

CARDIAC EXAMINATION

- A cardiac examination is an evaluation of the cardiovascular system, which includes the heart, lungs, and blood vessels.
- Many elements of a cardiac exam are usually performed (to some extent) during a routine physical examination in animals.
- A cardiac exam is important to assess the overall health of the heart and circulatory system

OBSERVATION

- Abdominal distention
- weight gain
- Tachypnea
- Dyspnea
- Coughing
- Orthopneic

EVALUATING THE HEAD AND NECK

MUCOUS MEMBRANES

- Alterations within the oral mucous membranes often do not occur until late in the process of many cardiac diseases, but the appearance of the oral mucosa may yield valuable information when combined with findings from the remainder of the physical examination.
- the equid displays abnormal mucous membrane colour in the gums. “abnormal” in this context refers to any deviation from a natural shiny pink colour, which includes pale/white, yellow (icteric), red or purple/blue.
- Normal mucous membranes are pink and moist with a brisk (one- to two-second) capillary refill time after blanching the gums

PALE/WHITE GUMS

- **Anaemia** – can have various causes including severe parasitic infestation, or disease such as equine infectious anaemia.
- **Haemorrhage** – blood leaking somewhere in the body, e.g. a bleeding injury or perforated gastric ulcer.
- **Hypovolaemia (low blood volume)** – can be due to haemorrhage e.g. from trauma, surgery, neoplasia (abnormal tissue growth/tumour); dehydration or fluid loss from severe diarrhoea, renal disease/failure or severe burns; accidental ingestion of anti-coagulant rodenticide (rat poison)
- **Pain/shock**– due to traumatic injury or toxic shock.
- **Dehydration** – can have various causes including diarrhoea, excessive sweating, insufficient opportunity to drink.
- **Chronic disease** – such as equine infectious anaemia; tissue necrosis as a result of cancer of the internal organs; bleeding gastric ulcers.

YELLOW GUMS

- Yellow (icteric) mucous membranes are usually associated with liver problems, and are caused by bile accumulating in the tissues rather than being excreted by the liver into the intestines (jaundice)5.
- Jaundice can be due to chronic liver disease, parasitic infestation or dietary reasons such as a diminished appetite (anorexia), malnutrition or a diet that is very rich in alfalfa.
- liver damage may be a result of poisoning through the ingestion of toxic plant material or noxious chemicals including lead, phosphorus, arsenic, copper or carbon tetrachloride.

RED GUMS

- Bright “brick red” mucous membranes are symptomatic of endotoxaemia. this is a septic condition caused by bacteria escaping from the bowel into the bloodstream.
- the red colour is caused by blood pooling in the capillaries and blood vessels and is most easily observed in the mucous membranes. this generally indicates damage to the intestinal barrier leading to a systemic inflammatory response⁷.
- endotoxaemia can be a complication of colic or enteritis and should be considered a veterinary emergency. if left untreated, intestinal shutdown can occur and the animal may lapse into potentially fatal endotoxaemic shock
- sometimes foreign bodies (e.g. seeds) can become trapped in the gum margins or between the teeth, irritating the gums and causing them to present an inflamed, red appearance. this is localised and easy to differentiate from endotoxaemia.

- **Cyanosis** is a medical condition characterized by blue colored skin and mucous membranes, which occurs as the result of inadequate amounts of oxygenated *hemoglobin* -- the molecule which carries oxygen to the body tissues -- or due to hemoglobin abnormalities.

causes of cyanosis involving the circulatory system

- Congenital defects
- Acquired disease: may be linked to mitral valve (left side of heart valve between atrium and ventricle) disease; disease of heart muscle
- Fluid collection around the heart: due to cancer or unknown causes
- Clogging of lung blood vessels with a clot
- Pulmonary hypertension: unknown origin (idiopathic); right-to-left cardiac shunts (blood is diverted to another pathway)
- Peripheral blood vessel disease

the causes of cyanosis involving the respiratory system

- Larynx (voice box): can be due to paralysis (acquired or congenital); collapse; spasm; swelling; trauma; cancer; chronic inflammatory disease
- Trachea: can be due to collapse; neoplasia; foreign body; trauma; underdevelopment
- Lower airway: can be due to pneumonia (viral, bacterial, fungal, allergic, mycobacteria, aspiration); chronic swelling of the bronchioles; allergies, *asthma*; chronic *dilation* of the bronchioles; cancer; foreign body; parasites; bruising of the lungs; swelling due to inhalation, snake bite, electric shock; near drowning
- Pleural space: may be due to air in the chest cavity; infectious (bacterial, fungal); *pus* in the chest cavity; blood in the chest cavity; cancer; trauma
- Chest wall, or *diaphragm*: may be related to congenital defects such as *hernia* around the heart or through the diaphragm (when an organ pushes through the wall, or enclosure that normally contains it); trauma (diaphragmatic hernia, fractured ribs); *neuromuscular* disease

Methemoglobinemia

- Methemoglobin (metHb) binds to water molecules rather than oxygen molecules
- Elevated concentrations of methemoglobin in the red blood cells leads to tissue *hypoxia* due to reduced oxygen carrying capacity of blood
- Congenitally acquired NADH-methaemoglobin reductase (NADH-MR) deficiency: deficiency of an *intracellular* reductive *enzyme*, which helps keep methemoglobin at levels of less than two percent, preventing cyanosis
- May be linked to ingestion of oxidant chemicals: acetaminophen, nitrates, nitrites, phenacetin, sulfonamides, benzocaine, aniline dyes, dapsone