PATHOLOGY

MD3

PATHOLOGY

Fundamentals of Pathology

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Learning Objectives

- ❑ Define the Etiology, pathogenesis, morphology, and clinical significance of disease
- ❑ List techniques for staining pathologic specimens

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OVERVIEW OF PATHOLOGY

Definitions

- The study of the essential nature of disease, including symptoms/signs, pathogenesis, complications, and morphologic consequences such as structural and functional alterations in cells, tissues, and organs

- The study of all aspects of the disease process focusing on the pathogenesis leading to classical structural changes (gross and histopathology) an molecular alterations The **Etiology** (cause) of a disease may be genetic or environmental. The **pathogenesis** of a disease defines the temporal sequence and the patterns of cellular injury that lead to disease. **Morphologic** changes of the disease process include both gross changes and microscopic changes. The **clinical significance** of disease relates to its signs and symptoms, disease course including complications and prognosis.

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Methods Used

- **Gross examination** of organs on exam questions has 2 major components: identifying the organ and identifying the pathology. Useful gross features include consideration of size, shape, consistency, and color.

Microscopic examination of tissue

• In light microscopic examination of tissue, **haematoxylin and eosin (H&E)** is considered the gold standard stain and is used routinely in the initial microscopic examination of pathologic specimens.

- The common denominator of the features is that haematoxylin binds nucleic acids and calcium salts, while eosin stains most proteins (both extracellular and intracellular).

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Hematoxylin

- Stains blue to purple
- Nuclei
- Nucleoli
- Bacteria
- Calcium
- Thyroid colloid

Eosin

Stains pink to red

Cytoplasm

Collagen

Fibrin

RBCs

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Eosin Stain

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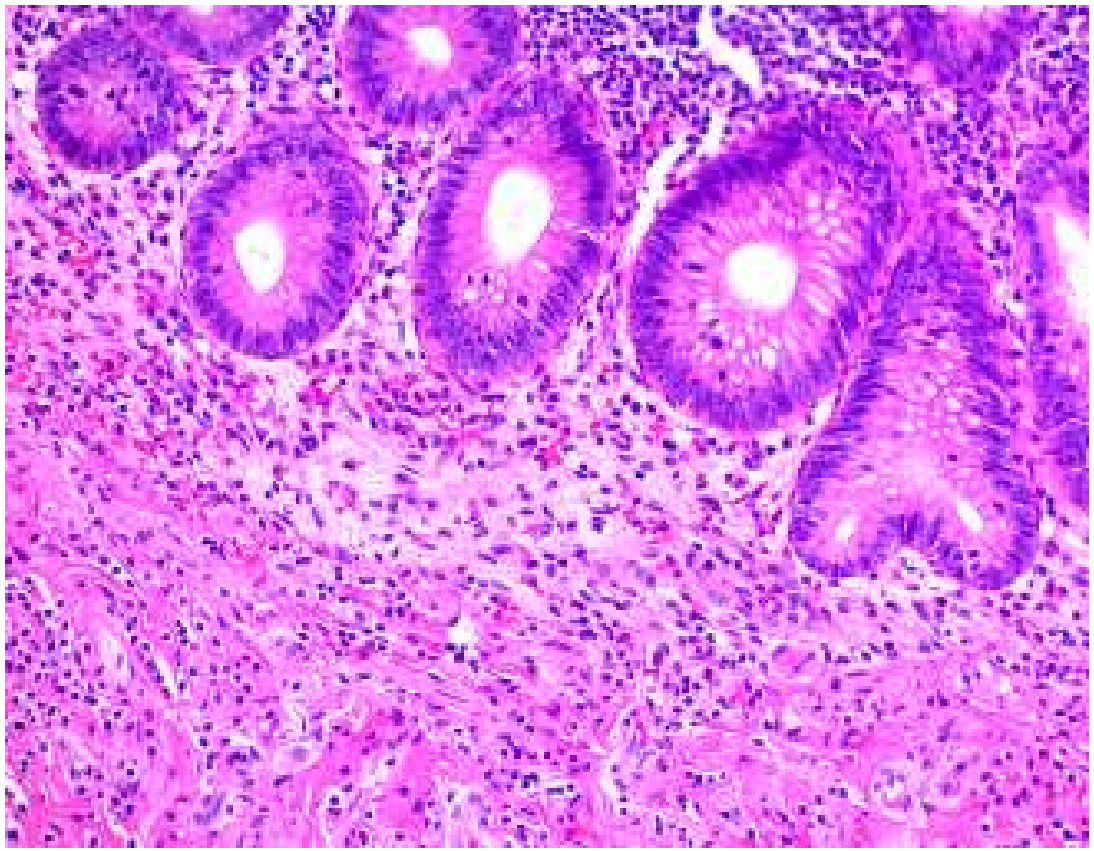
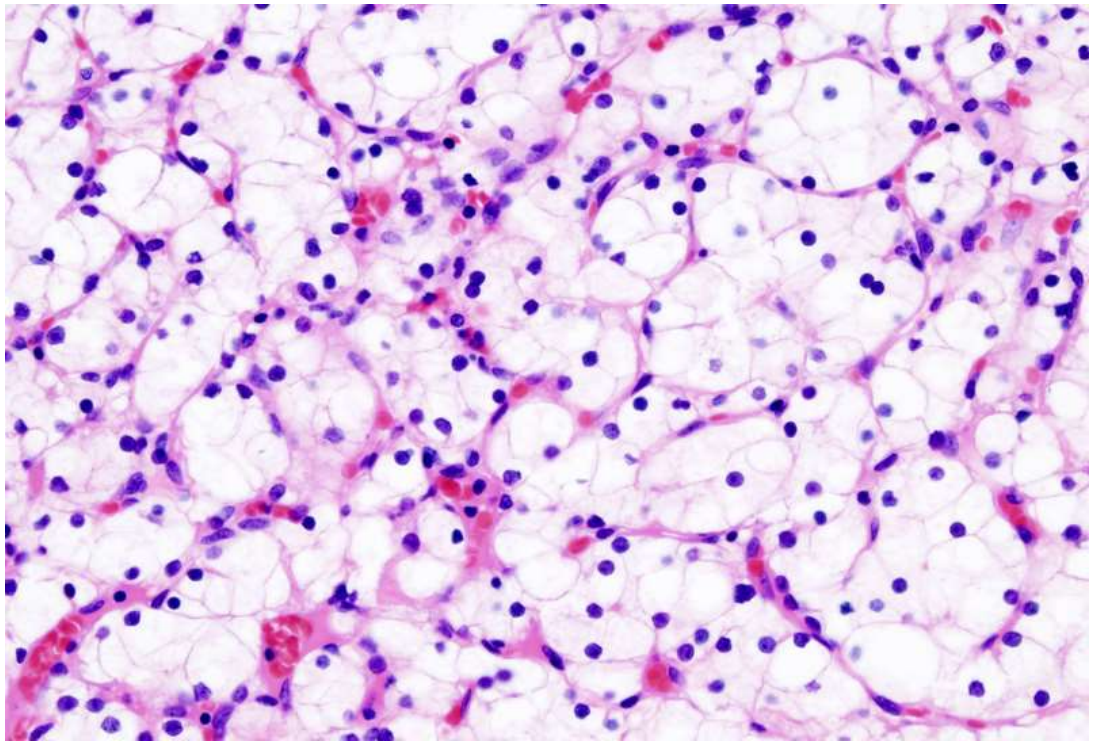
Eosin stain on slide



Eosin stain on adipose cells



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Other histochemical stains (chemical reactions):

Prussian blue (stains iron),

Congo red (stains amyloid),

Acid fast (Ziehl-Neelsen, Fite) (stains acid-fast bacilli),

Periodic acid-Schiff (PAS, stains high carbohydrate content molecules),

Gram stain (stains bacteria),

Trichrome (stains cells and connective tissue),

Reticulin (stains collagen type III molecules).

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Congo red

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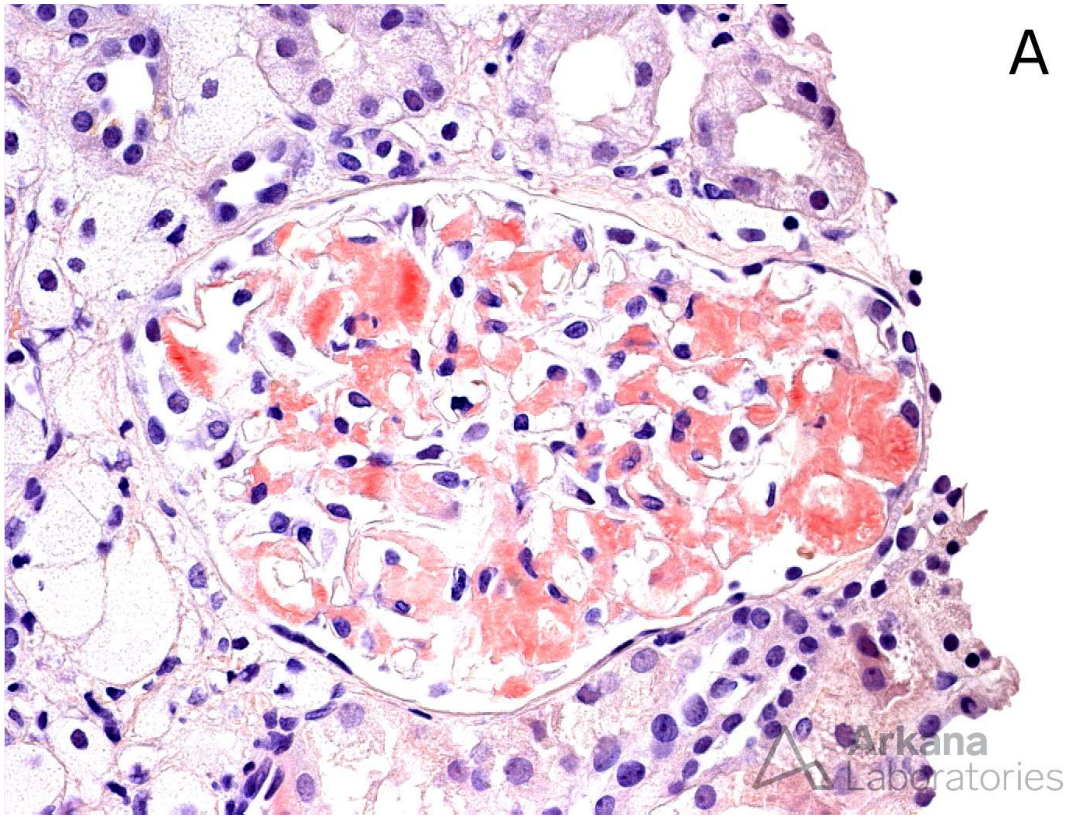
Congo red stain



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Immunohistochemical (antibody) stains include

Cytokeratin (stains epithelial cells),

Vimentin (stains cells of mesenchymal origin except the 3 muscle types; stains many sarcomas),

Desmin (stains smooth, cardiac, and skeletal myosin),

Prostate specific antigen, and many others.

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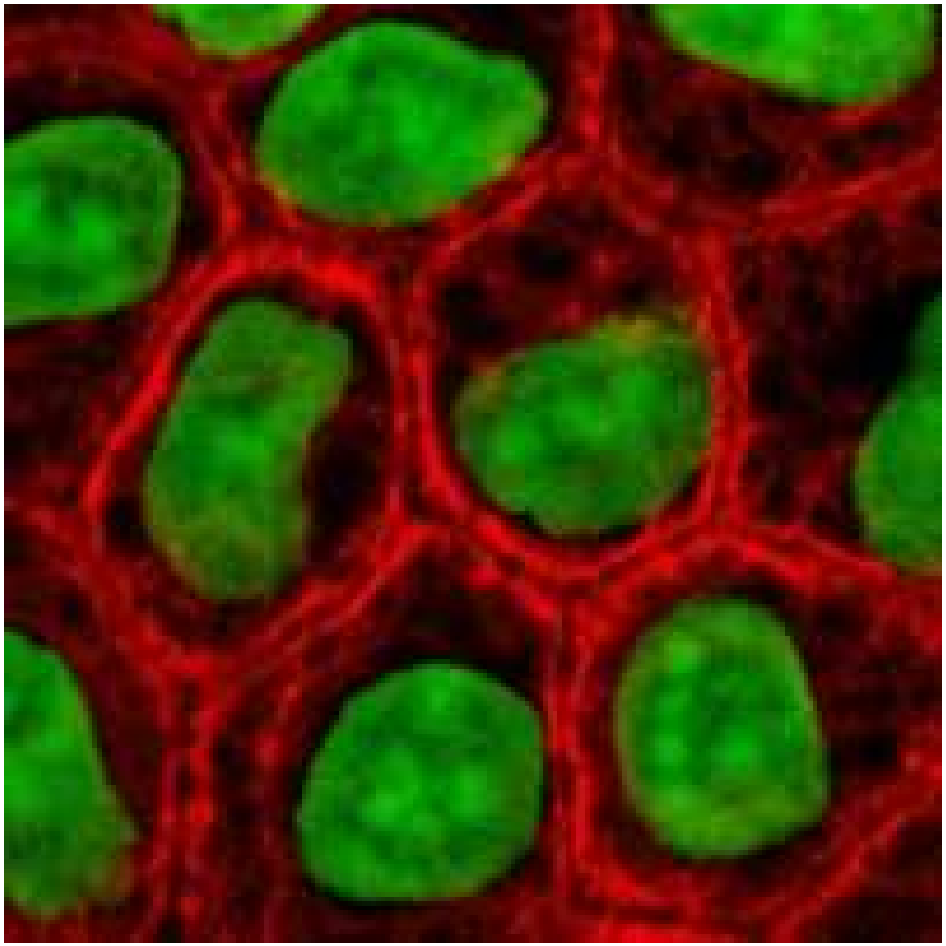
Cytokeratin

Cytokeratins are keratin proteins found in the intracytoplasmic cytoskeleton of epithelial tissue. They are an important component of intermediate filaments, which help cells resist mechanical stress.



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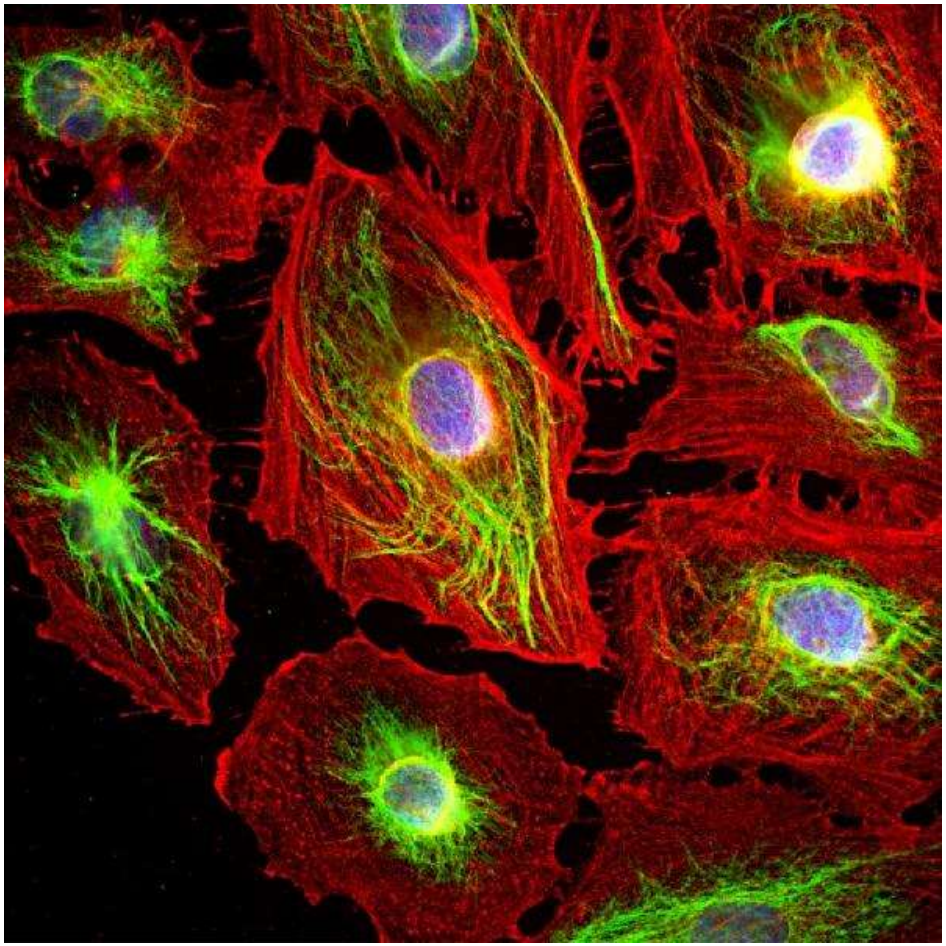
Vimentin

Vimentin is a type III intermediate filament (IF) protein that is expressed in mesenchymal cells. IF proteins are found in all animal cells as well as bacteria. IF, along with tubulin-based microtubules and actin-based microfilaments, comprises the cytoskeleton



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Prussian blue

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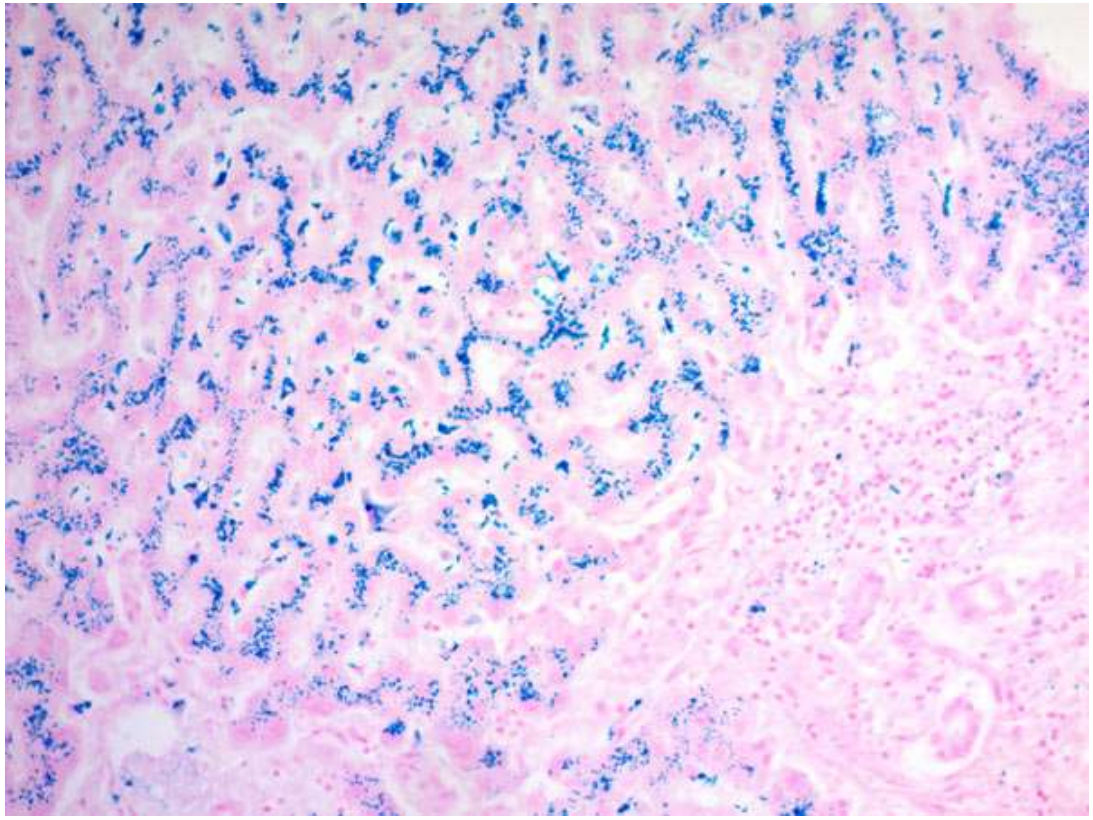
Prussian Blue



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- **Ancillary techniques** include **immunofluorescence microscopy (IFM)**, typically used for renal and autoimmune disease, and **transmission electron microscopy (EM)**, used for renal disease, neoplasms, infections, and genetic disorders.
- **Molecular techniques** include protein electrophoresis, Southern and Western blots, polymerase chain reaction (PCR), and cytogenetic analysis (karyotyping, in situ hybridization studies).

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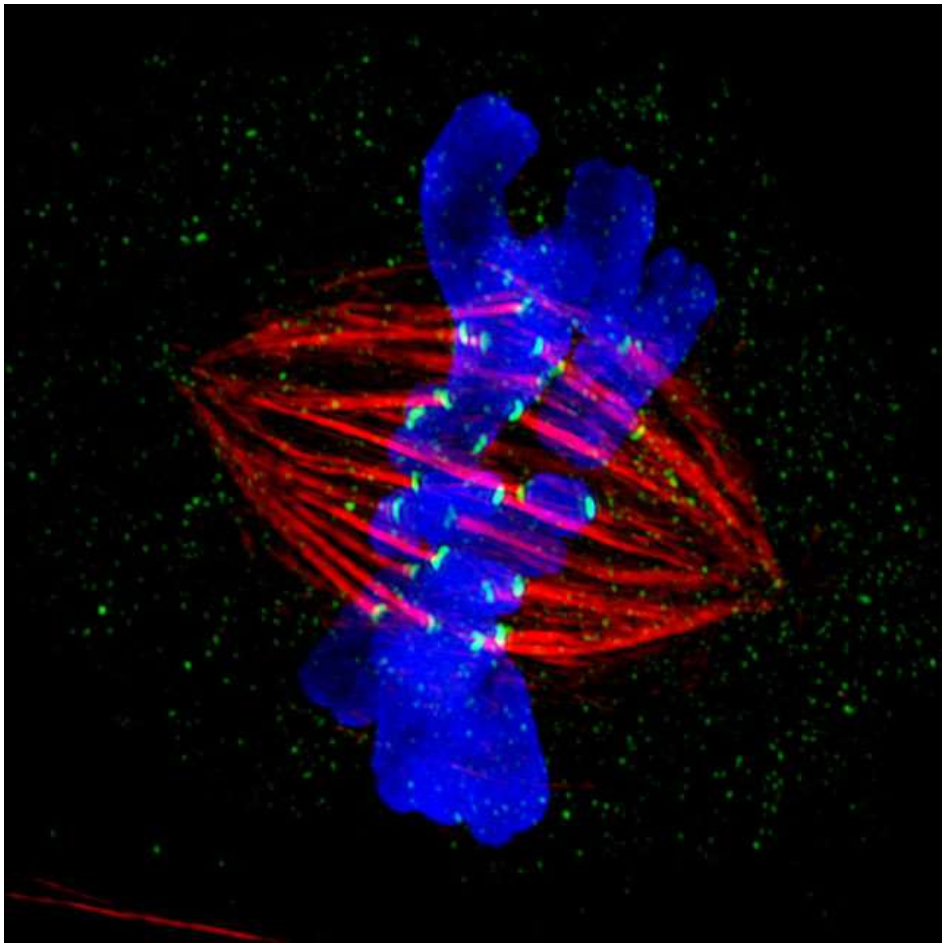
Immunofluroscent Microscopy



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