University of California, Santa Barbara
Program Learning Outcomes

B.S. in Pharmacology

Students graduating with a B.S. in Pharmacology should be able to:

Knowledge

1. Use or describe the following:
    - Basic biological concepts: cell theory, central dogma, evolutionary theory, principles of inheritance, energy flow in living organisms, biomolecules, organ systems, and the relationship between organisms and their environment.
    - Basic principles of physics as a basis for understanding the energetics of biochemical reactions and the operation of instrumentation used to measure biological reactions.
    - Inorganic and organic chemistry as a basis for understanding the chemical bonds associated with drug-receptor interactions.
    - Molecular and Mendelian genetics in relationship to causes of disease, and potential sources of treatment.
    - Biochemistry and physiology to form a foundation for understanding human disease and drug metabolism.
    - Receptors, channels, transporters, and cellular signal transduction mechanisms with a focus on those which serve as important drug targets.
    - The roles of viruses and bacteria in human disease and mechanisms of antimicrobial therapy.
    - The biological basis of cancer and the choice of targets for cancer chemotherapy.
    - Drug resistance and its impact in the treatment of chronic disease.
    - Drug discovery and development; clinical testing.

Laboratory Skills

2. Use proper care and handling of research animals.
3. Use isolated animal tissues and organs in the qualitative and quantitative measurement of biological responses to drugs.
4. Use and understand molecular biology techniques for measurement of drug binding and metabolism: ELISA, western blot, PCR, spectrophotometry, luminometry, flow cytometry transfection, gene expression, and immunofluorescence microscopy.
5. Calibrate the instruments used to measure drug binding and biological response.
6. Calculate and prepare appropriate drug dilutions.

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Program Learning Outcomes, continued

Data Analysis and Presentation

7. Generate and use a standard curve in the conversion of raw instrument values to measurements of concentration.
8. Determine the parameters used to compare groups of experimental data: mean, standard deviation, standard error of the mean using appropriate formulas, Student's t-test and other statistical methods to evaluate the significance of experimental findings.
9. Graphically interpret data: log-dose response plot, Scatchard plot, Lineweaver Burk plot, Schild plot; calculation of Kd and Kd apparent values from graphs and comparison to literature values.
10. Produce detailed research-grade reports of their data including background information about drug structures and mechanisms, the nature and physiological functions of pertinent receptors, raw data and correctly labeled charts, graphs, and tables, discussion of results including significance of findings and sources of error.