HEART FAILURE

- The ability of the heart to respond to circulatory demands over and above those of the animal at rest is referred to as the cardiac reserve.
- Any cardiac lesion which impairs the efficiency of the heart, reduces the cardiac reserve.
- When the cardiac reserve is exhausted and the circulatory requirements at rest can no longer be met, "congestive heart failure" ensues.
- Myocardium is no longer able to compensate for increase in workload.

Components of the cardiac reserve
- Increased rate of contraction
- Increased stroke volume

In cardiac failure
- Coordinated sympathetic nervous system stimulation occur
- With reciprocal parasympathetic inhibition.
- Sympathetic stimulation
  - Increases the force of myocardial contractions
  - Increases the tone in most of the blood vessels of the body
- One side heart failure – second side HF also

LEFT-SIDED HEART FAILURE

- Clinical signs — primarily pulmonary (lungs),
  - Dyspnoea on exertion
  - Cough
  - Orthopnea.
- Common causes
  - Myocarditis,
  - Degeneration of the myocardium,
  - Stenosis and insufficiency of the mitral and semilunar valves
  - Congenital heart diseases.
HEART FAILURE

LEFT-SIDED HEART FAILURE

- Progressive dilatation of the left ventricle and atrium which may be followed by left ventricular and atrial hypertrophy.
- Pulmonary (lung) congestion, edema and induration.
- Reduction in pulmonary vital capacity and impaired gaseous exchange result in hypoxic stimulation of the carotid sinus.
- Eventually, right heart failure develops subsequent to increased pulmonary resistance and increased pressure in the pulmonary artery
- Coughing in dog — most distinctive and alarming feature

HEART FAILURE

RIGHT-SIDED HEART FAILURE

- Clinical signs
  - manifestations by generalized venous congestion,
  - Include
    » distention of the jugular and other superficial veins,
    » liver and spleen enlargement,
    » accumulation of fluid in serous cavities and in tissues (generalized edema).
HEART FAILURE

RIGHT-SIDED HEART FAILURE

Hydroperitoneum

Hydrothorax

Common causes
- left-sided heart failure,
- myocardial degeneration,
- myocarditis,
- factors that cause increased pulmonary resistance,
- hydropericardium,
- exudative pericarditis,
- endocarditis
- defective tricuspid and semilunar valves.

Progressive dilatation of the right ventricle and atrium which may be followed by right ventricular and atrial hypertrophy.

blood accumulates in the vena cava
- leading to generalized venous congestion.
- Centrilobular congestion, degeneration, necrosis, and fibrosis of the liver.
- Splenic red pulp becomes engorged,
- generalized edema (ascites, etc.).
- Eventually, right heart failure
- Generalized edema is a prominent feature
  - In the horse and cow, a dependent subcutaneous edema
  - subcutaneous oedema is scant or absent in other species.
  - In the dog, edema in the peritoneal cavity (ascites)
HEART FAILURE

RIGHT-SIDED HEART FAILURE

• whereas in the cat, it is in the thorax (hydrothorax).
• Cor pulmonale — heart failure due to lung disease

HYPERTROPHY AND DILATATION

• Myocardial hypertrophy is an increase in bulk of cardiac muscle due to an increase in size of component fibers.
  • SIMPLE HYPERTROPHY
    » hypertrophy in the absence of dilatation.
  • ECCENTRIC HYPERTROPHY
    » both hypertrophy and dilatation of the heart.
  • CONCENTRIC HYPERTROPHY
    » hypertrophy results in a decrease in size of the heart chambers.

• Hypertrophy affects
  – the left heart more frequently than the right
  – the ventricles more frequently than the atria.
• Hypertrophy of the right heart makes the heart broader at the base
• Hypertrophy of the left heart increases the organ length.
• Bilateral hypertrophy results in a more rounded shape than normal.
• Grossly,
  – increased thickness and
  – rubbery firmness

• Cardiac dilatation may involve one or both chambers of the heart.
  – Grossly,
    — the dilated heart is globose (spherical) shaped,
    — the walls are soft, pliable, and thin.
• Endocardium is usually diffusely thickened and opaque.
HYPERTROPHY AND DILATATION

HIGH ALTITUDE DISEASE OF CATTLE
(Bovine High Mountain Disease, Brisket Disease and Pulmonary Hypertensive Heart Disease)

- Develops subsequent to chronic hypoxia in lungs that causes increased pulmonary vascular resistance and increased pulmonary arterial pressure.
- The disease is characterized by dilatation and hypertrophy of the right ventricle and atrium with the ultimate development of cardiac decompensation and signs related to "congestive heart failure".
- Affected cattle reside at usually above 5,000 feet.
- There is a failure of the cardio-respiratory system to adjust to the chronic anoxia.
HIGH ALTITUDE DISEASE OF CATTLE

- The disease usually develops slowly and generalized edema is a prominent feature.
- Oedematous swelling in the ventral pectoral region is responsible for the term "brisket disease."
- Due to chronic venous congestion, liver lesions may vary from early "nutmeg" appearance to severe centri-lobular fibrosis.
- The lungs exhibit varying degrees of atelectasis and emphysema.
- Microscopically, hypertrophy of the media of small pulmonary arteries may be observed.

HIGH ALTITUDE DISEASE OF CATTLE

- Young cattle are more susceptible than adults
- Morbidity rate is highest in animals exposed to high altitudes for the first time after 3-4 weeks.
- Pleural effusion and ascites are usually abundant.
- Marked distention and pulsation of the jugular veins are usually prominent.
- Appetite may be decreased.
- Profuse diarrhea may develop as a result of intestinal venous hypertension. Respiration is labored, and animals may appear cyanotic.

With forced exertion, severely affected animals may collapse and die.
- In the terminal stages, the animal is often anorexic, recumbent, and unable to rise.
- Animals transported from low altitudes to above 5,000 feet, the incidence of severe pulmonary hypertension may not affect more than 2% of animals.
- Ascites, hydrothorax, and hydropericardium are consistent findings.

References