CHAPTER 2: DRUG AND DOSAGE FORM

by

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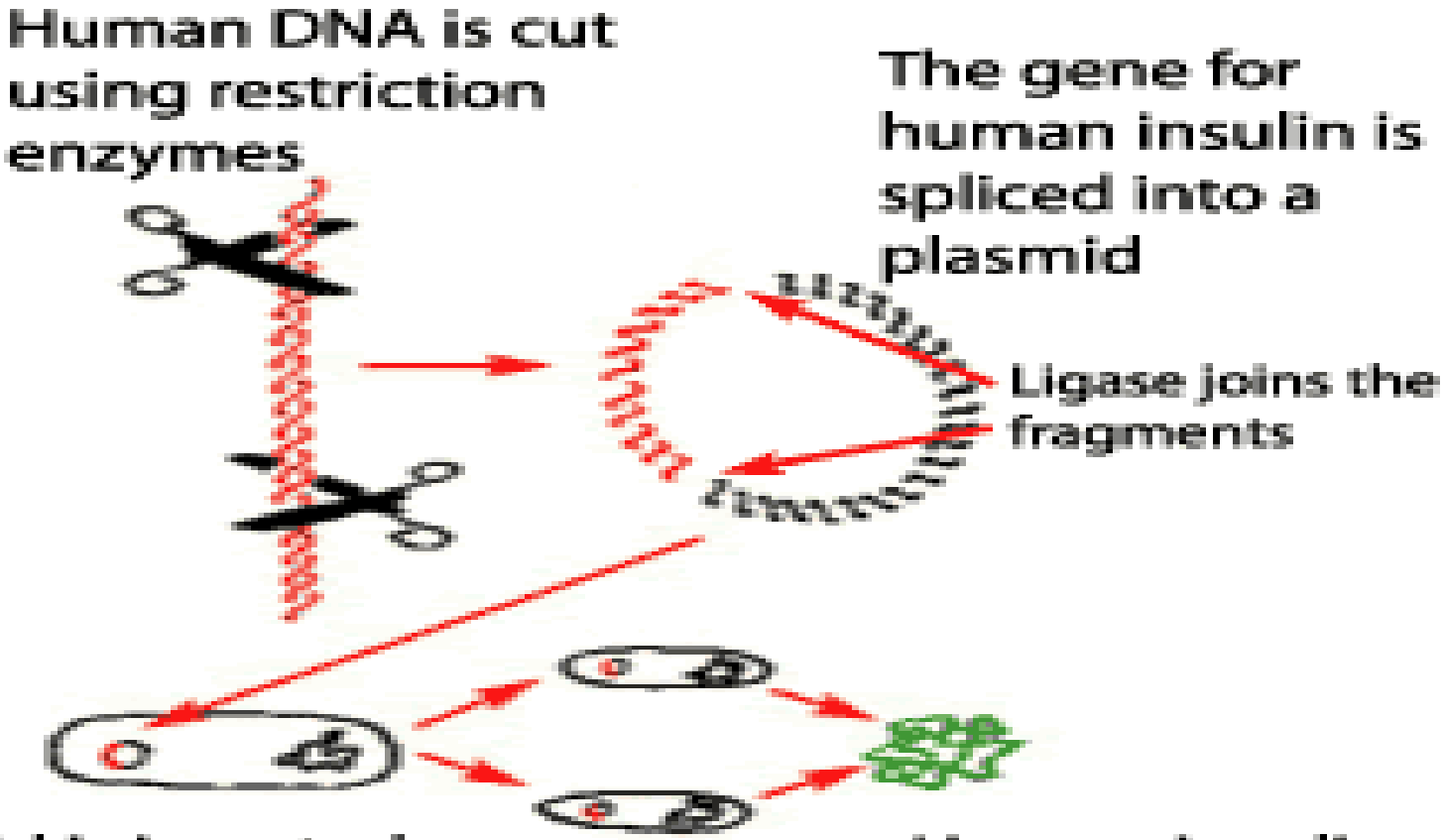
Objectives

- **Sources of drugs**
- **Drug discovery and nomenclature**
- **Drug development,**
- **Clinical trials phases**
- **Route of administration**
  - Oral
  - Parental
  - Topical
  - Vaginal and Rectal

Sources of drugs

- plants
- Minerals and substances of animal origin
- Microorganisms like fungi and bacteria
- synthetically or semisynthetically chemical compound.
- Biotechnology (recombinant DNA technology)

Biotechnology



Approaches in drug discovery

1-Classical pharmacology:

Synthetic small molecules, natural products or extracts were screened in intact cells or whole organisms to identify substances that have a desirable therapeutic effect.

Approaches in drug discovery

2-Reverse pharmacology:

Target base drug discovery (TDD), a hypothesis is first made that modulation of the activity of a specific protein target will have beneficial therapeutic effects.

Screening of small molecules to identify compounds that bind with high affinity to the target protein using **CADD (computer aided drug design) like Docking.**

Drug nomenclature

- Chemical name
- Generic (Non-proprietary Name)
- brand name

Chemical name

- The chemical name is the scientific name, based on the molecular structure of the drug.
- These names are typically very long and too complex to be commonly used in referring to a drug
- Ex: N-acetyl-p-aminophenol

Generic Non-proprietary Name

- Generic names were often obtained by contracting the chemical names into fewer Syllables.
- Generic names are used to provide a clear and unique identifier for active chemical substances, appearing on all drug labels, advertising and other information about the substance. Ex: Paracetamol
- They are used in New Drug Approval for the US Food and Drug

Brand name

- Company name for selling product.
- It is usually followed by subscript ® which mean registed by the patent office.
- It is easy to pronounce and easy to remember by users.
- Ex: panadol®

Drug development

- **Drug development** is a blanket term used to define the process of bringing a new drug to the market once a lead compound has been identified

- It includes:

1- **Pre-clinical research**

2- Drug Formulation

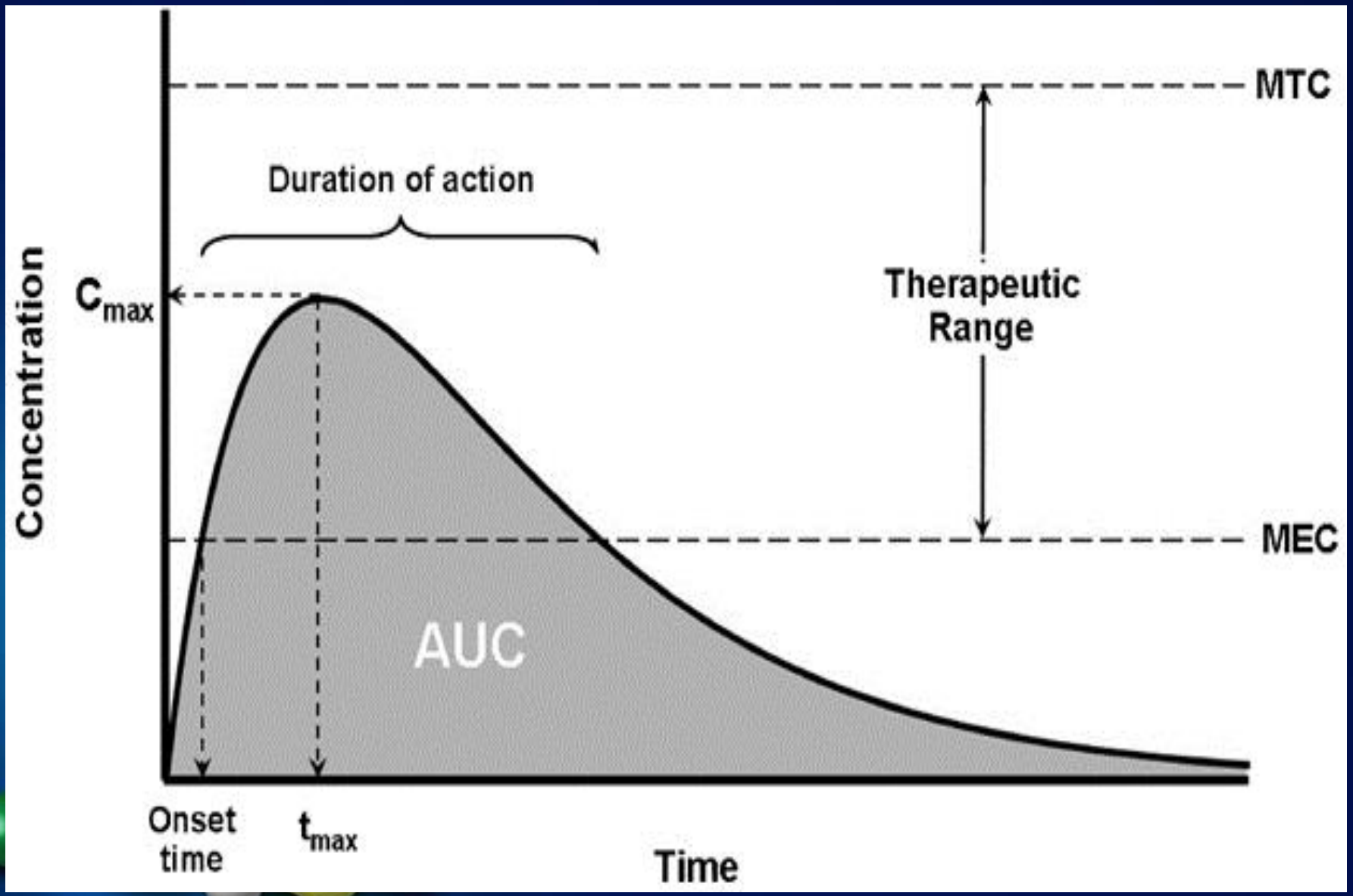
3- Clinical development (clinical trials)

Pre-clinical testing

- Laboratory (e.g. on cells) and animal testing is undertaken to assess the safety of the new compound. The tests estimate toxicity of the product when given acutely or repeatedly

- Duration of pre-clinical testing is 2–4 years

Therapeutic window



Pharmaceutical developement

No patient would be capable of taking a dose of say 1 mg from a powdered drug supplied in bulk form.

Some drugs require preparation in sterile conditions. Therefore drugs need to be converted into dosage form by the process of formulation.

Pre-formulation studies

These are carried out to investigate the physical and chemical properties of a drug before making formulation of dosage form including:

- Solubility and dissolution rates
- chemical stability
- lipophilicity
- melting point
- particle morphology

Clinical development

- **Phase I:**

  safety and dosage testing (tolerability, bioavailability, pharmacokinetics) in healthy volunteers.

  Results indicate dose, regimen and duration of therapy to be adopted in phase II study.

  Duration: 1–1.5 years.

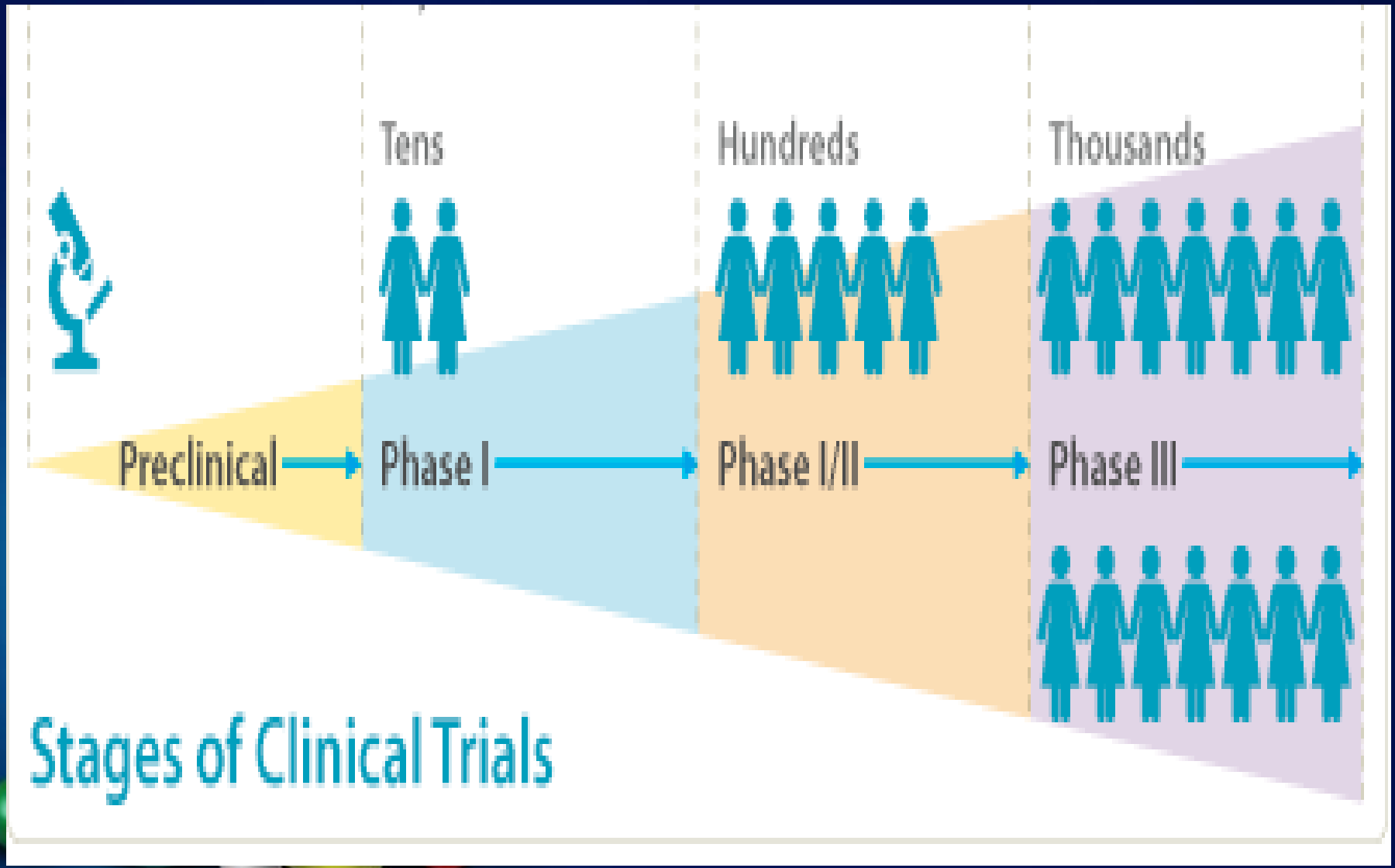
Clinical development

- **Phase II:**
- safety and efficacy testing on patient volunteers (hundereds).
- Evidence of efficacy and safety of the drug in patients is identified and optimal dose and dosing regimen are identified.
- Duration: 2–3 years.

Clinical development

- **Phase III:**
- safety and efficacy testing on larger numbers of patients (thousands).
- The trials aim at comparing the new treatment with placebo of safety, tolerability, efficacy, patient acceptability, compliance and pharmacoeconomic analysis.
- Duration: 2–5 years.

Clinical development



Drug classification

- 1-**Chemical type**
- 2- **Pharmacological**
- 3- **prescription or non-prescription drug (OTC drug):**

Route of administration

- ***systemic effect:***

  drug is distributed throughout the body to cause a general effect (e.g. tablets)

- ***local effect:***

  drug is limited to the area of the body where it is administered (e.g. nose drops).

The choice of the route of administration

1- Desired effect time

2- Effect type

3- Absorption features of the drug

4- drug stability in GIT

Routes of administration and examples of dosage forms

- **Oral route:**

– solid oral dosage forms (tablets, capsules)

– liquid oral dosage forms (syrups, suspension)

- **Topical route:**

– transdermal drug delivery

– inhalation

– nasal, ophthalmic ear drops

–topical for skin disorders: creams, ointments, lotions, gel

Routes of administration and examples of dosage forms

- **Parental route:**

– intramuscular, subcutaneous, intravenous

- **Rectal route:**

– enemas, suppositories

- **Vaginal route:**

– pessaries, fluid solutions, creams.