

General Veterinary Pharmacology

VM 341 Fall 2016

Lectures: Mon, Wed 9:45- 11
Room: G2120
Office Hours: M 11:15 – 1:15 pm
Wed 11:15 – 1:15pm

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COURSE OBJECTIVES:

<u>Topic</u>	<u>Student Objectives</u>
General Principles	To understand through the use of prototypic examples how drug absorption, distribution, metabolism and excretion and pharmacokinetic factors influence the drug response.
Autonomic Pharmacology	To understand the classification of drugs acting on the autonomic nervous system and the receptor mechanisms by which prototypic drugs induce a biochemical/physiologic response.
Peripheral Muscle Relaxants	To understand the classification of drugs which (blockers of the skeletal NMJ) block the skeletal neuromuscular junction and how they cause the relaxation of skeletal muscle.
CNS Pharmacology	To understand the classification of drugs acting on the central nervous system. To understand the use and actions of inhalation anesthetic drugs used in veterinary medicine.
Diuretics	To introduce the major classes of diuretic drugs, their action, toxicity and clinical use.
Gastrointestinal Pharmacology	To understand the action and clinical use of drugs on the digestive tract.

I. Topics to be covered

- Principles.
- Autonomic Drugs.
- Peripheral Muscle Relaxants
- CNS Stimulants.
- General Anesthetics.
- Local Anesthetics.
- Sedative-Hypnotics.
- Psychopharmacology.
- Opioid Analgesic and Antagonists.
- Nonsteroidal Anti-inflammatory Analgesic and Antipyretic Drugs.
- α_2 -Adrenergic Agonists.
- Anticonvulsants.

- **Histamine and Antihistamines.**
- **Corticosteroids.**
- **Thyroid and Anti-thyroid Drugs.**
- **Antidiabetic Drugs**
- **Diuretics.**
- **GI Pharmacology.**
- **Reproductive Pharmacology**

General Principles: The students should understand and be able to discuss:

1. The advantages and disadvantages of the various routes of administration.
2. How the dosage form and the route of administration may influence the pharmacological response.
3. How drugs cross biologic membranes and in detail the influence of pH, pKa and blood flow on this process.
4. Factors which influence drug absorption.
5. Drug distribution from the plasma to various tissues: influence of plasma protein binding and competition for these sites; the significance of the blood brain barrier and the "placental barrier".
6. Redistribution of drugs.
7. Biotransformation of drugs and be able to elaborate on the following: why this may or may not be associated with a decrease in biologic activity of the drug; role of the cytochrome-p-450 system; the role of phase I and phase II type reactions in biotransformation; the importance of induction and inhibition of the cytochrome-p-450 system by drugs and chemicals; the role of hepatic pathology, tissue storage, age, species, sex and pharmacogenetics in the biotransformation process.
8. Drug excretion and be able to elaborate on the following: The process of renal excretion and factors which influence it; biliary excretion; and elimination of drugs via the lungs, salivary glands, sweat glands and mammary glands.
9. Drug action and drug receptor concepts.
10. Dose-response relationships: the graded response, the quantal response.
11. Pharmacokinetics with emphasis on the 2-compartment model; how pharmacokinetics is needed to determine body clearance, $t_{1/2}$, bioavailability, volume of distribution and the dosing rate; and have knowledge on species variability.

Autonomics: The students should understand and be able to discuss:

1. Anatomical origin of parasympathetic and sympathetic neurons and the organs innervated.
2. Role of the autonomics in controlling physiologic functions such as: body temperature, blood pressure and digestion.
3. Tissue responses to stimulation of the autonomic nervous system.
4. Synthesis, storage and release of transmitters.

5. Classification of cholinergic receptors: muscarinic, nicotinic.
6. Receptor mediated events (ionic, biochemical) leading to the cellular response.
7. The pharmacology of cholinomimetics and their therapeutic uses.
8. The classification of drugs which inhibit the breakdown of acetylcholine (acetylcholinesterase inhibitors).
9. The pharmacology of acetylcholinesterase inhibitors and their therapeutic uses.
10. The pharmacology of the antimuscarinic drugs atropine, scopolamine and selected atropine-like drugs and their therapeutic uses.
11. The synthesis, storage and release of norepinephrine and epinephrine and their metabolism and/or inactivation.
12. The post receptor events (ionic, biochemical) leading to the cellular response to adrenergic agonists.
13. The structure-activity relationship of adrenergic agonists on blood vessels, gut, bronchi and the heart.
14. The classification of adrenergic agonists and the tissue receptor(s) mediating the pharmacologic response.
15. The classification of sympathomimetic amines into direct vs. indirect acting.
16. The therapeutic use and possible adverse effects of sympathomimetic amines.
17. The classification of adrenergic antagonists and their use.
18. Adrenergic neuron blockers and contrast their action to the adrenergic receptor antagonists.
19. Transmission in autonomic ganglia.
20. The pharmacologic effects of stimulating and blocking autonomic ganglia.

Peripheral Muscle Relaxants: The students should understand and be able to discuss:

1. The mechanism of action of succinylcholine and how this differs from tubocurarine.
2. The pharmacokinetics of both succinylcholine and the competitive blocking drugs.
3. Factors that can influence the effects produced by neuromuscular blockers.
4. Adverse effects produced by neuromuscular blockers.
5. Methods used to reverse neuromuscular blockade.

Corticosteroids: After the lecture, the students are expected to know:

1. The physiological and pharmacological actions of corticosteroids and the mechanism of action.
2. The goals of new compounds for specific uses.
3. Chemistry and structure-activity relationship of corticosteroids.
4. The absorption, transport, metabolism, and excretion of corticosteroids.
5. Different formulations of corticosteroids.
6. Side effects and contraindications to corticosteroids.
7. How the inhibitors of adrenal cortex work. These drugs are used for the treatment of hyperadrenocorticism.

Reproductive Pharmacology :These lectures cover gonadotropins, sex steroids and their antagonists, and oxytocic drugs. After the lectures, the students are expected to know:

1. The actions and adverse reactions of gonadotropins and sex steroids and their therapeutic uses.
2. The fate of gonadotropins and sex steroids once they are administered.
3. The physiological control of uterine contractility.
4. The actions and uses of various oxytocic drugs.

Thyroid and Antithyroid Drugs: Thyroid hormones are used for hypothyroidism and antithyroid drugs are used for hyperthyroidism. After the lecture, the students are expected to know:

1. How thyroid hormones are synthesized and factors that modulate the synthesis pathway.
2. Physiological and pharmacological actions of thyroid hormones.
3. Absorption, distribution, metabolism, and excretion of thyroid hormones.
4. Names of classes antithyroid agents. Since methimazole is the principal antithyroid agent, the students are expected to know fate and side effects of this drug.

Antidiabetic Agents:This lecture will focus on insulin and oral hypoglycemic drugs. After the lecture, the students are expected to know:

1. Two types of diabetes mellitus and possible causes of them.
2. Factors that modulate insulin secretion.
3. Physiological and pharmacological actions of insulin.

4. Three classes of insulin preparations. When given the name of a preparation, the students should know which class this agent belongs to.
5. Signs of insulin overdose.
6. The causes of insulin resistance.
7. How oral hypoglycemic drugs glyburide, metform and troglitazone work.

GRADES:

First Hour Exam:	30%
Second Hour Exam:	30%
Final Written Exam	40%

REFERENCES:

- 1) Handbook of Veterinary Pharmacology, by Walter H. Hsu. 2nd edition, Willy-Blackwell, 2013.
- 2) Veterinary Drug Handbook 7th Ed. By D.C. Plumb. Iowa State Press, 2011.
- 3) Veterinary Pharmacology and Therapeutics 9th Ed. by H.R. Adams. Iowa State Press, 2009.