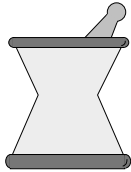


**WELCOME TO
APPLIED DRUG THERAPY!!!**



**Nursing 813
Applied Drug Therapy**

Michael A. Oszko, Pharm.D.
**Associate Professor, School of
Pharmacy**
The University of Kansas Medical Center
3901 Rainbow Blvd.
Kansas City, Kansas 66061

Phone: (913) 588-5377
Fax: (913) 588-2355
E-Mail: moszko@kumc.edu

Outline

- **Course Syllabus**
- **Drug Information**
- **Some thoughts about drugs
and drug therapy**
- **Pharmacokinetics**
- **Pharmacodynamics**
- **Case studies**
- **Prescribing Drugs**



Applied Drug Therapy

- Purpose of Course
- Assumptions about your knowledge base
- Textbooks
- Weekly lectures
- Evaluation/Grading
- Homework
- Course Facilitators
- ADT on the Internet

Purpose of Course

- To learn how to “prescribe” drugs
- To learn how to monitor and adjust drug therapy
- To learn how to make drug therapy decisions
- To learn how to educate patients and insure that they adhere to what you “prescribe”

Purpose of Course

- Focus is on:
 - Drug Selection
 - Drug Therapy Monitoring
 - Prescription Writing
 - Patient Education

Assumptions

- You have had a previous course in pharmacology
- You have at least some experience with administering and monitoring drug therapy
- You are willing to acknowledge that drug therapy is NOT “black and white”

Sources of Drug Information

- “Goodman and Gilman” - Pharmacology
- “PDR” - Package Inserts
- “USP-DI” - Patient Information
- Your local pharmacist!
- Poison Control Center
–(KU: 1-800-332-6633)
- World Wide Web
- Miscellaneous

Weekly Lectures

- Tuesdays 6:00 - 8:30 pm
- Typical Lecture
 - 6:00 - 6:30 Quiz/Discussion of Homework
 - 6:30 - 7:05 Lecture
 - 7:05 - 7:15 Break
 - 7:15 - 8:30 Lecture

Evaluation and Grading

- **Grade Distribution**
 - Homework: 300 points
- **Format: Case Study/Short answer/Essay**
- **(NO “multiple-guess!”)**
- **Standard Grading Scale (sorry, no “curve”)**
- **A word about academic integrity**

Site Facilitators

- **KU: Kelli Kramer**
- **WSU: Connie Riddle**
- **PSU: Ruthellyn Hinton**
- **FHSU: Carol Moore**
- **Garden City: Eldonna Sylvia**

Applied Drug Therapy on the Internet

- **World Wide Web Home Page**
 - <http://classes.kumc.edu/son/nrsg813/>

GENERAL PRINCIPLES OF DRUG THERAPY

**Michael A. Oszko,
Pharm.D.**

**Associate Professor
Schools of Pharmacy, Medicine,
and Nursing
The University of Kansas
Medical Center**

DRUGS ARE POISONS WITH THERAPEUTIC SIDE EFFECTS!!!



PATIENT VARIABLES

■ Inherent Factors

- Age
- Sex
- Weight
- Race
- Genetic Background



PATIENT VARIABLES

■Acquired Factors

- Education
- Nutritional Status
- Medical History
- Health Status
- Allergies
- Immunization Status



PATIENT VARIABLES

■Physiologic Factors

- Organ Function
- Immune Function
- Severity / Intensity of Disease



PATIENT VARIABLES

■Pharmacologic Factors

- Pharmacokinetics
- Pharmacodynamics
- Efficacy / Toxicity
- Drug Interactions



PATIENT VARIABLES

■Psychologic Factors

- Compliance
- Beliefs
- HCP Relationship
- Desire for Treatment



PATIENT VARIABLES

■Social Variables

- Socioeconomic Status
- Activities of Daily Life
- Use of Drugs, alcohol, caffeine, tobacco
- Occupation
- Family / Friends



HEALTH CARE TRIVIA

(Impress your friends!)

- Health care consumes 13.5% of GDP (\$1.1 trillion).
- Drugs account for only 9.2% of health care costs, but is the largest out-of-pocket health care expense.



HEALTH CARE TRIVIA

(Impress your friends!)

- 70% of office visits in private practice result in the generation of a prescription.
- 14-21% of all prescriptions are never filled.



HEALTH CARE TRIVIA

(Impress your friends!)

- 44 million Americans have no health insurance; millions more are under-insured.
- 36 million Americans have insurance without a prescription drug benefit.



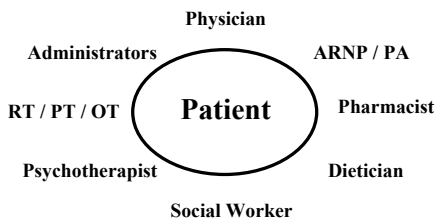
The Elderly

- Comprise 13% of the US population, but consume 30% of the drugs.
- 19% of income is spent on health care --- with 90% going toward drugs

“Traditional” Drug Therapy



A Better Way



DRUG THERAPY CONSIDERATIONS

- Is drug therapy necessary at all?
- Can/will the patient comply?
- Can the patient afford it?
- What is the endpoint?

**DRUG THERAPY
CONSIDERATIONS**

- **Can efficacy/toxicity be monitored?**
- **Does the patient understand?**
- **Who else needs to be involved?**

**DRUG SELECTION
CONSIDERATIONS**

- ① **Safety**
- ② **Efficacy**
- ③ **Cost**

PRESCRIPTION COSTS

Acquisition Cost
+ Mark-up
+ Fee for Professional Services

Cost of Prescription

CASE STUDY

- A 72 year old female presents to her primary care physician complaining of stiffness and pain in her left knee.
- Following a complete physical exam, including laboratory work-up, the following problem list was generated:
 - Urinary tract infection
 - Osteoarthritis

CASE STUDY

- She was prescribed:
 - Voltaren 50 mg tid
 - Cytotec 200 mcg qid
 - Noroxin 400 mg bid

STICKER SHOCK!!!

- Voltaren 50 mg #90
\$79.87
- Cytotec 100 mcg #120 \$60.87
- Noroxin 400 mg #14 \$39.79
-
- TOTAL \$180.53

CLINICAL PEARLS
(These are Free!)

- Acquaint yourself with the cost of (new) drugs
- Be aware of what your patient can(not) afford
- Prescribe generically whenever possible (i.e., most of the time)

Finding the cost of drugs

- www.planetrx.com
- www.drugstore.com

CLINICAL PEARLS
(These are Free!)

- Discourage patients from “shopping around”
- When selecting drugs, don’t base your choice solely on marketing or “what’s new”
- Remember, the pharmacist is your ally!

Domains of Pharmacy

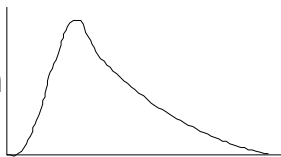
- **Pharmaceutics**
- **Pharmacokinetics**
- **Medicinal Chemistry**
- **Pharmacology**
- **Pharmacognosy**
- **Pharmacoeconomics**
- **Pharmacoepidemiology**
- **Pharmacotherapeutics**

Pharmacokinetics and Pharmacodynamics

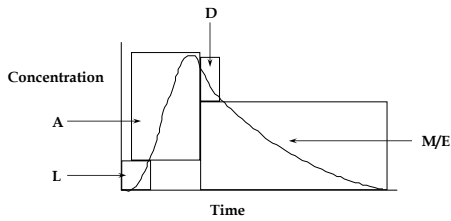
- **Pharmacodynamics: The effect of the drug on the body**
- **Pharmacokinetics: The effect of the body on the drug**

Pharmacokinetics

- Liberation**
- Absorption**
- Distribution**
- Metabolism**
- Excretion**



Serum concentration curve



Liberation from the dosage form

■ Oral

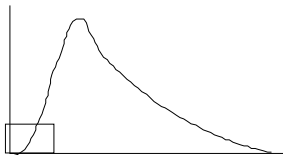
- Sustained release
- Enteric coated

■ SQ/IM

- "Depot"

■ Intravenous

■ Topical



Bioavailability

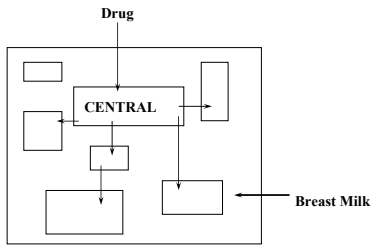
■ Defined as the fraction (F) of drug which is absorbed into the bloodstream.

■ Affected by

- Drug characteristics
- Dosage form characteristics
- Site of absorption (stomach, muscle, etc)
- Concurrent medications and/or food

■ IV route: 100% bioavailability

Drug Distribution



Volume of distribution (V_d)

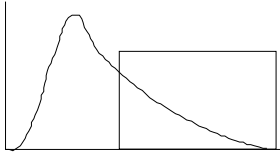
- Not a true “volume”, but rather a mathematical concept which describes the extent to which a drug is distributed in the body.
- Depends on
 - Drug characteristics
 - Protein binding
- Examples
 - Warfarin - 0.1 L/kg
 - Digoxin - 7 L/kg

Metabolism

- Occurs primarily in the liver, but can occur in other organs as well
- Metabolic reactions
 - Type I - Conjugation
 - Type II - Cytochrome P450 system (oxidation, demethylation, etc)
- Metabolites may be active or inactive
- Prodrug: an inactive molecule which requires metabolism for activation.

Excretion

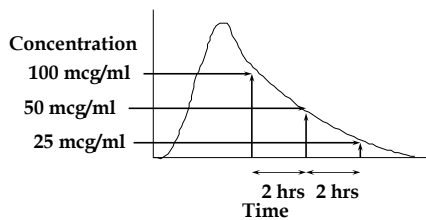
- Occurs primarily in the kidneys, but can occur in other organs as well (e.g., bile)



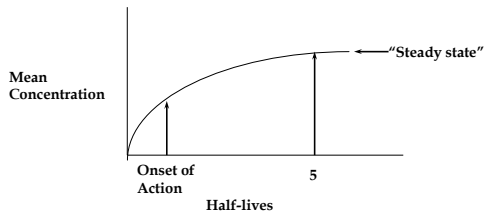
Pharmacokinetic concepts

- Fraction absorbed (F)
- Volume of Distribution (Vd)
- Half life ($t_{1/2}$)
- Clearance (Cl)

Half-life ($t_{1/2}$)



Drug accumulation



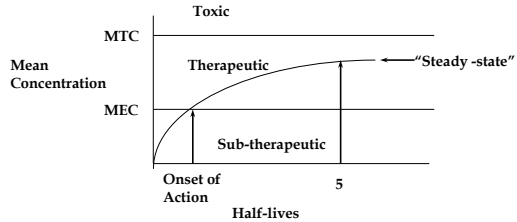
Clearance

■ A mathematical concept which describes the rate of removal of a drug from a theoretical volume.

■ $Cl = 0.693Vd/t_{1/2}$

Pharmacodynamics:

"The therapeutic window"

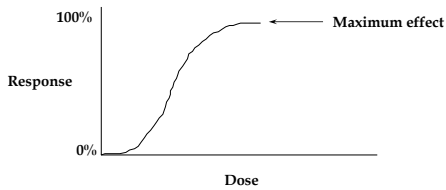


Pharmacodynamics:

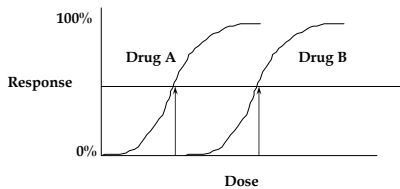
Basic principles

- Not all drug effects are concentration-dependent, but most drug effects are dose-dependent.
- Frequently, the therapeutic and toxic effects of a drug overlap (e.g. chemotherapy)
- Drug effects are best measured by **OBSERVATION!**

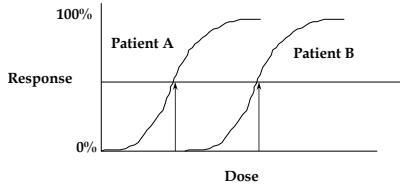
Dose-response curve



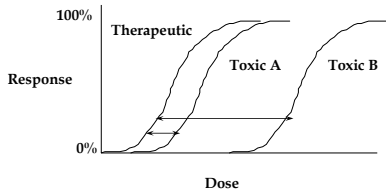
Potency



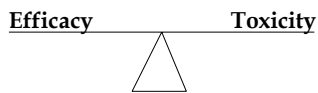
Inter-patient variability



Therapeutic index



The delicate balance



Case #1

A 72 yowf with a history of atrial fibrillation presents to her physician complaining of shortness of breath and palpitations. She is taking digoxin. Her serum concentration of digoxin was 0.3 ng/ml (Therapeutic range = 0.5-2.0 ng/ml)

**A drug can't work
if you don't take
it!**



Case #2

A 72 yowf with a history of atrial fibrillation presents to her physician complaining of shortness of breath and palpitations. She is taking digoxin. Her serum concentration of digoxin was 2.7 ng/ml (Therapeutic range = 0.5-2.0 ng/ml)

Case #3

A 72 yowf with a history of atrial fibrillation presents to her physician for a routine checkup. She is taking digoxin. Currently she is in normal sinus rhythm with a HR of 78. Her serum digoxin level is 2.7 ng/ml (Therapeutic range = 0.5 - 2.0 ng/ml).

**Treat the patient,
not the number!**



**General Principles of Drug
Prescribing**

ARNPs

■ KAR 60-11-101

■ “Advanced registered nurse practitioners function in a *collegial relationship* with physicians and other health professionals in the delivery of primary health care services.”

Drug Prescribing by ARNPs

■ Prescribing Tips

- KEEP IT LEGIBLE!!!
- Use metric units only
- Share your protocols with local pharmacies
- Get to know your local pharmacists
- When in doubt, find out
- Remember, prescribing is a responsibility, not a right!

Primary Care Associates
1234 Wellness Road
Resume Speed, Kansas
Phone: 999-1212

Name _____ Date _____
Address _____ Age/Wt _____

Rx

Dispense as Written _____ Substitution Permissible _____

Refills _____

Primary Care Associates
1234 Wellness Road
Resume Speed, Kansas
Phone: 999-1212

Name Priscilla Promiscuous
Address 124 Red Light Lane

Date 1/14/97
Age/Wt _____

Rx Doxycycline 100 mg
Disp # 14
Sig: Take 1 capsule bid x 7 days

Dispense as Written

Molly Moral, ARNP
Substitution Permissible

Refills 0

Per protocol Dr. Jones
