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Neurological and Musculoskeletal disorders of backyard poultry

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Musculoskeletal and neurological disorders are extremely common in poultry and often cause similar symptoms.

NEUROLOGICAL DISORDERS

MAREK'S DISEASE

Marek's disease is a common contagious disease of chickens. Pheasants, turkeys and quail can also be affected. The disease is caused by a herpesvirus, which is very resistant in the environment, and infects chicks shortly after hatching. Vertical transmission does not occur.

The incubation period varies but can be as short as 8 days. The virus enters via the respiratory tract and then spreads to the lymphoid organs within 24-36 hours. B and T lymphocytes experience cytolytic infection, leading to transient or permanent immune suppression. The virus is also incorporated into the feather follicular epithelium, which is the only site of complete viral replication within the body.

If the host's immune system can control the infection, the latent phase follows, in which the virus is present in lymphocytes but without tumour growth or cytolytic changes. Viral shedding continues indefinitely. In progressive infections, there may be a second cytolytic phase, which occurs in lymphoid tissue around the body. The final lymphoproliferative phase, in which tumours comprising neoplastic, inflammatory and non-neoplastic immune cells develop, occurs in immunosuppressed birds. This can occur as early as 3 weeks following infection.

There are several distinct syndromes recognised:

- The clinical signs of the **classic form** include asymmetrical limb paralysis and the development of pale visceral tumours, leading to depression, weight loss, pallor, diarrhoea, anorexia and death. At necropsy, the nerves are often swollen and discoloured.
- The **acute form** of the disease is characterised by death in young unvaccinated birds following 24-72 hours of depression and stupor.
- The **chronic form** can lead to immune suppression and worsening of current diseases due to lymphocyte impairment, bursa of Fabricius atrophy and thymic atrophy.
- With **ocular lymphomatosis**, lymphocytic infiltration of the iris leads to grey discolouration, pupillary irregularity and blindness.
- **Cutaneous leucosis** defines lymphocytic feather follicle infiltration.
- **Transient paralysis** is a non-neoplastic syndrome caused by vasogenic cerebral oedema and is associated with flaccid paralysis of the limbs or neck for 24-48 hours. Birds can recover but often go on to die from classic visceral tumours some weeks later. Some birds develop persistent neurological disease with tics and torticollis.

Diagnosis is made by PCR, but the test needs to be able to differentiate between vaccine-derived virus and wild type. There is no effective treatment, and the prognosis is grave. The only effective means of disease control is vaccination, which must take place soon after hatching, as early immunity is vital. Complete environmental decontamination is unrealistic as the virus can persist for several months to years.

NEWCASTLE DISEASE

ND is caused by a paramyxovirus and is associated with respiratory, neurological and gastrointestinal signs with a high mortality rate. Chickens are most susceptible, although waterfowl can harbour the infection. Spread of the virus occurs via movement of wild birds, fomites or via wind-borne spread of infectious litter and debris. The virus can be found in eggs, but affected hens usually cease egg production, so vertical transmission is uncommon. The virus enters the body via ingestion or inhalation and replicates at the site of introduction during the incubation period (2-15 days). Viraemia only occurs with velogenic and mesogenic strains, and replication begins in other organs. Lentogenic viruses multiply on epithelial surfaces. A second viraemia follows, and the virus begins to be excreted from both the respiratory and gastrointestinal tract.

Avirulent strains cause no noticeable clinical signs, whereas lentogenic strains cause subclinical or mild respiratory signs. Respiratory signs predominate with mesogenic strains and have low mortality rates. Velogenic strains are characterised by high mortality and are either viscerotropic (the bird shows gastrointestinal signs) or neurotropic (the bird shows respiratory and nervous signs).

There is usually a marked reduction in egg production. Both viscerotropic and neurotropic strains cause muscle tremors, limb paralysis, ataxia, circling, opisthotonus and torticollis.

Clinicians should collect serum, cloacal and tracheal swabs for submission to the nearest state veterinarian.

AVIAN ENCEPHALOMYELITIS

This disease, also known as epidemic tremor, is caused by a hepatovirus. It causes ataxia and tremors in chickens, pheasants and turkeys less than 3 weeks of age. Older birds rarely show neurological signs, although a reduction in egg production and hatchability may be seen. The virus is transmitted both vertically and horizontally. There is no treatment.

ENTEROCOCCUS

Enterococcus species are Gram-positive facultative anaerobic cocci. The chronic form of this infection is associated with head tremors, lameness, depression and weight loss. The diagnosis is confirmed by isolating the bacterium from affected tissues.

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Antibiotics are likely to be useful early in the disease course, but resistance can occur. Penicillin, tetracyclines, erythromycin and nitrofurans can be used, although culture and sensitivity testing is advised.

BOTULISM

Botulism is caused by the toxin produced by *Clostridium botulinum*. The toxin causes ascending flaccid paralysis in waterfowl, chickens, turkeys and pheasants. Droopy wings, neck and eyelids are common as the disease progresses, and death results from respiratory and cardiac failure. *C. botulinum* is a spore-forming, Gram-positive anaerobic bacterium that produces exotoxins which block nerve impulses at the peripheral cholinergic nerve receptors. The incubation period ranges from hours to 2 days, depending on the dose of toxin.

Treatment is supportive, and aspiration pneumonia must be avoided. Antibiotics may be used to reduce further toxico-infection, and specific antitoxins can be used.

ANATIPESTIFER DISEASE

Anatipestifer disease is caused by the Gram-negative bacterium *Riemerella anatipestifer* (previously called *Pasteurella* and *Moraxella*). Primarily a septicaemic disease of domestic ducks and geese, although it has been recorded to affect turkeys as well.

Clinical signs include head and neck tremors, lethargy, ataxia, reluctance to walk, dyspnoea, incoordination, oculonasal discharge, green diarrhoea and hyperexcitability. Mortality is 5-75% in young animals.

The diagnosis is confirmed by identification of the organism. Appropriate antibiotics include sulpha drugs, enrofloxacin, penicillins and lincomycin.

MYCOTOXICOSIS

Certain fungi species produce toxins, and when ingested (usually from feed), a variety of clinical signs can result. A presumptive diagnosis is made on the clinical signs and history. Identification of the toxin in feed can be difficult. Removal of the source of the toxin is the most appropriate treatment, and antifungal medication is not helpful after intoxication.

BONE, CARTILAGE AND JOINT DISEASES

VIRAL ARTHRITIS

Viral arthritis is a debilitating disease caused by an avian reovirus. It occurs mainly in chickens, but turkeys may also show signs. The virus is transmitted horizontally and is shed from the intestinal and respiratory tracts.

Clinical signs include lameness, stunted growth, swelling of the hock joint, gastrocnemius tendon and digital flexor tendons. The gastrocnemius tendon may rupture. Serous, sanguineous or purulent joint effusions may be seen, as well as tendon sheath pathology, damage to the articular cartilage and an enlarged proximal metatarsal diaphysis. There is usually concurrent myocarditis present.

Diagnosis is made through virus isolation, PCR or serology.

STAPHYLOCOCCAL ARTHRITIS

Staphylococcus aureus is a common pathogen and is very resistant in the environment. The bacterium enters the body through compromised epithelial or mucosal surfaces.

Subsequent bacteraemia allows the bacteria to lodge in the joints and bones, leading to arthritis, synovitis and osteomyelitis. Predilection sites include the proximal tibiotarsus and femur, and there may be femoral head necrosis.

Clinical signs include lameness, reluctance to walk, droopy wings, ataxia and swollen joints. Diagnosis is via demonstration of Gram-positive dividing cocci on joint tap cytology or culture. Appropriate antibiotics include penicillins, tetracyclines, sulphonamides and lincomycin. Improving hygiene is paramount.

MYCOPLASMOSIS

Mycoplasma spp. are small bacteria lacking a cell wall, causing a range of respiratory, reproductive and musculoskeletal problems in poultry. Commercially, specific pathogen-free breeding stock is created via antibiotic treatment of eggs. *M. meleagridis* and *M. synoviae* are the two species that cause musculoskeletal problems in poultry. Tylosin is often used. Lincomycin and spectinomycin are effective in water.

OTHER BACTERIA

E. coli, *Pasteurella multocida*, *Salmonella* spp. and *Enterococcus* spp. can cause septicaemia, which can lead to arthritis and osteomyelitis.

DYSCHONDROPLASIA

Predilection sites are the proximal tibiotarsus, femur, tarsometatarsus and proximal humerus. Clinically, an abnormal mass is encountered below the growth plate, which corresponds to a core persistent pre-hypertrophic cartilage that has neither matured nor ossified. The condition is exacerbated by nutritional deficiencies.

Many birds are asymptomatic, but others will show signs of lameness, stilted gait and bowing of the legs. Prevention is aimed at genetic selection and proper nutrition.

CHONDRODYSTROPHY

Birds with chondrodystrophy tend to manifest with short, widened leg bones with distortion of the hock. This condition has been reported in chickens, ducks and turkeys and may appear similar to valgus/varus. It is associated with nutritional deficiencies.

Clinically, lameness, hock swelling, slipping of the gastrocnemius tendon with a shallow trochlea, shortened or rotated bones (especially tibiae), and shortened beaks may be seen. Proper nutrition is paramount.

SPRADDLE LEGS

This condition is associated with high humidity during incubation and slippery flooring after hatching. It causes the legs to splay laterally from the coxofemoral joint and may not manifest until 2-3 weeks of age. Early treatment involves hobbling the legs to keep them in a normal position as the bird grows.

DEGENERATIVE JOINT DISEASE

This condition affects the coxofemoral, stifle and intertarsal joints, mainly turkeys and heavier meat birds, but may also be seen in the spine of laying hens. Erosion and thinning of the articular cartilage result in subchondral bone exposure, cartilage flaps, osteophytes and periarticular fibrosis. Pain and lameness are seen as a result. In pet birds, meloxicam (1mg/kg) is used, as well as providing an easily accessible environment.

OSTEOPOROSIS

Osteoporosis is a condition of decreased normal skeletal mineralisation, usually secondary to insufficient weight-bearing activity. It is responsible for up to 30% of spontaneous fractures in commercial poultry. With the calcium demands of egg laying, there is continuous remodelling of medullary bone. In hens with heavy egg production, they metabolise structural as well as medullary bone to satisfy the calcium requirements. This eventually thins the bony cortices, making birds prone to fractures.
The best prevention is to provide ample exercise and a nutritionally balanced diet, and to only select moderate egg-laying production birds as pets.

ANGEL WING

Angel wing is most commonly seen in large waterfowl and can be unilateral or bilateral. Affected birds have a valgus rotation of the carpal joint or metacarpal bones, giving dorsolateral rotation of the primary flight feathers when the wing is held at rest. A rapid growth rate seems to be the cause, with calcification of the bones lagging behind the weight-bearing requirements of the rapidly feathering distal wing. Early treatment by bandaging the wing into a normal position is usually curative. If possible, growth rates should be slowed.

SOFT TISSUE DISORDERS

Ligament failure and avulsion, crooked toes (shortening of flexor tendons), ruptured gastrocnemius tendon, bumblefoot and myopathies are some of the soft tissue disorders that occur in backyard poultry.

BUMBLEFOOT

Bumblefoot is the common name given to pododermatitis and is mainly seen in heavy breeds and turkeys. Wet bedding and high stocking rates lead to an increase in lesions. Once there is a breach in the integument, bacteria can enter and can lead to cellulitis, tendonitis and osteomyelitis. Staphylococcal bacteria are often involved.

Milder lesions respond to conservative treatment. Moderate lesions require medical and/or surgical management. Severe cases are sometimes refractory to treatment, carry a poor prognosis and may require euthanasia.

NUTRITIONAL DISORDERS

Deficiencies of B vitamins, calcium and vitamin E can all present with various neurological signs and are best avoided using good nutrition. It is important to avoid excessive supplementation.

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QUESTION 1

What is the causative agent for Marek's disease?
a. Paramyxovirus
b. Herpesvirus
c. Adenovirus
d. Reovirus
e. Hepatovirus

QUESTION 2

Which of the following is not a recognised form of Marek's disease?
a. Classic form
b. Chronic form
c. Cerebellar leucosis
d. Ocular lymphomatosis
e. Transient paralysis

QUESTION 3

Which is the site of viral replication in the body for Marek's disease?
a. B lymphocytes
b. T lymphocytes
c. Spleen
d. Feather follicles
e. Bursa of Fabricius

QUESTION 4

What is the causative agent of Newcastle disease?
a. Paramyxovirus
b. Herpesvirus
c. Adenovirus
d. Reovirus
e. Hepatovirus

QUESTION 5

A client brings in a 4-month-old Brahma cockerel that has been lame. The owner suspected bumblefoot. On examination, you find that the bird is stunted and has swollen hocks. The gastrocnemius tendon on the right is also ruptured. The client elected euthanasia. A concurrent myocarditis is noted on PM.

What is the causative agent?
a. Paramyxovirus
b. Herpesvirus
c. Adenovirus
d. Reovirus
e. Hepatovirus

QUESTION 6

Which of the following is a predilection site for *Staphylococcus aureus* in the body?
a. Proximal tibiotarsus
b. Proximal humerus
c. Distal tibiotarsus
d. Distal humerus
e. Lumbar spine

QUESTION 7

Which antibiotic is often used for *Mycoplasma spp.* Infections?
a. Penicillins
b. Enrofloxacin
c. Tylosin
d. Potentiated sulphonamides
e. Doxycycline

QUESTION 8

A backyard chicken is examined for lameness. A mass is noted on the proximal part of the tibiotarsus. On X-ray, it appears below the growth plate and does not have a bony opacity. What is the most likely diagnosis?
a. Bacterial arthritis
b. Dyschondroplasia
c. Chondrodystrophy
d. Valgus/varus
e. Osteoporosis

QUESTION 9

Which of the following is false regarding angel wing?
a. It is always bilateral
b. It is commonly seen in large waterfowl
c. Affected birds have valgus rotation of the carpal bones
d. Fast-growing birds are more prone
e. The condition can be cured if treated early

QUESTION 10

A large 4-year-old Indian game stag is presented for lameness. On clinical exam, you notice a proliferative scab centrally on the plantar aspect of the foot. The surrounding tissue is swollen. You remove the scab and note a caseous core. What is the diagnosis?
a. Ruptured gastrocnemius tendon
b. Vitamin E deficiency
c. Bumblefoot
d. Trauma
e. Ligament avulsion

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