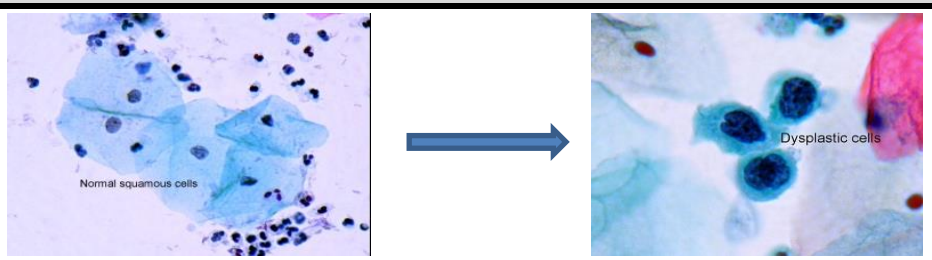
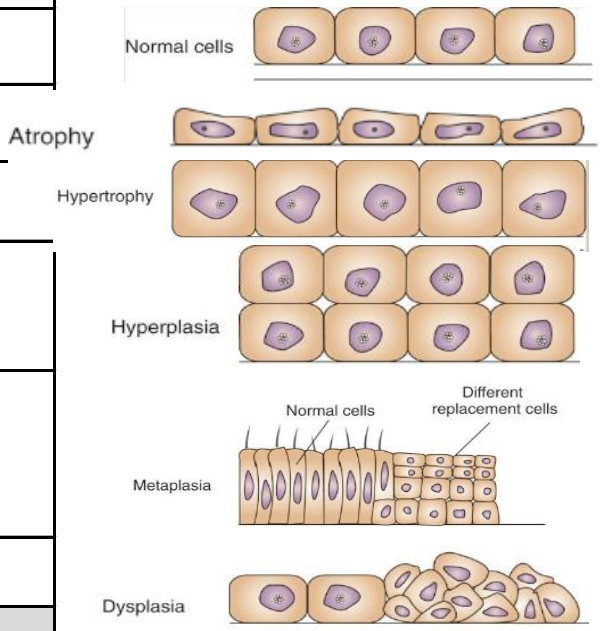
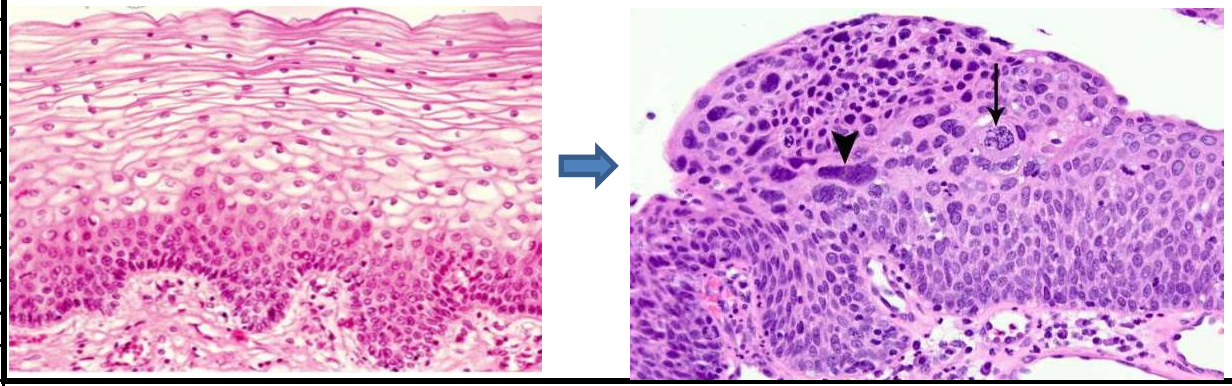
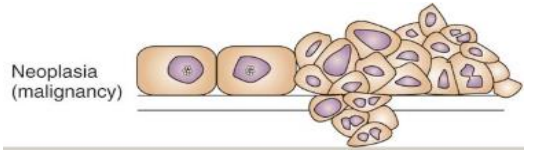
	BIOS 2015 ... CHAPTER 1 - INTRODUCTION
Page	**Note**
2	Pathophysiology involves the study of functional or physiologic changes in the body that result from disease processes.
	Key is to understand normal so that deviations from normal can be appreciated.
	Some changes are physical and detectable by senses, others are at molecular level and require laboratory studies to diagnose.
	Homeostasis is the maintenance of a relatively stable internal environment regardless of external changes. Includes such factors as blood pressure, body temperature, and fluid balance. **Disease** develops when significant changes occur in the body, leading to a state in which homeostasis cannot be maintained without intervention.
3	**Primary Prevention:** The goal is to protect healthy people from developing a disease or experiencing an injury in the first place.
	Secondary Prevention: These interventions happen after an illness or serious risk factors have already been diagnosed.
	Tertiary Prevention: This focuses on helping people manage complicated, long-term health problems such as diabetes, heart disease, cancer, and chronic musculoskeletal pain.
	The research process in the health sciences is a lengthy **three-stage process** that aims to demonstrate both the safety and effectiveness of a new therapy.
	Stage 1: "basic science" in which researchers work to identify a technology that will work to limit or prevent the disease process (often requires the use of animals or cell cultures).
	Stage 2: a **small number of human subjects** are studied to determine if the therapy is safe for humans.
	Stage 3: a **large number of patients** with the disease (or at risk) are enrolled in clinical trials (**double blind studies** in which the research subject and the person administering the treatment do not know if the subject is receiving a standard, proven therapy or the therapy being tested).
4	Success in the three stage process produces **"evidence based research findings".**
	In some rare cases, stage three research trials will be stopped if there is a significant difference in the mortality rate for the experimental group versus the control group. AZT is an example.
	Once a therapy is approved for use, it may show additional potential to treat a different disease. Such use is termed **"off-label"** use.
5	Examination is both **"Gross"** - what can be seen by eye - and **"Microscopic"** what can be seen using a microscope. A tissue sample known as a "Biopsy" is surgically removed from a patient and prepared for microscopic exam.
	An **"autopsy"** is an exam of the patient after death.

	"Diagnosis" is the label given for a disease that may require testing on many levels to confirm.
	(example) A physical symptom may lead to a radiologic study that may identify a mass that may be biopsied that may be studied with DNA markers to arrive at the final diagnosis of a rare malignancy.
6	**TERMS:**
	"Idiopathic" - cause of the disease is unknown.
	"Iatrogenic" - a disease or condition caused by a medical mistake or as an unwanted secondary effect (complication) of a primary treatment.
	"Predisposing factors" - things that increase the risk of a disease. Example: A high dietary intake of cholesterol and saturated fats, cigarette smoking, obesity, and a sedentary lifestyle are factors that increase the risk of heart attacks.
	"Prophylaxis" or prophylactic treatment refers to preventative measures like taking aspirin daily to lower the chance of a heart attack (in a high risk patient).
	"Pathogenesis" is the sequence of events that results in disease.
	"Acute" - rapid onset vs **"Insidious"** - onset that is vague with gradual progression.
	"Chronic" - a persistent disease that may smoulder or present as multiple acute episodes often with **"sequelae"** (unrepaired or permanent damage).
	"Subclinical" refers to a process where the disease is not yet producing symptoms strong enough to be observed.
	"Latent" refers to a silent stage or incubaion phase pior to the disease being clinically evident.
	"Prodromal period" - a point in time when symptoms are vague and not definitive.
	"Manifestations" are signs and symptoms caused by a disease. They may be **"local"** or **"systemic"** (widespread). **"Signs"** are objective and can be seen by observers (like fever or a rash). **"Symptoms"** are subjective, hard to measure, and reported by the patient (Like pain and nausea).
	"Lesion" is a site of disease that may be grossly or microscopically evident.
7	**"Syndrome"** is a collection of findings that occur together and are associated with a defined disease process.
	"Remission" - the disease has regressed and is not detectable.
	"Exacerbation" - the disease worsens.
	"Precipitating factor" - a condition that triggers an event.
	"Complication" - a secondary problem.
	"Therapy" - a treatment or series of treatments designed to improve or cure a disease.
	"Convalescense or Rehabilitation" - is the recovery period period leading from disease to cure.
	"Prognosis" - the expected outcome of the disease (good or bad).

	"Morbidity" - the damage caused by the disease.
	"Mortality" - death resulting from the disease.
	"Epidemiology" - population studies to track the occurrence of a disease. Important in controling **"epidemics"** (outbreaks of disease). **"Pandemic"** - a large epidemic covering many geographic zones.
	"Incidence" - the number of new cases in a given time period.
	"Prevalence" - the overall number of cases in a given population and time period.
	"Communicable disease" - is one that can be spread from person to person.
	"Notifiable or Reportable Disease" - is one that is required to be reported to an agency like the CDC (Centers for Disease Control). Usually are diseases with public consequences.
8	Adaptive Cellular Changes may be grossly and microscopically evident.
	"Atrophy" - decrease in cell size and subsequently organ size.
	"Hypertrophy" - increase in cell size and subsequently organ size.
	"Hyperplasia" - increase in cell number and subsequently organ size.
	"Metaplasia" - change in cell type (example ciliated collumnar to squamous in irritated airways). 
	"Dysplasia" - difficult growth, a process where cells change to an abnormal cell that may be precancerous. Stays above the basement membrane.
	PAP Smear
	 NORMAL SQUAMOUS CELLS DYSPLASTIC SQUAMOUS CELLS



9	**"Anaplasia" -** backward growth, a process where cells lose their normal appearance and have a malignant appearance that may include pleomorphism (variation in size), enlarged and dark (hyperchromatic) nuclei with prominent and sometimes bizarre nucleoli, and an increased mitotic rate, sometimes with multipolar and bizarre mitoses.
	
	ANAPLASIA - note large and bizarre nuclei, hyperchroatic nuclei, and mitoses.
	"Neoplasia" - new growth, may be a "Benign" tumor or a "Malignant" tumor (cancer).
	- Benign grows locally, does not metastasize, and usually does not kill the host.
	- Malignant may be locally aggressive, destroying vital structures, spread to distant sites, and usually will kill the host if untreated.
	CELL DAMAGE AND NECROSIS:
	"Apoptosis" - programmed cell death; used in development (formation of fingers), and to eliminate genetically defective cells before they become cancer.
	Cells can be injured by:
	- **ischemia,** decreased oxygen to the tissue from the blood usually due to an interuption in blood flow (like a blood clot) or circulation that is oxygen poor (as in anemia).
	- **hypoxia,** reduced oxygen in the tissue, cells can not function and tissues may die.
10	- **anaerobic -** without oxygen, biochemical pathways that flourish in a low oxygen environment are called anaerobic. This may lead to lactic acidosis.
	- **physical** injury from pressure or heat.
	- **chemicals** from outside the body (**exogenous**) or produced inside the body (**endogenous**).
	an example of endogenous chemicals that damage cells is **free radicles**.
	- microorgnsims that produce infectious disease.



Cell Damage:

- may be minor and reversable or severe and leading to cell death.
- initial chages may be biochemical and not make the cell appear diseased.
- in time, the cell may manifest an altered appearance (altered morphology).

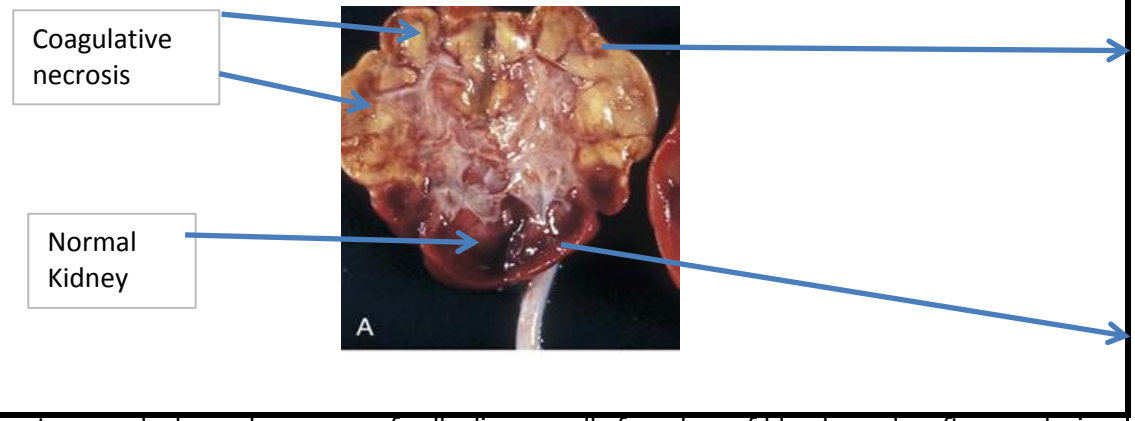
After a cell dies, the nucleus fragments (karyorrhexis) and undergoes dissolution (or lysis). Digestive enzymes from lysosomes are released in the adjacent tissues and cause the cardinal signs of inflanmmation (swelling, redness, pain, and loss of function).

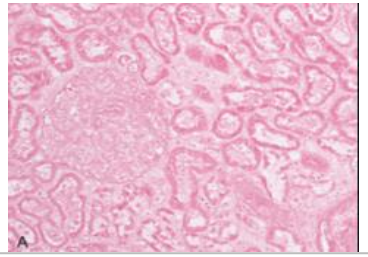
Some enzymes from dead tissue leak into the blood system and be detected in tests that may idenify the source (after a heart attack, cardiac specific enzymes are found in blood).

"Necrosis"- is the term used when a group of cells die. Depending on how they die, the appearance may be distinct both grossly and microscopically. Different types of necrosis include:

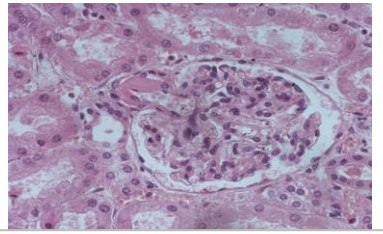
- Liquifaction necrosis: tissue becomes liquified. (typical in brain and sites of infection)

- Coagulative necrosis: tissue retains form but grossly is pale adjacent to normal tissue and has a "pinked out" ghost like image on microscopic exam (on stain with Hematoxylin and eosin).





Kidney with coagulaive necrosis - note stain is all pink and cell nuclei are not blue and are not easy to see.



Normal Kidney - note stain is pink and blue and cell nuclei are easy to see.

- Infarction: tem used when a large area of cells dies, usually from loss of blood supply, often producing coagulative necrosis.

- Fat necrosis: is an enzymatic digestion of the tissue (can result in soap formation).

-Gangrene: necrois with bacterial superinfection (looks dead, often black)
: sometimes preceded by infarction
: can be "wet" or "dry"

Gangrenous Toes

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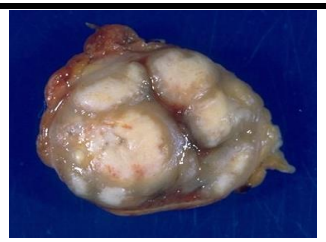
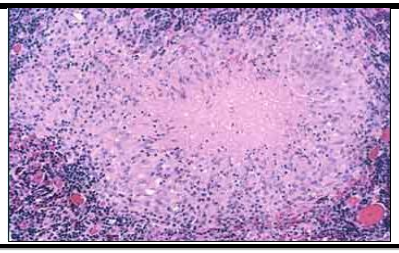
- Caseous necrosis: "cheesy necrosis" named due to its appearance. This type of necrosis forms a granuloma (necrotic area surrounded by a collar of macrophages) with a center composed of pasty, crumbly tissue that resembles cheese.



Gross photo of lymph node. Cut surface shows



Microscopic appearance of a caseating granuloma. Pink

This is the type of necrosis seen in infections with *Mycobacterium Tuberculosis* that causes tuberculosis (TB). The below figure points out the early lesion as a Ghon complex with central and peripheral lymph node involvement and the later lesion where apical lung lesions eventually cavitate.

FIGURE 1-4 **A and B**, Pulmonary tuberculosis. **C**, A tuberculous lung with a large area of caseous necrosis.