

Pathology 434

John Burns
10/4/05

Table of Contents

Class 1 Focus.....	1
Intro to pathology.....	1
Requirements.....	2
Pathology.....	3
Science of pathology.....	3
Review Normal cells, tissues, organs.....	3
Cell.....	3
The Normal Cell.....	3
Cell Structure	3
Cellular Constituents:.....	3
Examples of organelles.....	4
Mitochondria.....	4
Mitochondria Function:.....	4
Nucleus.....	4
Tissues – organs.....	4
Muscle Tissues.....	5
Nervous Tissue.....	5
Epithelial tissue.....	5
Connective tissue.....	5
Connective tissue proper.....	6
Bone.....	6
Blood	6
Organs and systems.....	6
Mast Cells.....	6
Systems.....	7
Next Week.....	7

Class 1 Focus

1. Intro to Pathology 434
2. Requirements
3. Presentation Format
4. Review of the Science of Pathology
5. Review of Normal Cells, Tissues, and Organs
 - Kumar: Basic Pathology (required)
 - Review and Pretest for NCAOM is optional – but good.

Intro to pathology

- Objective: Provide students the opportunity to fulfill the bioscience requirements for the

national board exams.

- Class Focus: Review bio science pathology information that the nccaom says an American TCM graduate should know about regarding western medical science
- Competence: Gain western medical knowledge of the pathogenesis of diseases, disorders, and injuries.

Requirements

- Responsible for lectures
- Attendance
- Class participation i.e. Presentations
- Weekly pathology topics
 - 5 – pages including
 - Quiz/review of most important aspect of pathology your presenting.
 - See hand out
 - For classmates to remember for their professional future
 - Name of the specific disease/disorder
 - Epidemiology: information regarding how many people have it, where they live, etc...
 - Etiology: the cause or origin of a disease.
 - Pathogenesis: the development of a particular disease
 - Including: the specific events involved, cell changes and bodily tissues or systems affected.
 - Mechanisms of damage, timing of the clinical course of disease, and the prognosis for the effects of the disease.
 - Clinical signs and symptoms
 - Lab test confirmations: CBC, Lipid panel, enzymes, Bun, etc...
 - Imaging tests used for confirmation: X-rays, CT Scans, MRI
 - Western medical interventions: medications, chemotherapy, radiation, surgery, etc.
 - Possible side affects of Western Medical interventions:
 - Prevention/Rehabilitation: WM or TCM (modalities, how many weeks of therapy, electro stim, etc...)
 - Correlating TCM differential Diagnosis and acupuncture treatment strategies (optional) (points, manipulations, treatments, treatments per week, diet, herbs, etc)
 - 5 Questions: Quiz/Review of topic presentation
 - These questions will be added to class database of possible questions to be used for mid-term and final written exams along with the lecture notes and reading assignments.
 - Purpose of presentations:
 1. To expose you to a variety of diseases and disorders as if you were in a Western medical setting.
 2. Develop a western medical understanding to the pathogenesis of a variety of diseases, disorders, and injuries.
 3. Develop your abilities to better communicate with and educate your

patients to what they are dealing with and what TCM has to offer them during their course of treatment.

Pathology

Pathology: Derived from the Greek word “pathos” which means suffering/

Looking at it from another perspective:

- The word path: a route along which something moves. A course of action (Tao)
- Thus pathology, according to the instructor translates to the “study or science of the path or way of suffering”.

Science of pathology

- Study of the mechanism by which cells, tissues, and organs are injured.
- And on the structural changes that underline disease process.
- All forms of tissue and organism injury or “suffering” starts with molecular structural alteration in cells.
- It is necessary then to begin our consideration of pathology with an examination of disease at the cellular and sub-cellular levels by first review the human cells...

Review Normal cells, tissues, organs.

Cell

- basic unit of function in the body.
- So small when viewed with light microscope difficult to conceive that each cell is a living entity unto itself.
- Equally amazing: physiology of organs and systems the result of complex functions of the cells which they are composed
- complexity of function demands complexity of structure.
-

The Normal Cell

- Is a restless, pulsing microcosm
- Constantly modifying its structure and function in response to changing demands and stresses.
- Until these stresses become too severe the cell tends to maintain a relatively narrow range of structure and function.
- So called normal homeostasis (yin-yang balance). Hippocrates “Let food be your medicine.”

Cell Structure

- As a basic functional unit of the body. Each cell is a highly organized molecular ?

Cellular Constituents:

- Cell membrane: gives form, selectively permeable, protects internal structures from the external environment, controls passage of materials in and out of the cell.

- Cytoplasm: aqueous content of cells, serves as matrix substances in which chemical reactions occur.
- Organelles: sub-cellular structures of cell that perform specific functions.

Examples of organelles

- Endoplasmic reticulum: smooth and rough
- Ribosomes: synthesizes proteins
- Golgi apparatus: synthesis carbohydrates and packages molecules for secretion.
- Mitochondria: releases energy from food and transforms energy into ATP
- Lysosomes: digest foreign molecules and worn damaged cells
- Peroxisomes: contain enzymes that produce hydrogen peroxide for oxidation reactions. (electron that escapes, and another electron fills the valance) (exercise forms many free radicals – you need to eat healthy)
- Nucleolus: forms ribosomes, stores DNA, RNA
- Chromatin: controls cellular activity for carrying on life processes. [Chromatin](#) is the DNA-protein complex that constitutes chromosomes.

Mitochondria

- Mitochondria: only an ovum (egg cell) contains mitochondria, the head of the sperm does not.
- Therefore all mitochondria fertilized egg are derived from the mother
- this provides a unique form of inheritance that is passed only from mother to child.
- Mitochondria migrate through the cytoplasm and are able to reproduce themselves because they contain their own DNA
- All cells except mature RBC have a hundred to a few thousand mitochondria (exercise can increase the mitochondria density.)

Mitochondria Function:

- referred to as the powerhouses (palace of qi) because they serve as sites for the production of most cellular energy.
- This process is called oxidative phosphorylation. Wikipedia says:
[ATP](#), the "high-energy" exchange medium in the cell, is synthesized in the [mitochondrion](#) by addition of a third phosphate group to [ADP](#) in a process referred to as [oxidative phosphorylation](#). ATP is also synthesized by substrate level phosphorylation during [glycolysis](#). ATP is synthesized at the expense of solar energy by [photophosphorylation](#) in the [chloroplasts](#) of plant cells.
- The formation of ATP in the mitochondria by using energy derived from electron transport to oxygen.

Nucleus

- Most cells in the body have a single nucleus (skeletal muscles are multi nucleic)
- houses the nucleic acids RNA/DNA which are critical for genetic regulation.

Tissues – organs

- cells that have similar functions are grouped into categories called tissues.

- The entire body is composed of only four types of tissues:
 1. Muscle
 2. Nervous
 3. Epithelial
 4. Connective Tissues

Muscle Tissues

Specialized for contractions

There are three types

- Skeletal
 - cells are long and thin – myofiber
 - parallel arrangement – controlled individually
- Cardiac
 - found only in the heart – myocardial cells
 - intimately interconnected – intercalated discs
 - stimulation of one cells – stimulation of all cells
- Smooth (do not have cross striations)
 - found in digestive tract, blood vessels, bronchioles, urinary and reproductive systems
 - circular arrangement – rhythmic contractions of the lumen (cavity) (5-34 sounds in abdomen/minute is normal)
 - centrally located nuclei

Nervous Tissue

- Consists of nerve cells or neurons
- Three parts
 - Cell body
 - Dendrites (branches)
 - Axon (cytoplasmic extension of cell body)
- Specialized for electrical events (yin and yang)

Epithelial tissue

Consist of cells that form

- membranes
 - cover and line the body surfaces
- glands
 - derived from these membranes
 - exocrine – secrete chemicals to outside
 - endocrine - secrete chemicals called hormones into the blood

Connective tissue

- Characterized by large amounts of extracellular material
- Various types:
 - Connective tissue proper
 - Cartilage

- Bone
- Blood

Connective tissue proper

- consists of scattered collagen and tissue fluid
- provides space for blood and lymphatic fluid
- some types and examples:
 - adipose – dermis of the skin
 - dense fibrous- tendons, ligaments, sclera of the eye
 - elastic: large arteries, lower respiratory tract
 - reticular: lymph nodes, liver, spleen, thymus, and bone marrow

Bone

- produces in concentric layers or lamellae
- arranged around blood vessels
- bone-forming cells surrounded by their calcified products
- become trapped within cavities called lacunae
- trapped cells (osteocytes) remain alive because they are nourished by lifelines of cytoplasm that extend from the cells to the blood vessels in canaliculi (little canals)
- The blood vessels lie within central canals, surrounded by concentric rings of bone lamellae

Blood

- Blood is usually classified as connective tissue
- half of it's volume is fluid
- this fluid is composed of extracellular material (fibrinogen)
- Plasma
- unlike serum which lacks fibrinogen.
- Is capable of forming insoluble fibrin threads (3-6 minutes)
- Together with platelets (derived from bone marrow) participate in forming clots.

Organs and systems

- organs are composed of all four primary tissues
- An individual organ is a structure composed of at least two types of tissues
- An example of organ: Skin
 - Consists of connective, epithelial , nervous tissues
 - The architecture of most organs is similar to the skin
 - Most art covered by an epithelium immediately over a connective tissue later.
 - The connective tissues contain blood vessels, nerve ending, scattered cells for fighting infection (mast cells)

Mast Cells

- Mast cells settle in connective tissue and usually do not circulate in the blood stream
- They contain cytoplasmic granules which store mediators of inflammation

- The extracellular release of mediators is known as degranulation and may be induced by
 - trauma, high temperatures, radiation
 - chemical substances, venoms
 - immune mechanisms: L allergens
- upon cell activation: release of histamines
- Transduce a variety of intracellular signals that regulate cell function (changes in pH, Calcium concentration, protein phosphorylation)

Systems

- organs consisting of tissue that perform related functions are grouped into systems
- these include:
 - immune,
 - nervous, respiratory,
 - cardiovascular,
 - endocrine,
 - digestive,
 - musculoskeletal,
 - integumentary,
 - reproductive, and
 - excretory systems,
- By means of numerous regulatory mechanisms these systems work together to maintain homeostasis to maintain the life and health of the entire organism.

Next Week

Acute and chronic inflammation

Presentations: 15 minutes – 5 pages....