in the country (Nepal).
  - The first edition was published in 1997.
  - third edition in 2020.



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IBUPROFEN

It has anti-inflammatory, analgesic and antipyretic properties. The drug is often prescribed in lower doses, at which it is analgesic but inferior as an anti-inflammatory agent. It has fewer adverse effects than other NSAIDs but its anti-inflammatory activity is weaker.

Indications: rheumatic disease, musculo-skeletal disorders, post-operative pain, dysmenorrhoea.

Adverse effects and cautions: Gastrointestinal irritation, bleeding, rash, pruritis, tinnitus, dizziness, headache, fluid retention, vertigo.

Contra-indications and cautions: see under diclofenac.

Drug interactions: see under aspirin.

Dose: Initially 1.2-1.8 g daily in 3-4 divided doses preferably after food, increased if necessary to maximum of 2.4 g daily; maintenance dose of 0.6-1.2 g daily may be adequate, CHILD, 20-30 mg/kg daily in divided doses (juvenile arthritis, up to 40 mg/kg daily), not recommended for children under 5 kg.

Preparation available

Ibuprofen Tablets: Each tablet containing 200 mg, 400 mg and 600 mg of ibuprofen is usually available. Ibuprofen tablets are coated.

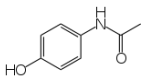
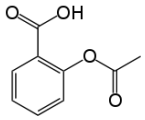
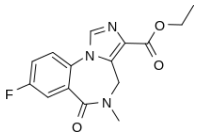
Drug Nomenclature

1. Chemical Name
   - Describes the substances chemically
   - Looks strange to anyone who isn't a chemist, pharmacists and is difficult to pronounce.

2. Non-proprietary Name
   - Generic Name
   - Name given by United States Adopted Name (USAN)

3. Proprietary Name
   - Brand Name
   - Name assigned by the manufacturer and his property or trademark.

Drug Nomenclature Cont…

Chemical Name	Generic Name	Brand Name
Para-acetylaminophenol 	Paracetamol	Niko Pacimol
Acetyl salicyclic acid 	Aspirin	Ecosporin Delisprin
R0 15-1788 	Flumazenil	

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Sources of Drugs

1. Plants
2. Animals
3. Minerals
4. Microbes
5. Synthetic
6. Genetic engineering

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Plants cont....

Plant	Part	Drug	Use
Purple Foxglove	Leaves	Digitalis	Congestive heart failure (CHF)
Cinchona	Bark	Quinine	anti malarial
Atropa Belladona	Leaves	Atropine	Organophosphate poisoning (OPPs)
Pappaverous somniferous	Poppy seed (opium)	Morphine Codeine	Opioid Analgesic Antitussive

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Animals

Animal	Part	Drug	Use
Cow/ Pork	Pancreas	Insulin	Antidiabetic hormone
Fish	Sperms	Protamine sulphate	Antidote of heparin
Pig	Intestine	Heparin	Anticoagulants
Ox	Lungs	Heparin	Anticoagulants
Cow	Stomach	pepsin	Digestive Hormone

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Microbes

Microbes	Name	Drug
Fungi	Penicillium	Penicillin
Actinomycetes	Streptomyces Venezuela Streptomyces aurefaciens	Chloramphenicol Tetracycline
Bacteria	Bacillus subtillis	Bacitracin

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Minerals

Minerals	Drug	Use
Magnesium	Milk of magnesia	Constipation
Iron	Ferrous sulphate	Anaemia
Calcium	Calcium sulphate	Osteoporosis
Aluminum	Aluminum Hydroxide	Antacid

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Synthetic

- Presently majority of drugs are obtained synthetically.
- produced using chemical synthesis, which rearranges chemical derivatives to form a new compound.
- Advantage
  - ✓ more effective and less toxic than the naturally obtained substances.
  - ✓ Quality can be controlled
  - ✓ Can be produced in large scale in short time.
- Examples: Sulfonamides, aspirin, amphetamines, barbiturates

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Genetic Engineering

- Genetic modification
- Set of technologies used to change the genetic makeup of cells, including the transfer of genes within and across species boundaries to produce improved or novel organisms.
- Examples: Hepatitis B vaccine,
  Human Insulin,
  Human Erythropoetin

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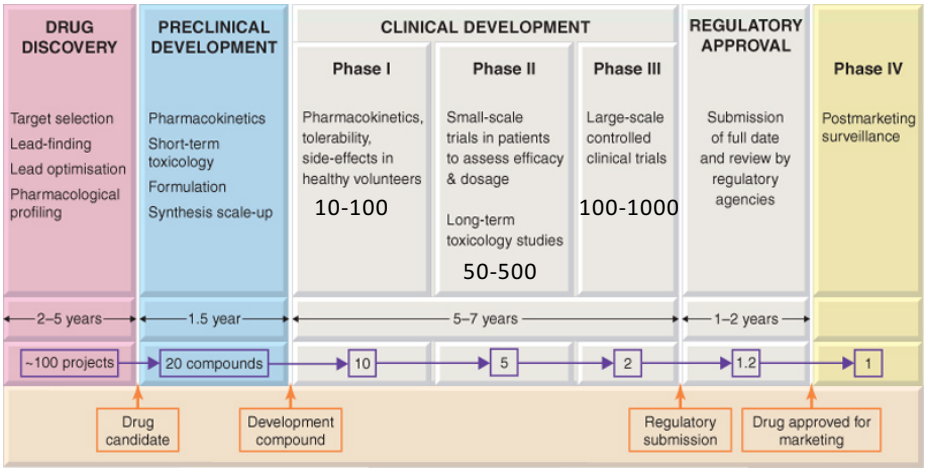
Drug Discovery and Development



FDA: Food and Drug Administration (US)
DDA: Department of Drug Administration (NEPAL; 1979 AD)

A **PATENT** is an intellectual property right granted "to exclude others from making, using, offering for sale, or selling the invention" for a limited time.

The drug patent is awarded for around twenty years in the United States.

Placebo: is anything that seems to be a "real" medical treatment- but isn't. It could be a pill, a shot, or some other type of "fake" treatment.

Why Pharmacology?

- Responsible for drug administer.
- directly involved with patient care.

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Drug Information Need to Know before Administration of Drugs

- ✓ *Generic and trade name*
- ✓ *Clinical uses and indications for use*
- ✓ *Mechanism of action*
- ✓ *Adverse side effects*
- ✓ *Signs and symptoms to monitor*
- ✓ *What to teach the patient*

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