Lecture title: EXOGENOUS PIGMENTS

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Summary: CARBON

Carbon is the most common exogenous pigment. The usual route of enti the body is via inhalation, and its accumulation in the lung results in a condition called anthracosis (also known as black lung).

Carbon is ubiquitous in the air and all animals are exposed, but those m likely to show gross lesions live in an environment with substantial air pollution, such as adjacent to busy highways (e.g., animals in a zoo near highway or animals living in a house with a smoker). In the alveoli, the is phagocytosed by macrophages, which transport it via the lymphatics regional tracheobronchial lymph nodes. Because elemental carbon is in not metabolized by the body, it remains in the tissue for the life of the a

Grossly the lungs are usually speckled with fine 1- to 2-mm-diameter subpleural black foci. In severely affected cases, the medulla of the tracheobronchial lymph nodes may be black.

Microscopically, carbon presents as fine black granules and may be extracellular or intracellular (within macrophages). Carbon pigment m within the alveolar walls or be frequently present as black peribronchio peribronchial foci. Because of the nonreactiveness of carbon, there are histochemical tests for it.

2- TATTOOS

Animals are frequently tattooed as a method of identification. These pig which include carbon, are introduced into the dermis. Some of the pigm

are phagocytosed by macrophages, whereas the remainder remains free in the dermis and does not invoke any inflammatory reaction.

3- DUSTS

Pneumoconiosis is the general term used for any dust inhaled into and retained in the lung. Anthracosis, from the inhalation of carbon, is a subtype of pneumoconiosis. Inhalation of silicon (e.g., from quarries) is called silicosis. These minute particles enter the lungs by escaping the mucociliary defense mechanisms of the nasal and upper respiratory systems and deposited in pulmonary alveoli where they maybe phagocytosed and carried to the peribronchial regions.

4- CAROTENOID PIGMENTS

These pigments are also called lipochrome pigments, although this term is sometimes confused with lipofuscin. They are fat-soluble pigments of plant origin and include the precursors of vitamin A, namely carotene.

Grossly, these pigments normally occur in a wide variety of tissue, such as adrenal cortical cells, corpus luteum-lutein cells, Kupffer cells, and testicular cells.

Carotenoids discolor fat yellow to orange-yellow. The concentration of carotenoids retained in tissue depends upon the species of animal. Some animals store little or no carotenoids and have white fat and clear serum. These animals include Holstein cattle, sheep, goats, and cats. As fat stores are depleted (e.g., in starvation), carotenoids become concentrated in the adipocytes, with dark yellowish-brown color.

ENDOGENOUS PIGMENTS

1-MElANIN

Melanin is the pigment normally present in the epidermis and is responsible for the color of the skin and hair. It is also normally present in the retina, iris,

and in the oral mucous membrane of some breeds (e.g., Jersey cows and Chow dogs).

Melanin is secreted by cells called melanocytes. In the skin of animals, these cells are in the basal layer and transfer their pigment to adjacent keratinocytes, where the melanin is often arranged as a cap over the nucleus to provide some protection from ultraviolet radiation. Melanin is formed by the oxidation of tyrosine which requires the copper-containing enzyme tyrosinase. Thus in copper deficiency, particularly in cattle and sheep, there is a fading of the coat color, and this is most obvious in black wool. A general lack of melanin can be due to a metabolic defect: a lack of tyrosinase. This condition is called albinism, and the affected animal is called an albino. Histologically the melanocytes appear normal.

Pathologically, melanin is present in hyperpigmentation of the skin associated with many types of chronic injury and endocrinopathies such as hyperadrenalism and in primary neoplasms of melanocytes (melanomas and melanosarcomas).

Microscopically, melanin is stored in melanosomes in the cytoplasm of melanocytes. However, if there is damage to the cells containing melanin (e.g.,damage to melanocytes), the free melanin is phagocytosed by macrophages, which are termed melanophages.

Extensive deposits of congenital melanin in tissues are termed congenital melanosis. It occurs in the lungs and aorta (intima) of cattle sheep, and pigs as brown to black.