• **Pharmacology**: is a science dealing with the study of drug

• **Drug** is a chemical or biological compound that is introduced to the body to induce an effect

• Difference between **drug** and **medicine**:

Drug is the active ingredient of the medicine, but the medicine is the final compound of the drug and as a doctor you deal with a medicine not drug.

For example:

Revanin (paracetamol) ➔ the active ingredient is paracetamol but the medicine not only paracetamol we add:

1. Preservatives (to prevent bacterial and fungus effect)
2. Excipient
3. Adhesive
4. Disintegrate
5. Flavoring agent

*All medicine are drug but not vice versa*

Medicine is a drug used for treatment or prevention from disease:
- treatment: for example if you have a hyper tension you will get a treat hypertension and in the same time you need to prevent this disease.
- prevention: like taking supplement (iron) to prevent anemia but if you have anemia you will take iron to treat it.
- difference between capsule and tablet: capsule has a gelatinous cover but tablet is a compressed powder.

**Sources of drugs:**

1. Plants: such as digitalis, vincristine.
   - At the beginning the source was natural (from herbs) but these natural substances don’t have the exact amount that we need in the dose.
   - After that drugs became semisynthetic.

   مثال: المورفين هي نبتة تستخدم لحالات التخدير ولكن لاحظوا أنها تتسبب الإدمان لهيك
   عدلوا على ال (formula) تبعتها بإضافة: 
   CH₃, OH or other groups

2. Human and animals: such as epinphrine, insulin and adrenocorticotropic hormone.
   - This source of drugs is purely synthetic.
So we have to take them from animals or human for example: insulin (the only drug used for diabetes type 1) ➔ they take them from pigs.

After that they used Recombinant DNA Technology: this technique includes cutting the DNA that's includes the gene used to express insulin hormone from pancreas and then put it in plasmid e coli (bacteria) ➔ e coli started making insulin.

3. Synthetic and chemical substance: as sodium bicarbonate

4. Minerals: as iron, iodine and zinc

*note: what we mean by chemical or biological drug? Chemical means synthetic compound, biological means from bacteria like streptokinase a drug that is taken from bacteria called streptococcus used for blood clot analysis.

The two main area of pharmacology are:

**Pharmacodynamics**

**Pharmacokinetics**

Pharmacokinetics: effect of body on drugs

ADME (ADME - absorption, distribution, metabolism, excretion) kinetic steps

A = absorption

D = distribution

M = metabolism

E = excretion

1- Absorption: mostly from stomach and intestine to the blood stream
2- Distribution: the blood distribute drug to all over the body then the drug reaches to the target tissue

3- Metabolism and excretion: the drug shouldn’t be in your body for a long time and the toxic effect should be elevated.

There are two ways for detoxification:
- Liver: converts active form to non-active
- Directly to urine

This depends on: if the drug is polar or nonpolar.

How?
If it is polar it melts in plasma and goes directly to urine.
If it is nonpolar it goes to liver → the liver converts it from nonpolar to polar → then it goes to urine.

**Pharmacodynamics**: effect of drugs on body

It needs receptors, enzymes and messengers to work.

Example 1 → receptors: Beta 1 blocker is a drug used to block Beta 1 receptor (a receptor located in the heart used for increasing heart rate).

Example 2 → enzymes: angiotensin 2 (angiotensin converting enzyme) converts angiotensin 1 to angiotensin 2 → causing vasoconstriction and increase blood pressure. The drug used to inhibit it is ACE inhibitor.
Names of drugs:

- **Chemical Name**: Specifies the chemical makeup of a drug which is often long and complicated.

- **Generic name**: Identifies the drug legally and scientifically. Becomes public property after 17 years of use by the original manufacturer. Shorter and less complicated.

- **Brand name**: Trademark name is the private property of the individual drug manufacturer and no competitor may use it. Often has the super script ® after or before the name. Example: Aspirin is a registered trademark owned by Bayer. Example: Bayer® Aspirin.

  EXAMPLE: Rivanin and panadol are brand names but the generic name is paracetamol for each of them.

Some terms used in pharmacology:

- Onset of action is the duration of time it takes for a drug to make its effects upon administration.
  The time frame within it the drug will be act.

  يعني عندي صداع وبدي الدواء يشتغل خلال نصف ساعة بس أخدنا الدواء اشتعل بعد ساعتين معايا ودعا ب процент ملاحظات:
- The onset of action for tablets and capsule is longer than injection because in injection you exclude absorption (has a rapid onset of action).
- The onset of action depends on the drug structure like adhesive and disintegration.
  - يعني ممكن إذا كان العامل adhesive عالي يحتاج وقت أطول ليفكك بالمعدة.

- Duration of action: the length of time that drug still effective
  - It’s important to determine how many time frequency you must take the drug.
  - مثلاً إذا بيستمر مفعوله 12 ساعة بيتأخذ مرتين إذا 24 ساعة مرة باليوم وهكذا.

- Dose: Amount of drug administered usually measured in milligrams or grams.
  - في البافارما شي بنسميه (5R)
  - We mean by 5R: right drug for the right patient with the right dose, right duration and right frequency.

  - Therapeutic dose
  - Toxic dose
  - Subtherapeutic dose

*It’s very important to give the therapeutic dose
  - Therapeutic dose: the exact dose that can treat this condition
  - Subtherapeutic dose: a dose that less than therapeutic dose
  - Toxic dose:
ممكن تصير بعدة حالات مثلاً:

therapeutic dose
حدا أخد جرعة أكبر من ال
وصار عندي two drugs
أو أخد toxicity سبلى Drug drug interaction

**هلا هاد كله بيعتمد على شغلة اسمها:**

(therapeutic index or therapeutic window)

Therapeutic index: the range between therapeutic dose and toxic
dose for example: the therapeutic dose is 10 mlg and the toxic
dose is 20 mlg between 10 – 20 is the therapeutic index and you
are free to give this drug.

ولكن الأدوية تصنف صنفين:

1- Narrow therapeutic index
2- Wide therapeutic index (safer)

• Dose interval (frequency)

• Indication: the therapeutic use

... يعني متى بصير نستخدم هاد الدوا...

contraindication في مصطلح ثاني اسمه معناه لا يعطى الى مثلاً

voltareen حداء معه أزمة ما بصير يأخذ

• Side effect / adverse effect:

رح نشرح الفرق بينياتهم من خلال هدول الأمثلة:

Side effect: a drug given for hyper tension → causes decreasing in
the pressure → after that causes a hypotension.
Glucophage $\rightarrow$ decrease in blood glucose $\rightarrow$ hypoglycemia

**It’s expected!!**

Adverse effect: when the drug is distributed to all over the body it causes another unexpected action or unwanted action in another part of the body.

مثلاً اليرفين يستخدم لعلاج الحساسية ولكن يسبب النعاس.