Disturbances of Calcium metabolism

Calcification: it is the deposition of calcium salts in tissues other than those with preformed matrix (bone & teeth). It is usually deposited in excess & has a multiple-focal distribution. Also called Mineralization.

Ossification: is the deposition of Ca salts in a preformed matrix & it is done by osteoblast, & the deposition is not distributed through the matrix in a regular manner.

Types of Calcification:

1- Dystrophic Calcification: deposition of calcium salts in dead or degenerated tissues. It is not related to Ca level in the blood.
2- Metastatic Calcification: Precipitation of Ca salts as a result of high concentration of calcium in blood.

Macro. App.(grossly)

1- Large amounts of Ca salts appear as white, yellow-white or grey ,firm cha1ky masses within the tissue.
2- The deposit will be fragmented if cut by knife.
3- It is irregularly rounded & honey-combed.
4- Gritty sound & feeling is felt while cutting.

Micro .App.

Deep blue granules or masses with in the tissue.

Occurrence:

1- Caseous areas of granulomas ex T.B (except in the bird).
2- Old thrombi.
3- Degenerate tumors.
4- Old scars.
5- Degenerate parasites.

Causes:

1- Local alkalinity in dead tissue Ca deposition.
2- Fatty acids formed in necrotic tissue & these F.A will bind Ca forming Ca. soaps.
3- Large doses of vitamin D causes hypercalcemia & then deposition of Ca salts in blood vessels & other tissues as well.
4- Renal failure will cause hypocalcemia.
5- Primary hyperparathyroidism. ~~hypo~~hypercalcemia
6- Magnesium defeciency & hypomagnesemia has been associated with calcification of the heart & blood vessels.

Significance:

1- Ca deposits are permenant & harmless.
2- May interfere with the function of the organ.
3- Ca deposition is one way of disposal of deed tissue.
4- May cause ossification.

Gout

It is the deposition of crystals of uric acid and urates in tissues. It is seen in humans, birds, dogs and cats . Mostly seen in articular and periarticular tissues.

Micro. App:
1- Clusters of sharp crystals are seen as empty spaces in joints.
2- Serous surfaces are covered with crystalline or amorphous material.
3- Crystals are surrounded by inflammatory reaction.

CROSS APP.
1- Joints are swollen, painful & have white, chalky deposits seen in it.
2-Serous surfaces have a thin grayish layer of the deposit.

Causes:
Are not exactly understood.
1- Birds: Vitamin A defeciency because Vit.A is needed for elimination of urates and uricacid.
2- Too much protein in the diet of the humans.

Significance:
1- In humans .the articular form is recurrent.
2- In chicken, recovery is possible with change in the diet.

Pigmentation:
Exogenous Pigmentation :

Anthracnose's:
It is the deposition of carbon, usually in the form of coal dust in tissues as a result of inhalation of carbon particles. It colors the lungs or regional lymph nodes. Carbon may be introduced through cutaneous abrasions and when this occurs, local tattooing in the form of a bluish-black pigment is observed under the skin.

Micro. App.
1- Carbon appear as minute black granules.
2- In the lungs: seen within macrophages, in the alveolar walls, & in the C.T of the interlobular septa.
3- In the lymph nodes: seen between lymphocytes & in the cytoplasm of phagocytic cells.
4- In the skin: seen in the dermis & the subcutis within cytoplasm of macrophages.

Gross App.
1- Lungs: depending on the amount of carbon deposited, lung may have a mottled appearance.
2- Lymph nodes; ere also darkened or have black spots.

Causes:
1- Due to repeated and continued inhalation of coal smoke. It is seen in animals and humans working in coal mines.

Significance:
1- In small amounts; it is harmless.
2- In large amounts; may cause Pulmonary fibrosis & may predispose the lung to infections.

Endogenous Pigmentation

Melanosis: deposition of melanin in various tissue, especially (Lung & Aorta). Pigment is seen in macrophage and causes no change to form, consistency or structure of the tissue.

Albinism: complete absence of melanin.
Causes: unability of melanocytes to synthesize of tyrosinase.
Tyrosine converted to melanine by tyrosinase.

Blood Pigments

RBC (break down) → HB → heme (crystallizable) 5%
→ globulin (95)%

Hemosiderin = Hemosiderosis

Is a shiny golden – yellow or golden – brown pigment its origins is HB.
Absorbed iron in the form of ferrous → convert ferric form and combined with transferring (plasma protein) and this store in the form of ferritin (protein apoferritin –iron complex) in the liver and bone marrow and the ferritin in small amount not see but when increase in the amount called hemosiderin in soluble ferritin.

Microscopic App:
1- Yellowish brown to golden rounded bodies.
2- Seen in cytoplasm of macrophages or free.
3- Prussian blue stain = greenish – blue color formed due to iron.

Gross App:
- Small amounts: can't see.
- Large amount: brown.

Causes:
Destruction of RBC
1- Hemorrhage.
2- Hemolytic anemia: ex. protozoa parasites.
3- C.V.C in lung and spleen.

Significance:
1- Pigment is not harmful.
2- Indicates hemolysis of blood. Ex. hemolytic anemia.

Jaundice:
It is the disease in which high concentration of bilirubin in the blood that it gives yellow color to tissues, especially in mucous membrane omentum , mesentery, skin.

Gross: yellowish discoloration of tissue.

Microscopic App:
1- Small amount: can't see (soluble and is not precipitated).
2- Large amounts: brown yellow seen in renal tubular lumen and there is brown – tinge to the epithelial cytoplasm.

3- In obstructive Jaundice : the bile pigment is seen in canaliculi, cytoplasm of hepatocytes.

Type and causes:

A- Hemolytic Jaundice:

Is a type associated with excessive destruction of RBC causes by:

1- Disease caused by protozoa parasites ex. Babesiosis, theileriasis, Anaplasmosis.
2- Disease caused by bacteria. Leptospirosis, clostridium .
3- Disease caused by viruses: .
4- Poisonous plants.
5- Poisonous chemicals ex. Na and K, chlorates and lead.
6- Venoms. Ex. snakes venoms.
7- Massive internal hemorrhage.
8- Neonatal hemolytic anemia.

B- Toxic Jaundice:

Caused by toxic substances that cause damaged or necrosis of hepatocytes.

Mechanism:

1- The liver cells are so damaged that they can't excrete bile.so the bile pigment stay in blood.
2- The cells are so swollen that they are blocking bile here bile is excreted but can't reach gall bladder and intestine → accumulate in liver → absorbed in to blood → stains the tissues.

Causes:

1- poisonous plants.
2- Inorganic substances ex. copper.
3- Infections diseases: leptospirosis.

C- Obstructive Jaundice

Caused by obstruction of bile flow.

Causes:

1- Obstruction of bile canaliculi.
2- Block bile ducts: ex. by parasites (Faschiola).
3- Biliary cirrhosis.
4- Cholangitis: that is associated with swelling of bile duct wall.
5- Outside pressure: ex. Tumor, Abscess, granuloma.
6- Gall stone.

Significance:

1- Bilirubin is not harmful but in kidneys it may causes renal nephrosis (tubular degeneration).
2- If cause removed Jaundice will disappear.