Introduction to Pathology and Diagnostic Medicine

Spring 2003
• What is *pathology*?
• Who is a *pathologist*?
• What is a *disease*?
• How are diseases *diagnosed*?
The Tree of Medicine
(After G. Diamandopoulos)
Pathology (Gr. *pathos* “disease” + *logos* “word, reason”) is the study of the links between diseases and the basic science.
What is a Disease?

• A disease is a *physical* or *functional* disorder of normal body systems that places an individual at increased risk of adverse consequences

• Diseases are *diagnosed* by physicians or other health care providers through a *combination of tools*

• When a disease is diagnosed, *treatment* is given to prevent or ameliorate complications and to improve prognosis
Diagnosis
(Gr. *dia* “through” + *gnosis* “knowledge”)

- Diagnoses are made by three general categories of physicians or health care providers:
  - *Clinical diagnosticians* identify diseases by examination of patient’s *history and physical examination*
  - *Pathologists* identify diseases by examining *cells and tissues removed from the body*
  - *Radiologists* identify diseases by *imaging* the intact body
Pathology is the study of the links between diseases and the basic science.

Pathologist is a person identifying diseases based on the examination of cells and tissues removed from the body.

Therefore, pathology is not necessarily what a pathologist does!
HST.035 is the study of Pathology!
The Disease Paradigm

Etiology

Pathogenesis

Biochemical Changes

Morphological Changes

Functional Changes

Natural History
Historical Paradigm of Diagnostic Pathology

• The “gross, microscopic and biochemical structure” of “lesional” cells and tissues provide information about:
  
  – The nature of the underlying process (diagnosis)
  
  – The degree of deviation from normal (grade)
  
  – The extent of the disease (stage)
CELLULAR PATHOLOGY

AS BASED UPON

PHYSIOLOGICAL AND PATHOLOGICAL
HISTOLOGY.

TWENTY LECTURES
DELIVERED IN THE
PATHOLOGICAL INSTITUTE OF BERLIN
DURING THE
MONTHS OF FEBRUARY, MARCH AND APRIL, 1858.

BY

RUDOLF VIRCHOW,
PUBLIC PROFESSOR IN ORDINARY OF PATHOLOGICAL ANATOMY, GENERAL PATHOLOGY AND THERAPEUTICS IN THE UNIVERSITY OF BERLIN; DIRECTOR OF THE PATHOLOGICAL INSTITUTE, AND PHYSICIAN TO THE CHARITÉ HOSPITAL, ETC., ETC.

TRANSLATED FROM THE SECOND EDITION OF THE ORIGINAL,

BY

FRANK CHANCE, B.A., M.B., CANTAB.
LICENTIATE OF THE ROYAL COLLEGE OF PHYSICIANS; PHYSICIAN TO THE HINCHINBROOK FREE DISPENSARY AND INFIRMARY.
Virchow’s Theory of Cellular Pathology

“The object chiefly aimed at in [my lectures], illustrated as they were by as an extensive a series of microscopical preparations as it was in my power to supply, was to furnish a clear and connected explanation of those facts upon which, according to my ideas, the theory of life must now be based, and out of which also the science of pathology has now to be constructed. They were more particularly intended as an attempt to offer in a better arranged form than had hitherto been done, a view of the cellular nature of all vital processes, both physiological and pathological ... so as distinctly to set forth what the people have long been dimly conscious of, namely, the unity of life in all organized beings.”

(Virchow, 1858)
Morphological Diagnosis

*based on*

Morphological Knowledge Database

- **Step 1:** The vast majority of patients who did not have a disease had an esophagus that looked like this:
Morphological Diagnosis

*based on*

Morphological Knowledge Database

- **Step 2:** The vast majority of patients who complained about “heartburn” had an esophagus that looked somewhat like this:
Morphological Diagnosis

*based on*

Morphological Knowledge Database

- **Step 3:** Therefore, the next patient whose esophagus looks like this should have no symptoms of heartburn, *and*
Morphological Diagnosis

based on

Morphological Knowledge Database

• **Step 4:** The next patient whose esophagus looks like this should have had the symptoms of heartburn.
Histological Grading and Staging: *Historical Quilt by Association*

Therefore,
Histological Grading of Colonic Neoplasia

- Normal Crypt
- Early Adenoma
- Late Adenoma
- Adenocarcinoma
From Cellular Pathology to Molecular Medicine

Normal Epithelium

“Proliferative” Epithelium

“Early” Adenoma

“Intermediate” Adenoma

“Late” Adenoma

Invasive Carcinoma

Metastases

APC gene (5q loss or mutation)

Methylation Abnormalities

k-Ras gene (12p mutation)

DCC/SMAD (18q loss)

p53 gene (17p loss)

Additional mutations
And, Back to Diagnosis

Beyond Virchow: 
The Theory of Molecular Pathology

Painted Chromosomes

DNA Microarray
And *Diagnostic Imaging*

HST.035

- Will introduce you to the basic principles of cellular pathology,
- Discuss major issues in pathology of specific organ systems,
- Introduce you to the principles of diagnostic pathology, and
- Introduce you to novel diagnostic technologies and challenges posed in their translation into clinical practice.