



Introduction to Pathology

Dr. Mazin Al-Salihi

Course Info

▶ Required Book

- ▶ Robbins Basic Pathology, 9th Edition
- ▶ Chapters in this course 1,2,5
- ▶ Remaining chapters will be covered in systems Yr2-3

▶ 24 Lectures

- ▶ 5 Introduction, Cell Injury, Cell Death, & Adaptation
- ▶ 5 Inflammation
- ▶ 4 Repair
- ▶ 10 Neoplasia

▶ 2 Exams

- ▶ Midterm
 - ▶ Final
-



Lecture		Ch/Pg
1. Course Orientation & Introduction		
2. Homeostasis, Adaptation, & Cell Death	<ul style="list-style-type: none"> Principles Adaptive Responses (Hypertrophy, Hyperplasia, Atrophy, Metaplasia) Cell Injury (reversible/irreversible) Cell Death Morphology of Cell Death 	Ch I Pg. 1-5 Pg. 8-11
3. Cell Injury & Death	<ul style="list-style-type: none"> Causes Principles & mechanisms (Mitochondria, Ca^{2+}, Free radicals & ROS, Membrane damage) Mechanisms in practice (Hypoxia Ischemia, Reperfusion, Chemical) 	Pg. 6-7 Pg. 11-18
4. Apoptosis	<ul style="list-style-type: none"> Definition Principles Causes Mechanisms (Mitochondrial, Death receptor) Mechanisms in practice (Growth factor deprivation, DNA damage, Protein damage, role in immunity) Necroptosis 	Pg. 18-22
5.	<ul style="list-style-type: none"> Autophagy Intracellular accumulations Pathologic calcification Cellular aging 	Pg. 22-28



Lecture		Ch/Pg
I 1. Cell proliferation in tissue repair	<ul style="list-style-type: none"> • Overview of tissue repair • Cell proliferation • Stem cells • Growth factors 	Ch2 Pg. 58-62
I 2. Role of the ECM in tissue repair	<ul style="list-style-type: none"> • Extracellular matrix <ul style="list-style-type: none"> • Structure • Components • Function • Regeneration in tissue repair • Overview of tissue response to injury - revisited 	Pg. 63-65
I 3-14. Scarring & Fibrosis	<ul style="list-style-type: none"> • Steps <ul style="list-style-type: none"> • Angiogenesis • Activation of fibroblasts & ECM deposition • Maturation & remodelling • Factors influencing tissue repair • Clinical examples 	Pg. 66-72
I 5. Neoplasia	<ul style="list-style-type: none"> • Definition & Nomenclature • Benign & Malignant neoplasia • Characteristics <ul style="list-style-type: none"> • Differentiation & Anaplasia • Rate of growth • Local invasion • Metastasis 	Ch5 Pg. 161-169



Lecture		Ch/Pg
16. Epidemiology & introduction to the molecular biology of cancer	<ul style="list-style-type: none"> Epidemiology <ul style="list-style-type: none"> Environment Age Heredity Acquired pre-neoplastic lesions 	Pg. 169-173
17. Genetics & epigenetics of cancer	<ul style="list-style-type: none"> Molecular Biology of Cancer (introduction) Karyotypic changes <ul style="list-style-type: none"> Translocation Deletion Amplification Aneuploidy miRNA Epigenetic changes (methylation) Molecular Biology of Cancer (initiation & progression) Hallmarks of Cancer (introduction) 	Pg. 173-178
18. Hallmarks of Cancer - Growth & Growth inhibition	<ul style="list-style-type: none"> Growth factors & their receptors Signal transduction & transcription Cell cycle control (cyclins & CDKs) The first tumor suppressor gene: RB 	Pg. 178-184
19. Hallmarks of Cancer - Growth inhibition & Evasion of death	<ul style="list-style-type: none"> Guardian of the genome: p53 TGFβ signalling Contact inhibition: NF2 & APC Evasion of cell death 	Pg. 185-190



Lecture		Ch/Pg
20. Hallmarks continued	<ul style="list-style-type: none"> • Limitless replicative potential • Development of sustained angiogenesis • Ability to invade and metastasize 	Pg. 190-195
21. New Hallmarks	<ul style="list-style-type: none"> • Reprogramming Energy Metabolism • Evasion of the Immune System • Genomic instability • Inflammation 	Pg. 195-198
22. Etiology of cancer	<ul style="list-style-type: none"> • Chemical • Radiological • Microbial <ul style="list-style-type: none"> • Oncogenic viruses • <i>H. Pylori</i> 	Pg. 198-204
23. Tumor immunity	<ul style="list-style-type: none"> • Tumor antigens • Cell mediated immunity • Immune surveillance & evasion 	Pg. 204-207
24. Clinical aspects of neoplasia	<ul style="list-style-type: none"> • Systemic effects • Grading & staging • Lab diagnosis including molecular methods 	Pg. 207-213



<http://eacademic.ju.edu.jo/M.AISalihi>

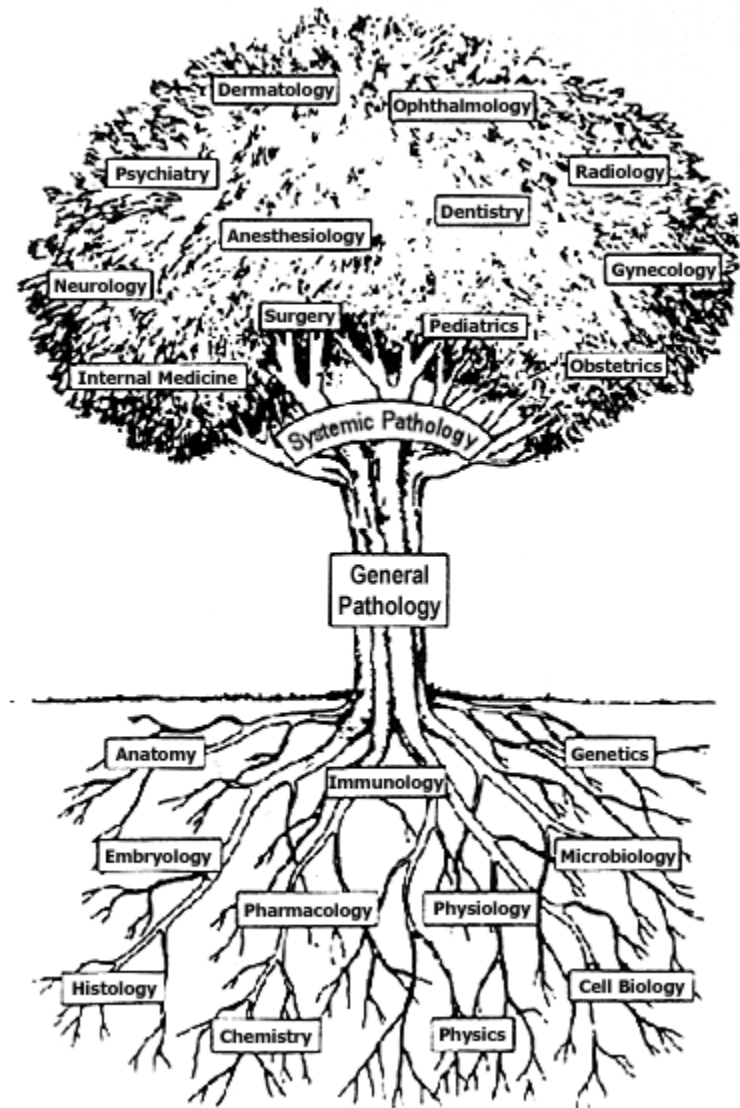




What is Pathology?

The Tree of Medicine

- ▶ Pathology is the scientific basis for clinical medicine
- ▶ Pathology gives clinical purpose to basic scientific research
- ▶ Pathology is not limited to what a pathologist does!



Nomenclature

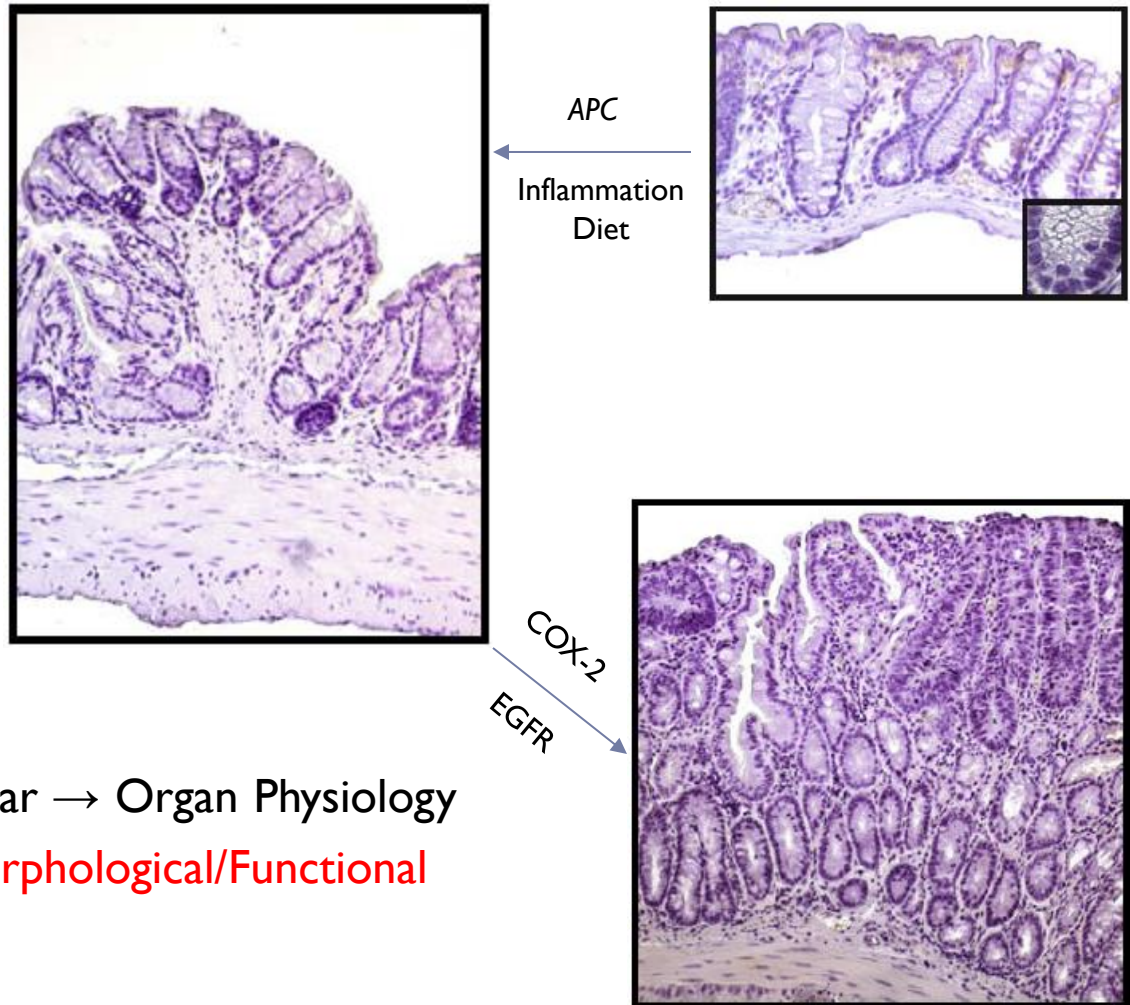
► Disease

► Etiology

- Genetic
 - Hereditary
 - Acquired
- Environmental

► Pathogenesis

- Molecular → Cellular → Organ Physiology
- Morphological/Functional**





Knowledge we take for granted

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.

Virchow's Theory of Cellular Pathology

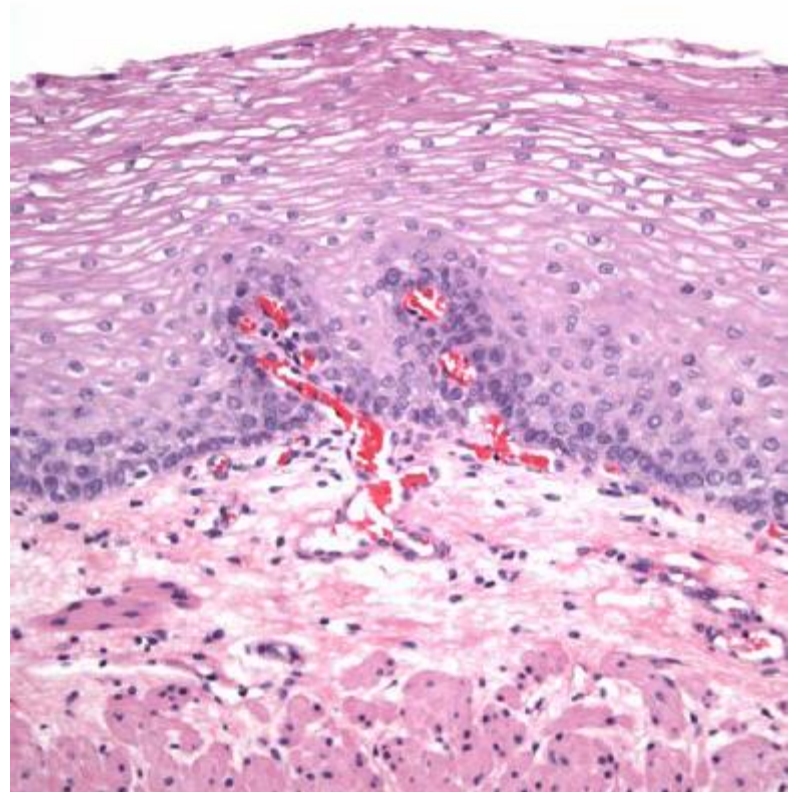
“The object chiefly aimed at in [my lectures], illustrated as they were by as an extensive a series of **microscopical preparations** as it was in my power to supply, was to furnish a clear and connected explanation of those facts upon which, according to my ideas, the theory of life must now be based, 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)



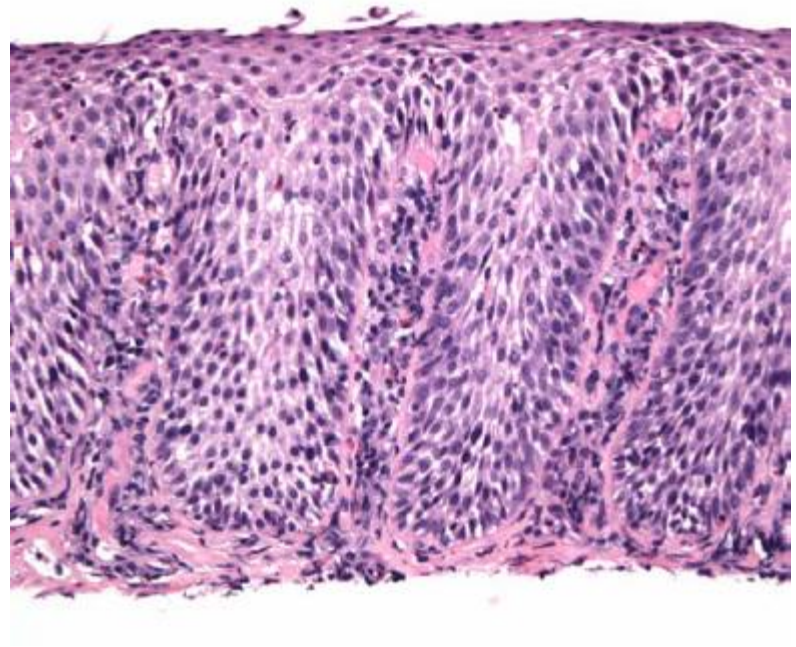
The Morphological Knowledge Database

The vast majority of patients who do not have a disease had an esophagus that looked like this



The Morphological Knowledge Database

The vast majority of patients who complained about heartburn had an esophagus that looked like this

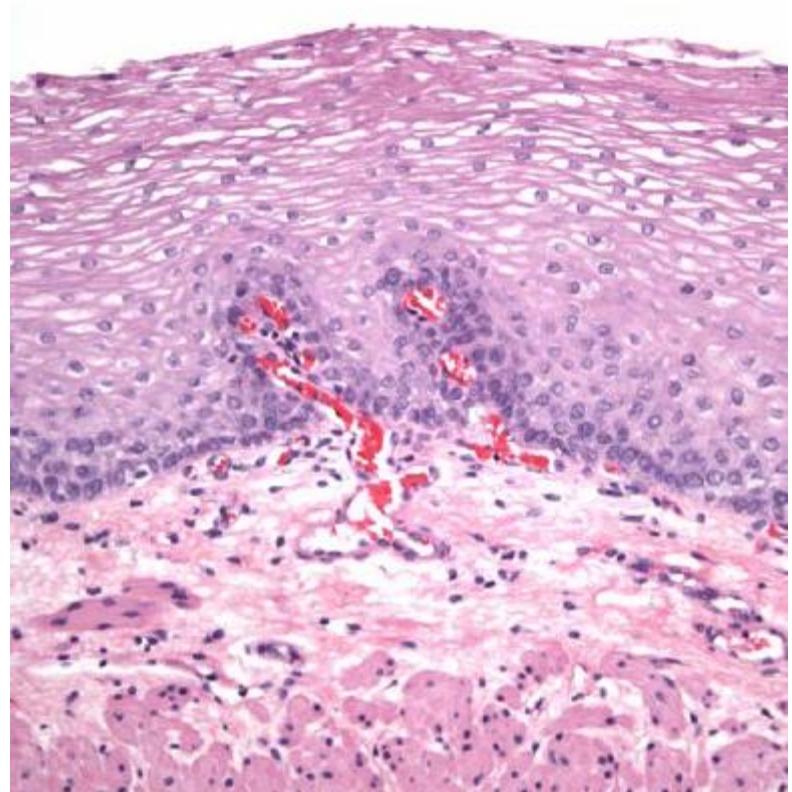


Therefore!



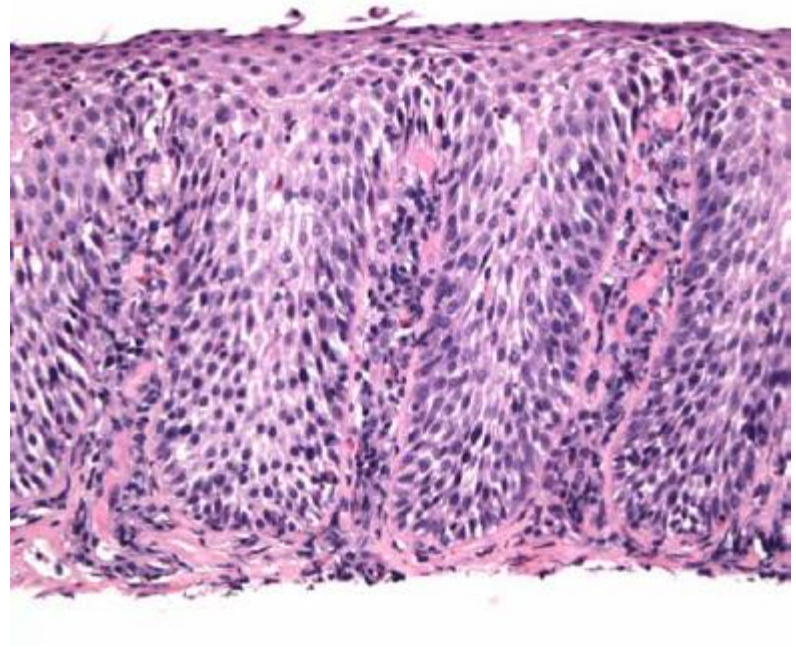
The Morphological Knowledge Database

The next patient with an esophagus that looks like this should have no heartburn



The Morphological Knowledge Database

The next patient with an esophagus that looks like this should have or had heartburn



The Morphological Knowledge Database

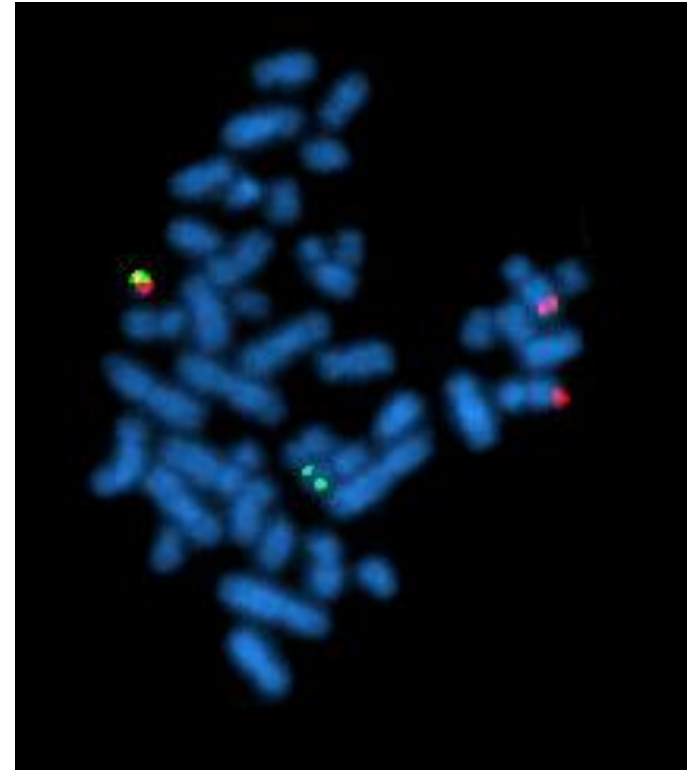
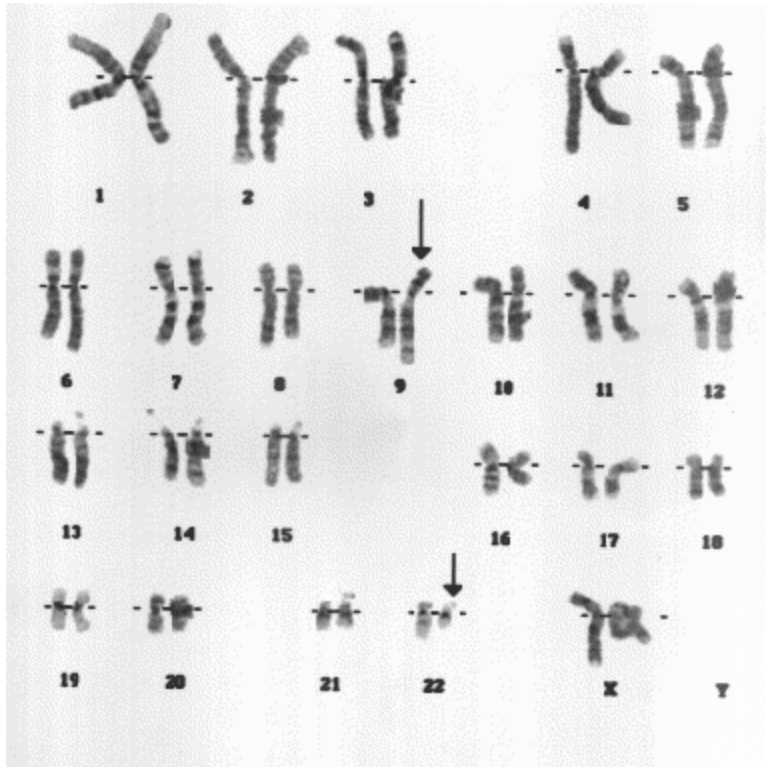
- ▶ Along with a **thorough history and clinical examination** a pathological examination will result in:
 - ▶ A diagnosis
 - ▶ Degree of deviation from the physiological norm (grade)
 - ▶ How far along we are in the disease process (stage)



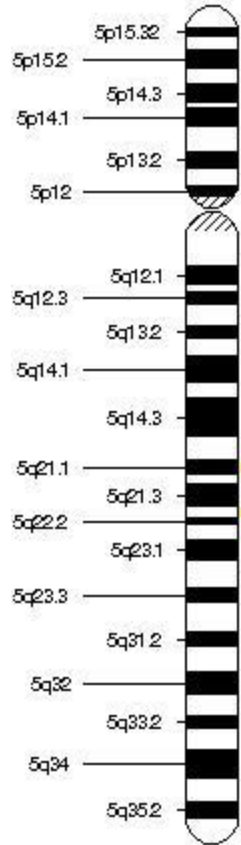


Knowledge we are developing

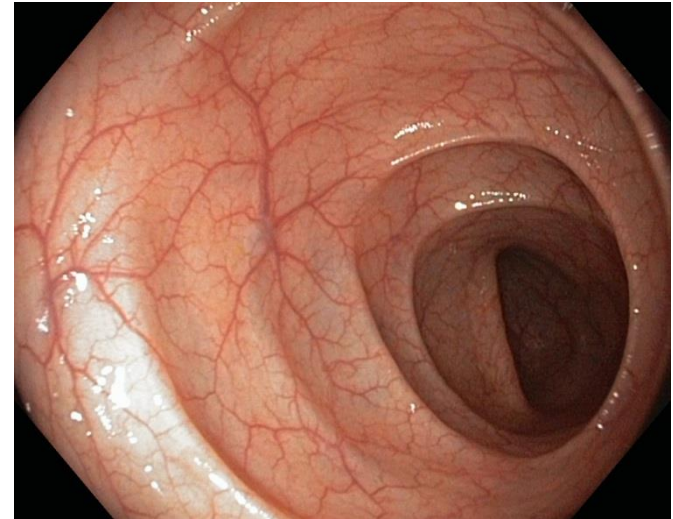
The Molecular Knowledge Database



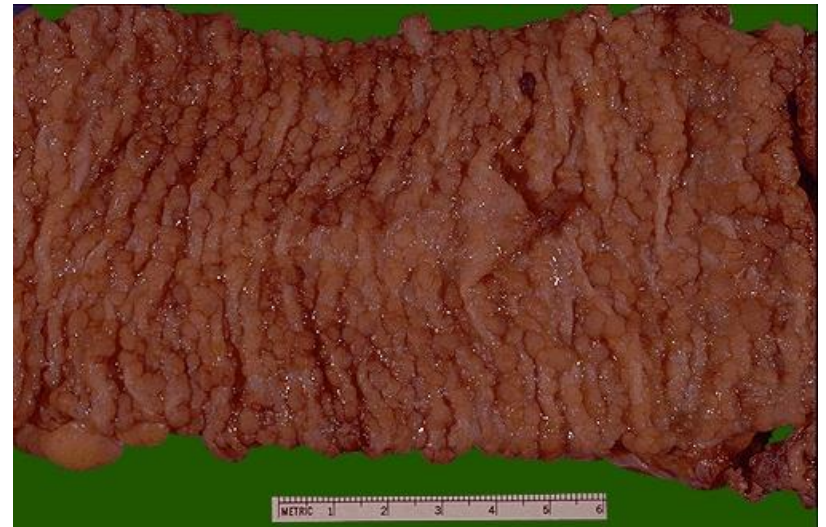
The Molecular Knowledge Database



Normal

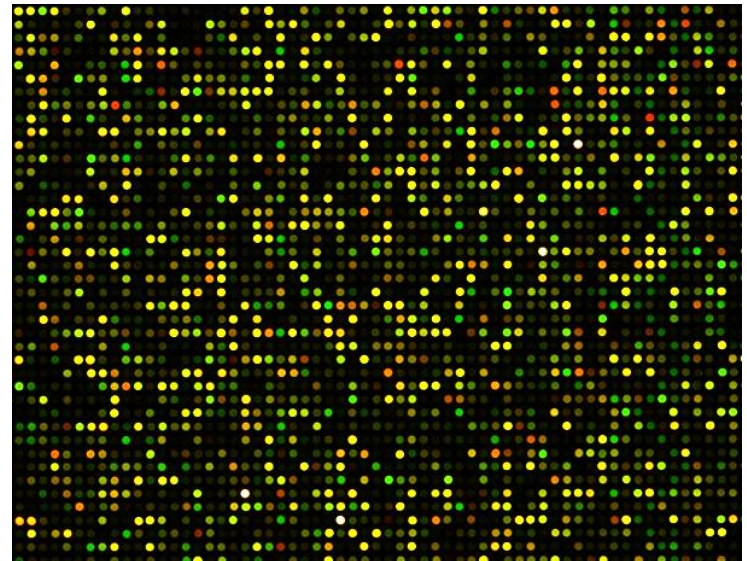
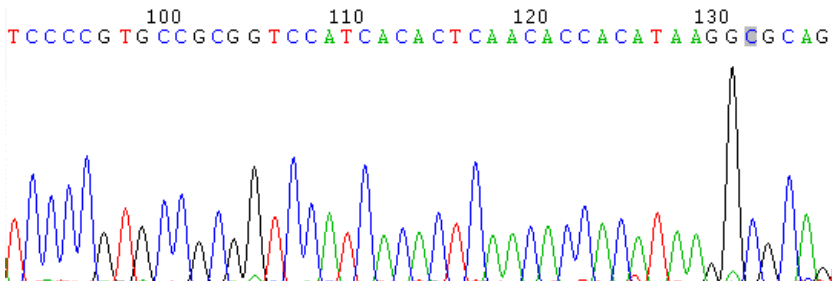
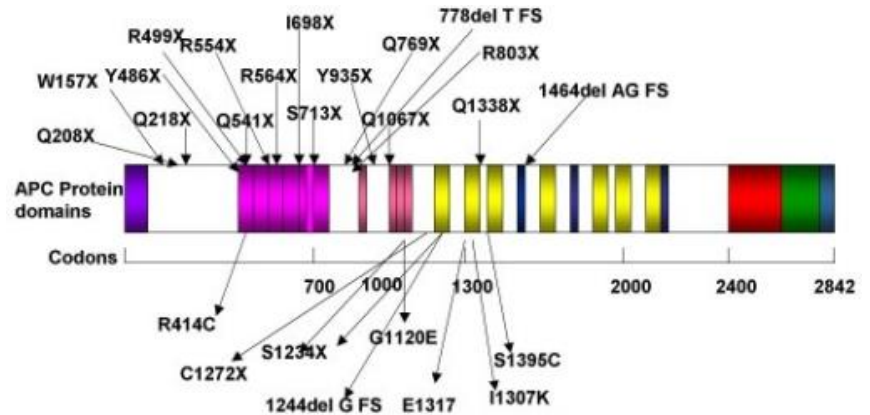
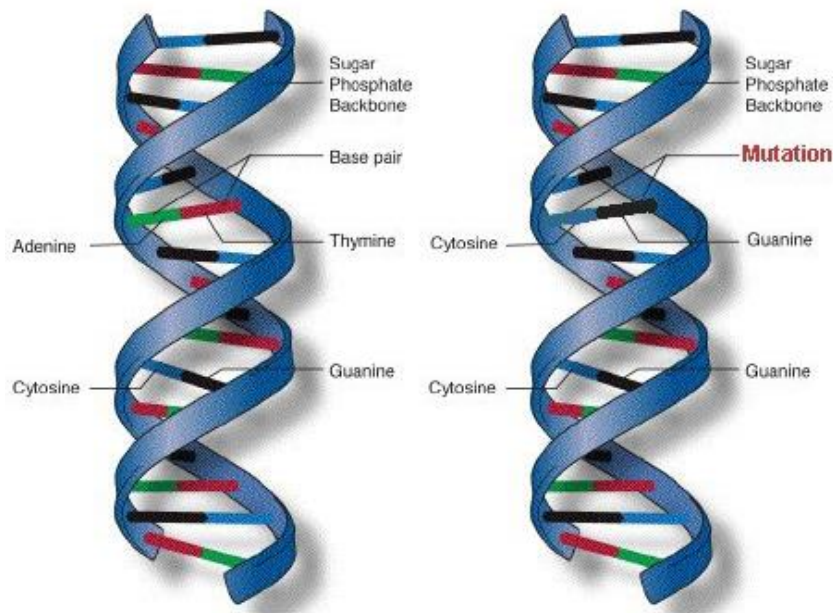


Mutation



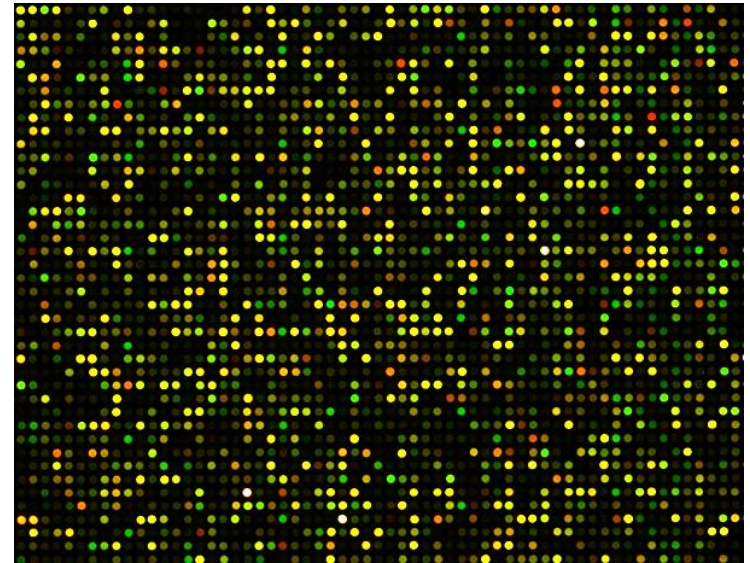
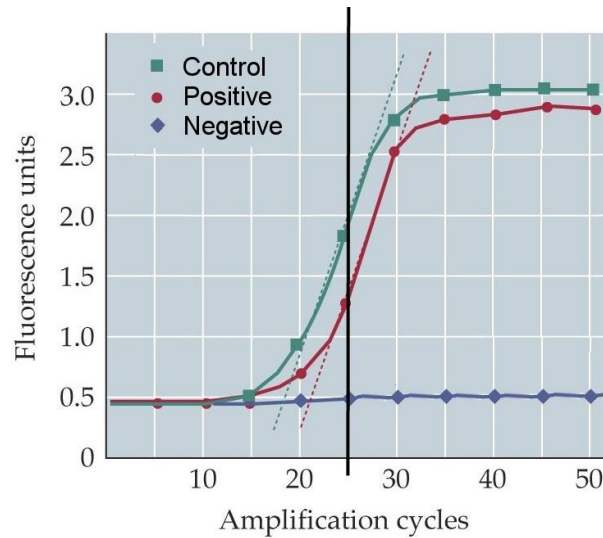
Molecular techniques making the move to the clinic

DNA

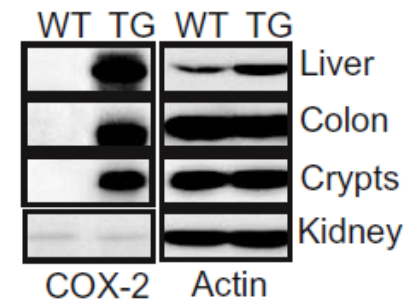
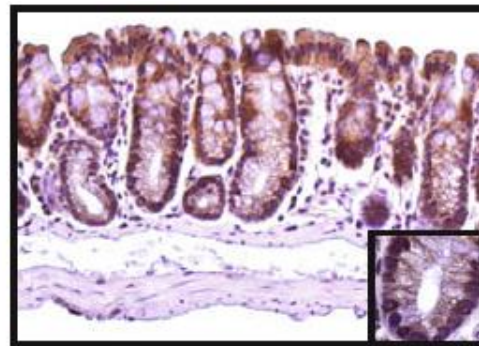
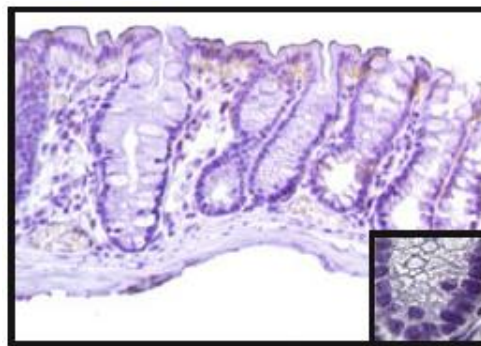


Molecular techniques making the move to the clinic

mRNA



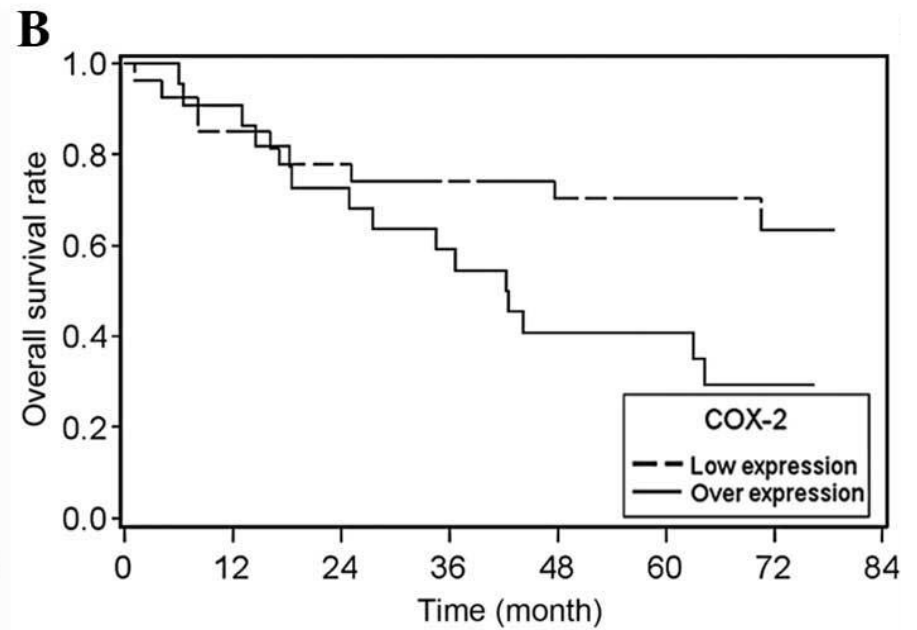
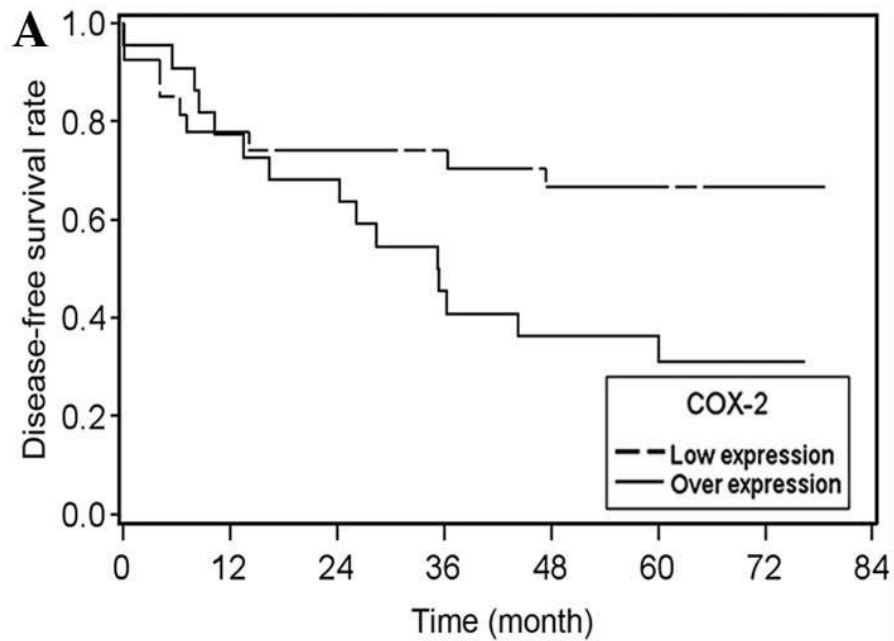
Protein



Why do we need the underlying molecular process?



The Molecular Knowledge Database



Any monkey can follow a flowchart

