In general terms, pharmacology is the science of drug action on biological systems.

Pharmacology embraces knowledge of the sources, chemical properties, biological effects and therapeutic uses of drugs.
The term *pharmacology* comes from the Greek words:

- *pharmakon* - drug or medicine
- *logos* - the truth about or a rational discussion

Birth of Experimental Pharmacology is associated with Francois Magendie in the early 19th century. He discovered how Strychnine and Curare worked.
A synthesis of several biomedical sciences....

...but unique in its own right
Pharmacologists Study Science at Every Level
Pharmacology: Its Scope

**Two important and interrelated areas:**

- **Pharmacokinetics**: study of the absorption, distribution, metabolism and excretion of drugs.

- **Pharmacodynamics**: study of the molecular, biochemical, and physiology effects of drugs on cellular systems and their mechanisms of action.
Subdivisions of Pharmacology

- **Neuropharmacology**: study of the effect of drugs on components of the nervous system (brain, spinal cord, nerves)
  
  **Example**: treatment of Alzheimer's

- **Cardiovascular Pharmacology**: study of the effects of drugs on heart, vasculature, kidney, nervous and endocrine systems that participate in cardiovascular function.
  
  **Example**: treatment of high blood pressure (hypertension)
Subdivisions of Pharmacology

- **Molecular Pharmacology**: study of the biochemical and biophysical characteristics of interactions between drug molecules and those of the cell

  **Example**: Drug-Receptor Interaction

- **Biochemical Pharmacology**: study of how drugs act with and influence the chemical ‘machinery’ of the organism

  **Example**: signal transduction through G proteins
Subdivisions of Pharmacology

- **Behavioral Pharmacology**: study of the effects of drugs on behavior
  
  **Example**: treatment of Attention Deficit Disorders
  
  ![Strattera](image)

- **Endocrine Pharmacology**: study of drugs that are hormones or hormone derivatives
  
  **Example**: creation of The Pill
Subdivisions of Pharmacology

- **Clinical Pharmacology**: application of pharmacodynamics and pharmacokinetics to patients with disease.

  **Example**: use of pharmacogenomics to tailor individual medical treatment

- **Chemotherapy**: study of drugs used for treatment of microbial/viral infection and malignancies

  **Example**: treatment of cancer through anti-angiogenic agents such as bevacizumab.

ANTIBODY THERAPY
Subdivisions of Pharmacology

- **Systems and Integrated Pharmacology**: study of the use of whole animal approaches to best predict the efficacy of new treatments in the human.

  **Example**: use of pharmacogenomics to tailor individual medical treatment

- **Veterinary Pharmacology**: study of the use of drugs for disease and health problems unique to animals.

  **Example**: treatment of feline leukemia (Viral) with Acemannan
What Pharmacology is NOT...

✧ Pharmacy
This is a separate profession responsible for the preparation and dispensation of medication.

✧ Pharmaceutical Science
THE NEW CENTURY
OF PHARMACOLOGICAL STUDIES

Adverse Drug Reactions
Anticancer & Antiviral Agents
Behavioral Pharmacology
Cancer Chemotherapy
Cellular Pharmacology
Combinatorial Chemistry
Developmental Pharmacology
Drug Policy & Regulation
Environmental Pharmacology
Gastrointestinal Pharmacology
Gene Therapies
Immunopharmacology
New Drug Design and Development
Pharmacogenetics
Pharmacology of Aging
Pulmonary Pharmacology
Recombinant-DNA Derived Drugs
Traditional and Herbal Medicines
Examples of Questions that Pharmacologists Ask:

- How do drugs act at cell surfaces to alter processes inside cells?

  **Example:** How does the compound fenfluramine activate serotonin receptors (to cause valvulopathy??)

- How can drugs help us unravel the mechanisms of biochemical and physiological processes? Pathophysiological processes?

  **Example:** Why do endothelin receptor antagonists reduce blood pressure? Is endothelin involved in this disease?
Examples of Questions that Pharmacologists Ask:

- How can knowledge of the structure of a macromolecule be used to design (intelligently) new more effective drugs?

  **Example:** Can HIV proteins be targeted with specific inhibitory molecules? Can we predict protein mutation?

- How do organisms develop increased or decreased sensitivity to drugs?

  **Example:** Resistant strains of streptomyocin, tumor resistance to chemotherapy.
Why Choose Pharmacology?...

- Synthesis of many biomedical sciences and necessarily integrative.
  
  Diverse, diverse, diverse!

- Pharmacology has been one of the greatest medical successes of the 20th century, yet it is vastly misunderstood.

- Pharmacology readily translates into improved human health.

- Trained to use drugs experimentally and clinically appropriately.

...It’s absolutely exciting!
A Wealth of Career Opportunities:

- Academician
- Journal Editor
- Scientific Writing
- Policy
- Professor
- Teacher
- Consultant
- Public Affairs
- Pharmaceutical Industry
Pharmacology is integrated into your daily life:

- Antibiotics
- Baby aspirin a day to reduce risk of myocardial infarction
- The birth control pill
- Viagra, Cialis--need we say more?
- Lipitor
- Nexium - the purple pill

When you get sick, you assume the medication will be there. Who develops these medications??? PHARMACOLOGISTS!!
How do you prepare for a Career in Pharmacology?

Undergraduate Years:

- Take core biochemical courses
  - biochemistry
  - biology
  - chemistry
  - physiology
  - PHARMACOLOGY IF YOU CAN!
- Get some Research Experience
- There are ~ 10 institutions that offer a BS in Pharmacology

Summer Undergraduate Research Fellowship Program

www.aspet.org - click on Awards and Fellowships
How do you prepare for a Career in Pharmacology?

Graduate Years in Pharmacology:

- Programs are offered all across this country
- Formal depts of pharmacology may not exist anymore
- Visit
  http://www.aspet.org/public/training_programs/training_programs.html

- Programs are didactically and researched based.

- Both PhD and MS granting programs exist
Be a part of it.....

American Society For Pharmacology And Experimental Therapeutics

[Logo]

www.aspet.org