

Principal Manifestations of Musculoskeletal Disease

1 - LAMENESS

- Lameness is an abnormal gait or locomotion characterized by limping or not bearing full weight on a leg, usually associated with localized pain in the musculoskeletal system.
- Lameness must be distinguished from **ataxia**, which is an abnormal gait characterized by lack of coordination of muscular action, usually because of a lesion of the central or peripheral nervous system.
- **Weakness** (paresis) is the inability to maintain a normal posture and gait, usually because of a lesion of muscle or generalized weakness as a result of an abnormal systemic state (e.g., shock), a metabolic abnormality (e.g., hypocalcemia or hypokalemia), or starvation. Weakness can also be caused by a lesion in the spinal cord or peripheral nerves.
- The incidence and severity of lameness in livestock populations varies tremendously because of differences in management systems (grazing versus confinement, concrete versus slatted floors, free stall design and use by dairy cattle, frequency of foot trimming, etc.), nutrition, genetics, age, body weight, and many other factors. For example, certain breeds may be more susceptible to diseases of the feet and legs than others.
- Osteoarthritis occurs most commonly in old animals.
- Diseases of the legs of dairy cattle occur most commonly at the time of parturition and during the first 50 days of lactation.
- Diseases of the feet of dairy cattle occur most commonly in days 50 to 150 of the lactation period.

- Often the etiology is complex, and a definitive etiologic diagnosis cannot be made.
- When lameness is a herd problem, not only are the economic losses increased, but clinical management becomes very difficult.
- The epidemiologic factors that contribute to lameness include the following:
 - ✓ Injuries as a result of floor surfaces
 - ✓ Persistently wet, unhygienic ground conditions
 - ✓ Overcrowding and trampling during transportation and handling
 - ✓ Nutritional inadequacies
 - ✓ Undesirable skeletal conformation
 - ✓ Failure to provide regular foot trimming.

2 - ABNORMAL POSTURE AND MOVEMENT

- As a group, diseases of the musculoskeletal system are characterized by reduced activity in standing up and moving and by the adoption of unusual postures.
- Abnormal movements include weakness (limpness) or stiffness and lack of flexion.
- Abnormal postures include persistent recumbency, including lateral recumbency.
- There may be signs of pain on standing, moving, or palpation.
- There is an absence of signs specifically referable to the nervous system.
- Differentiation from diseases of the nervous system and from each other may be aided by specific biochemical, radiologic, or hematologic findings that indicate the system involved.

3 - DEFORMITY

Atypical disposition, shape, or size of a part of the musculoskeletal system constitutes a deformity. This may occur in a number of ways, and be caused by the following defects.

A - Muscle and Tendon Defects

- Congenital hypermobility of joints, inherited and sporadic
- Congenital flexed or stretched tendons of limbs causing contracture of joints or hyperextension
- Inherited congenital splayleg of pigs
- Muscle hypertrophy (doppelender, culard) of cattle
- Acquired asymmetric hindquarters of pigs

B - Defects of the Skeleton

- Dwarfism—inherited miniature calves, achondroplastic dwarves; short legs of inherited congenital osteopetrosis; nutritional deficiency of manganese; acorn calves
- Giant stature—inherited prolonged gestation, not really giantism, only large at birth
- Asymmetry—normal wither height, low pelvis height of hyena disease of cattle
- Limbs—complete or partial absence, inherited or sporadic amputates; curvature of limbs in rickets; bowie or bentleg of sheep poisoned by *Trachymene* spp.

- Head—inherited and sporadic cyclopean deformity; inherited probatocephaly (sheep's head) of calves; inherited moles, bulldog calves; acquired atrophic rhinitis of pigs

C - Joint Defects

- Inherited congenital ankylosis of cattle causing fixation of flexion
- Joint enlargement of rickets and chronic arthritis

4 - SPONTANEOUS FRACTURES

- Spontaneous fractures occur uncommonly in farm animals, with the exception of physeal fractures of the metacarpus and metatarsus in young ruminants, and preexisting diseases are usually present in fractures not associated with a traumatic incident, such as the following:
 - Nutritional excess of phosphorus causing osteodystrophia in horses
 - Nutritional deficiency of calcium causing osteodystrophia in pigs
 - Nutritional deficiency of phosphorus or vitamin D in ruminants causing rickets and/or osteomalacia; hypervitaminosis A may contribute
 - Nutritional deficiency of copper
 - Chronic fluorine intoxication

5 - PAINFUL ASPECTS OF LAMENESS

- Musculoskeletal pain can be caused by lacerations and hematomas of muscle, myositis, and space-occupying lesions of muscle.
- Osteomyelitis, fractures, arthritis, joint dislocations, and sprains of ligaments and tendons are also obvious causes of severe pain.

- Among the most painful of injuries are swollen, inflammatory lesions of the limbs caused by deep penetrating injury or in cattle by extension from footrot.
- Amputation of a claw, laminitis, and septic arthritis are in the same category.
- Ischemia of muscle and generalized muscle tetany, as occurs in electroimmobilization, also appear to cause pain
- Research on the pathophysiology and pharmacology of pain associated with lameness in animals indicates that the threshold to painful stimuli change in response to pain (wind-up), and this change is seen as an indication of an alteration in nerve function or in nociceptive processing at higher levels.
- In flocks of sheep with severe lameness as a result of footrot, affected sheep had a lower threshold to a mechanical nociceptive stimulus than matched controls, and their thresholds remained low when tested 3 months later, after the apparent resolution of the foot lesions. Thus hyperalgesia persisted in severely lame sheep for at least 3 months.
- It is suggested that N-methyl-D-aspartate receptors are involved in the development of this long-term hypersensitivity.
- Similar findings have been reported in dairy heifers affected with claw lesions during the peripartum period.