



3th Stage

PIGMENTS AND MINERALS IN TISSUE

Lab 1

PIGMENTS

- **Pigments colored substances deposited in cells and tissue**
- **Some pigments are artificial while others are natural**

CLASSIFICATION OF PIGMENTS:

1. Artefact pigments

2. Exogenous pigments

3. Endogenous pigments



ARTEFACT PIGMENTS

- Most commonly as a result of fixation
- Normally lie on top of tissues and not within cells
- These are fixation artifacts which include:
 1. Formalin
 2. Mercury
 3. Chrome
 4. Picrates

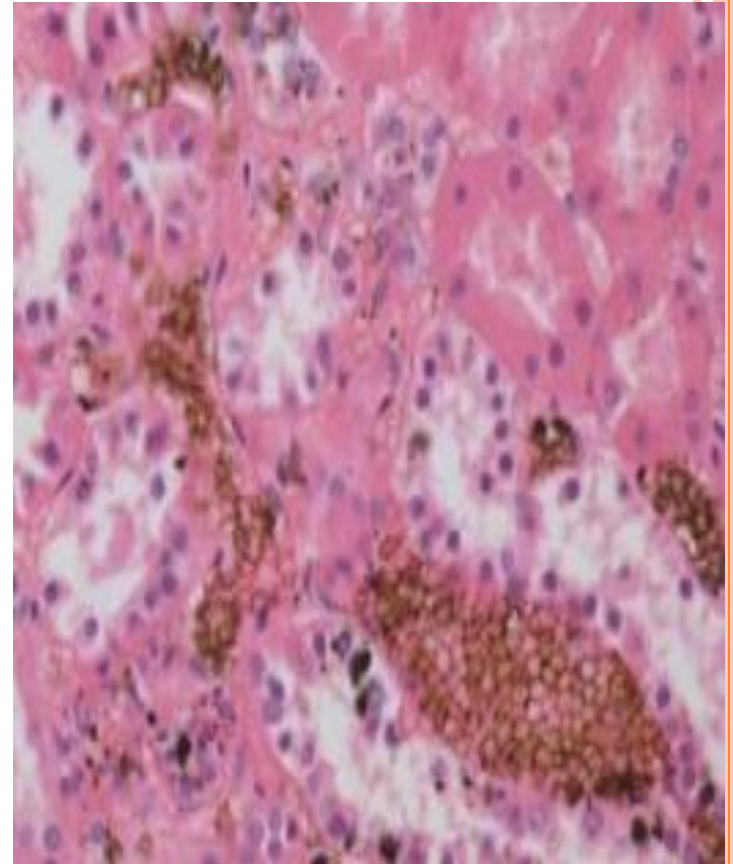


FORMALIN PIGMENT

Pigment appears as a brown/ brownish black deposit in tissues fixed in any formalin fixative with an acid pH & is more likely to occur in blood rich tissues.

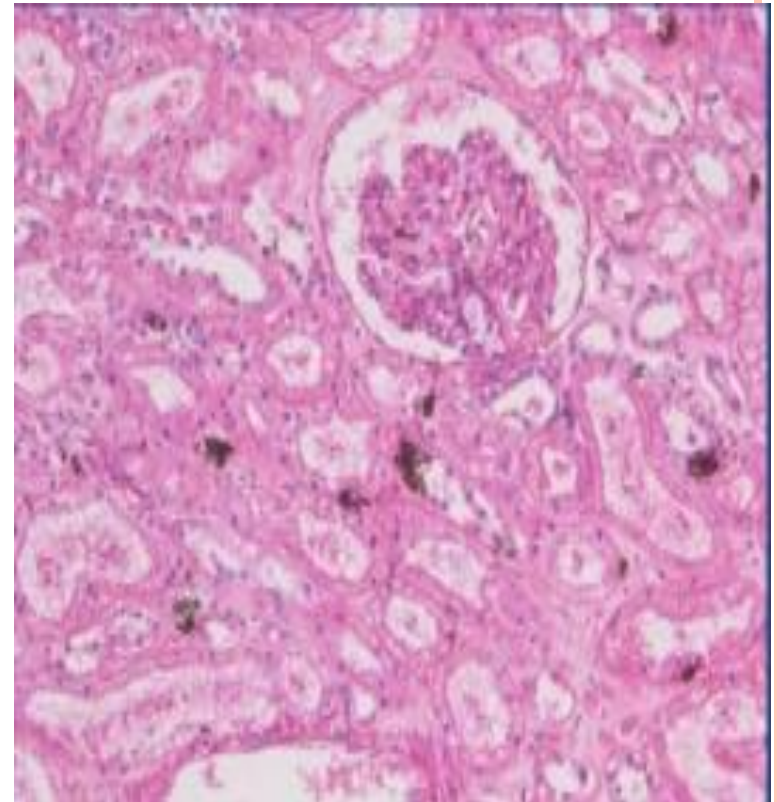
Can be removed by treating with

- ✓ Saturated alcoholic picric acid for some hours.
- ✓ 10% ammonium hydroxide in 70% alcohol for 5-15 min.
- ✓ Resistant to strong acids



MERCURY PIGMENT

- Tissues fixed in fixative mixtures containing mercury have been found to develop a uniform granular black deposit.
- This can be removed by treatment with **Lugol's iodine and sodium thiosulphate.**



CHROME AND PICRATE PIGMENT

CHROME PIGMENT

- Consequence of fixation in solutions containing potassium dichromate eg Zenker's fixative
- Can be removed by water before dehydration

PICRATE PIGMENT

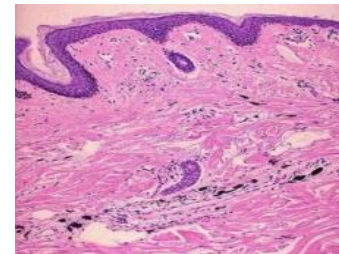
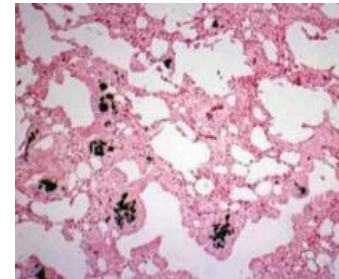
- Consequence of fixation in solutions containing picric acid eg Bouin's fixative
- Can be removed with saturated aqueous lithium carbonate



EXOGENOUS PIGMENTS

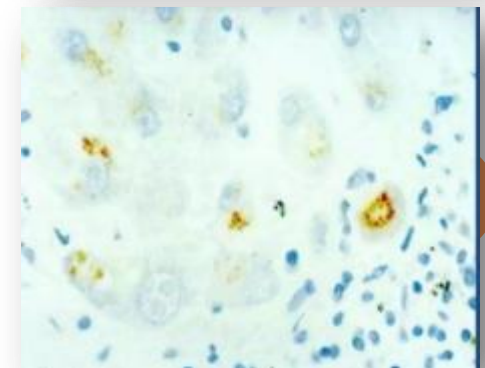
These originate outside the body, from external environment and are non physiological

- **Carbon** : black, found in lungs and associated nodes; resists bleaching insoluble in concentrate sulfuric acid.
- **Silica**
- **Dusts e.g coal dust**
- **Tattoo pigments**: Found in skin and associated lymph nodes
- **Silver**



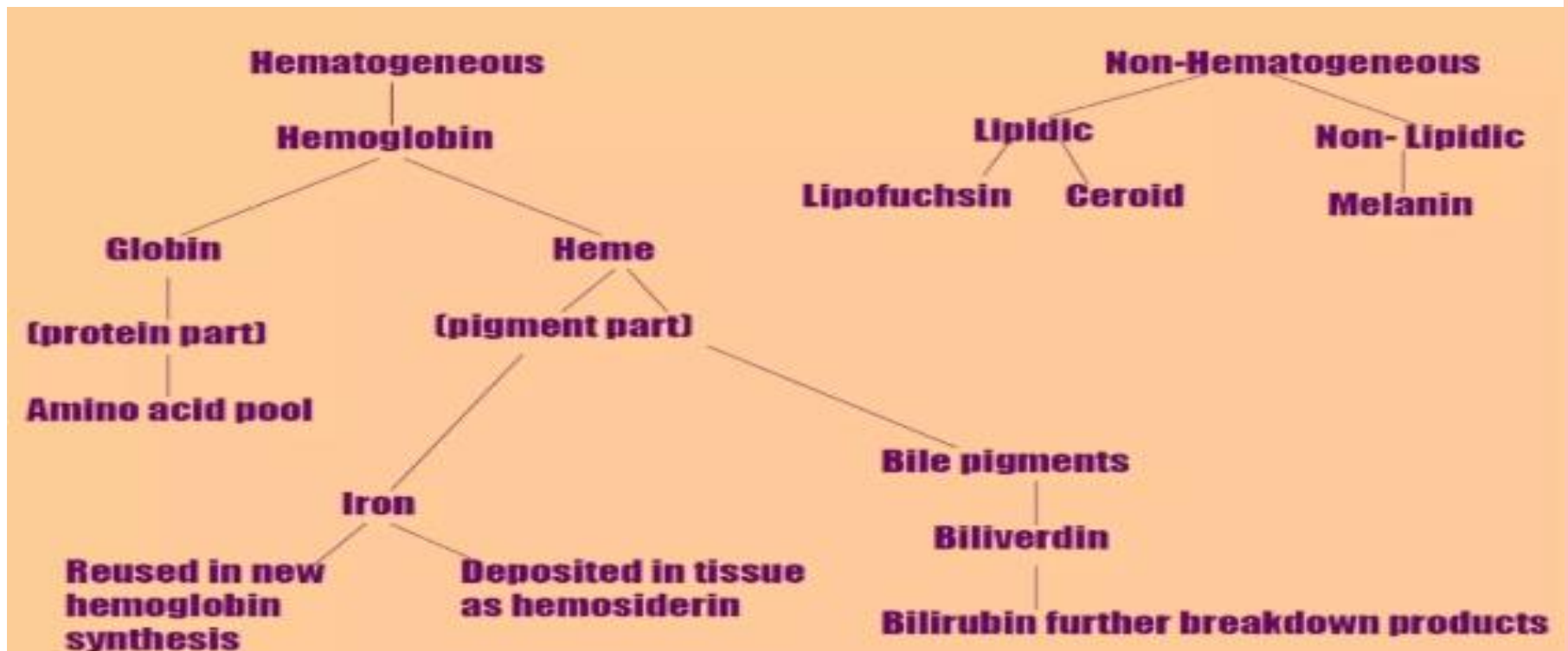
MINERALS

- Metallic and non-metallic ions necessary for growth and other bodily functions
- Calcium, ferrous and ferric iron, copper, phosphate and carbonate are the most common
- iron, and copper are metals normally found in the body; copper and aluminum are found in the body only in pathologic conditions.
- **Minerals normally found in the body:**
 - ❑ Calcium: normal in circulating blood and in bone; Abnormal deposits can be associated with atherosclerosis, sarcoid, TB and some tumours
 - Also found in joints in chondrocalcinosis
 - Demonstrate with von Kossa silver method
 - ❑ Copper
 - Accumulates in liver and other organs in Wilson's disease
 - Also found in primary biliary cirrhosis and other liver disorders
 - Stain with rhodanine (or rubeanic acid)



ENDOGENOUS PIGMENTS

- These are produced within tissue and serve a physiological function or are by products of normal metabolic processes.
- They are sub divided into:
 1. Haematogenous (Hemoglobin-derived)
 2. Non Haematogenous (Non Hemoglobin-derived)



HAEMATOGENOUS ENDOGENOUS PIGMENTS

NORMAL AND ABNORMAL IRON

❑ Storage

- Ferritin: protein-iron complex (normal)
- Hemosiderin: ferritin aggregate (abnormal)

❑ Normal and abnormal Iron...

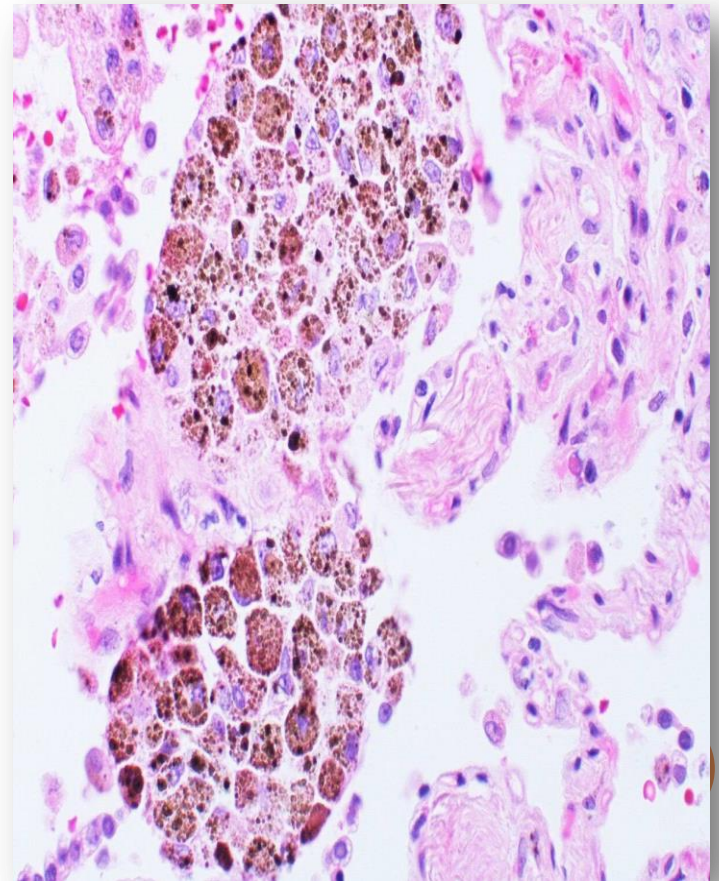
- Under normal conditions, hemosiderin can be seen in the mononuclear phagocytes of the bone marrow, spleen, and liver.
- Actively engaged in red cell break down.
- Excesses of iron causes hemosiderin to accumulate within cells.
- Local excesses of iron and hemosiderin result from.



HAEMATOGENOUS PIGMENTS

HEMOSIDERIN

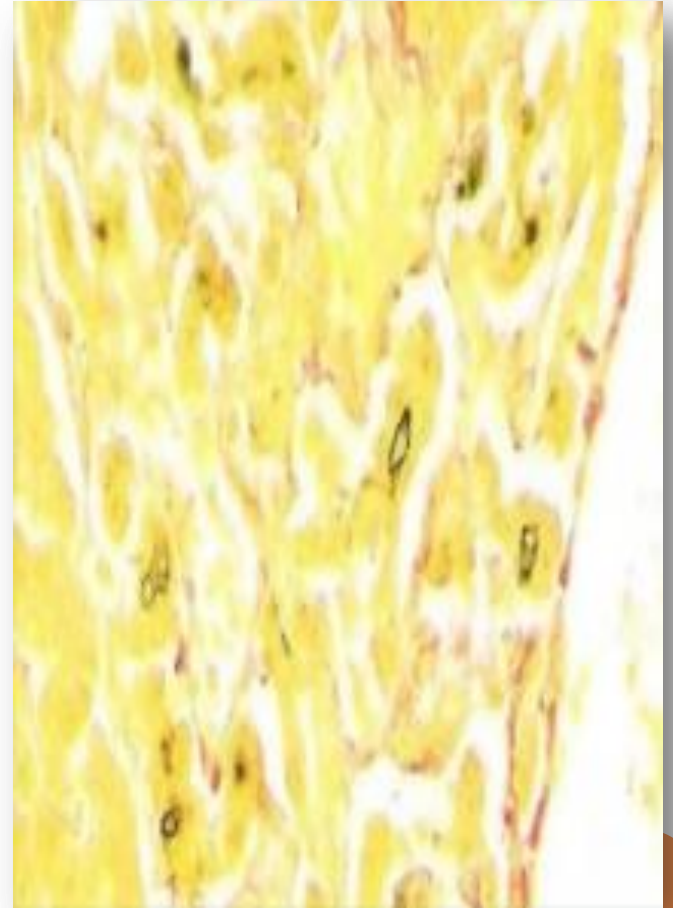
- These pigments are seen as yellow to brown granules and normally intracellularly. They contain iron in the form of ferric hydroxide that is bound to a protein frame work and is unmasked by various chemicals.
- Ferric iron is stored in bone marrow and spleen as haemosiderin
- **Causes of Hemosiderin deposits in the body**
 - Increased absorption of dietary iron
 - Impaired iron utilisation
 - Excess hemolysis
 - Blood transfusion (Exogenous iron load)



HAEMATOGENOUS PIGMENTS

BILE PIGMENTS

- Demonstration of bile pigments
- The need to identify bile pigments arises in the histological examination of the liver where distinguishing bile pigments from lipofuscin may be important since both appear yellow brown in H&E stained sections, and the green color of biliverdin is masked by Eosin.
- Bile pigments are not autofluorescent while lipofuscin is.
- Bile pigments are demonstrated by modified Fouchet technique in which the pigment is converted to the green color of biliverdin



NON-HAEMATOTOGENOUS PIGMENTS

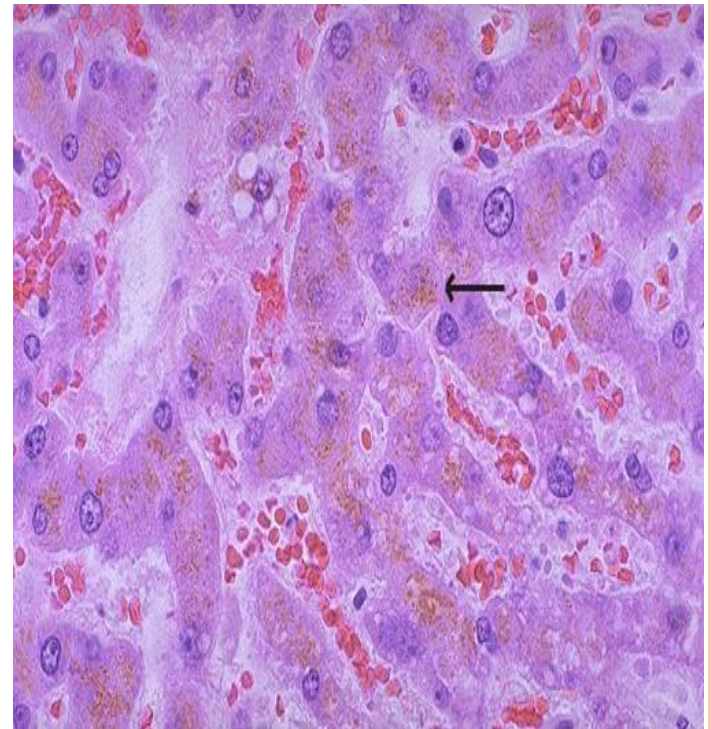
- Endogenous pigments not derived from blood
- There are two types of non-haematogenous pigment
 - Lipidic (lipofuscin and ceroid)
 - Non-lipidic (melanin)



LIPIDIC PIGMENT

LIPOFUSCHIN

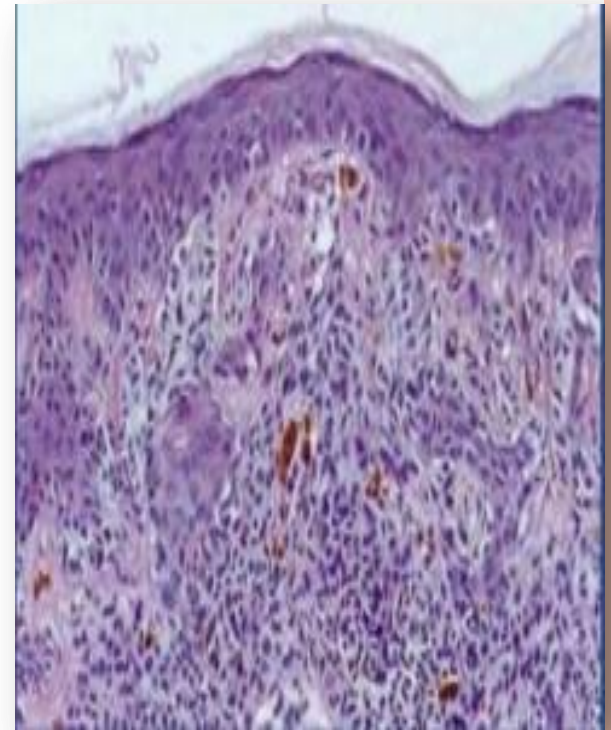
- Wear and tear pigment, usually found in the heart and liver
- These are yellow brown to reddish pigments and are thought to be produced by the oxidation methods of lipids.
- Stain with Schmorl's stain. Also use oil red O, aldehyde fuchsin, Sudan black B and PAS



NON-LIPIDIC PIGMENTS

MELANIN

- Melanin is the most important and is found in skin, hair, retina and parts of the CNS
- Melanin can be bleached in the tissue section by treatment with hydrogen peroxide or potassium permanganate and oxalic acid
- Pathologically, melanin is found in the cells of malignant melanomas and various benign naevi
- Melanin reduces silver nitrate to metallic silver in the Masson Fontana method (argentaffin)





Thank you