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Nutritional disorders of backyard poultry

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Nutritional disorders are most likely to be seen in rapidly growing birds or those in peak egg production. As backyard poultry normally include moderately productive birds, deficiencies should be relatively infrequent, as long as the birds are fed a commercially produced balanced diet that is correct for their age and production status. However, there is also a significant chance that birds kept as pets may be housed in an environment with external sources of food, be fed treats or, in some cases, be fed an inappropriate diet altogether.

In many cases, where nutritional imbalances occur, the exact identification of the deficiency is difficult to ascertain through clinical examination, as the clinical signs tend to overlap. When presented with birds with suspected nutritional disorders, the mainstay of the advice should be to feed a commercial diet. There are a variety of multivitamin preparations that can be added to the drinking water and can be used instantly to start correcting any suspected problem. An advantage of these preparations is that they generally contain sugars, which provide energy and drive the birds to drink, which helps with the dehydration that is commonly seen with sick birds.

PEROSIS

Perosis (chondrodystrophy) can be seen in young growing birds whose diet is deficient in manganese, choline, nicotinic acid, pyridoxine, biotin or folic acid. It is characterised as an anatomical deformation of the leg bones in young birds, caused by retarded growth of the long bones, widening of the tibiometatarsal joint and rotation of the distal end of the tibia & proximal end of the metatarsus. If severe, it can lead to the slipping of the gastrocnemius muscle tendon from its condyles. Clinically, it manifests as impaired locomotion because of the lateral and caudal malposition of the leg.

VITAMIN A DEFICIENCY

Most adult birds have around 2 months' store of vitamin A in the liver, and, therefore, to encounter vitamin A deficiency requires long-term dietary inadequacy. For this reason, it is unlikely that this condition will be seen in a bird fed on a commercial diet.

Hypovitaminosis A is also unlikely to be seen in chicks hatched from eggs laid by a dam fed on a commercial diet, as vitamin A reserves are passed onto the chick via the yolk sac. Chicks can show signs, and the condition would develop more quickly if they hatched from eggs laid by a hen with hypovitaminosis A.

Clinical signs:
Since vitamin A is involved in mucus production, clinical signs typically affect the eyelids, nose and oesophagus. Nasal and ocular crusting may be seen, sometimes to the extent that the eyelids are stuck together. Affected birds may also exhibit poor growth rates and have poor feathering. Vitamin A-deficient chicks may exhibit ataxia. Older birds present with pale combs and wattles.

Post-mortem findings:
Plaques in the oral cavity, pharynx and oesophagus are the most common finding post-mortem. These plaques are often secondarily infected with bacteria. The eyelids can be inflamed and stuck together with a thick, sticky exudate. Excessive white crystalline urate deposits may be seen in the kidneys and ureters.

Diagnosis:
Laboratory assay of the vitamin A content of the liver confirms the diagnosis.

Treatment:
Multivitamin preparations for use in water are available.

VITAMIN B DEFICIENCIES

THIAMINE
Thiamine (vitamin B1) is involved in the Krebs cycle. Deficiency causes intermediates of carbohydrate metabolism to build up and leads to polyneuritis, resulting in impaired digestion and general weakness. The onset of clinical signs in adult birds typically occurs 3 weeks after the start of feeding a thiamine-deficient diet.

Clinical signs:
Lethargy, inappetence and head tremors are seen with a mild thiamine deficiency. Birds may be presented recumbent, with flexed legs and a retracted head due to paralysis of the anterior neck muscles. Progression leads to lateral recumbency, with the head still retracted, decreased temperature and respiratory rate and convulsions.

Post-mortem findings:
Testicular degeneration, cardiac atrophy and anorexia are noted on PM.

Treatment:
Mildly affected birds that can eat should be fed a commercial diet and given an oral multivitamin preparation containing thiamine. Some birds may need to be drenched. Severely affected birds need to be force-fed and given an injectable thiamine.

RIBOFLAVIN
The epithelium and myelin sheaths are most affected by riboflavin (vitamin B2) deficiency. Mycotoxins antagonise vitamin B2, so feed storage and fungal/mycotoxin contamination may be a problem.

Clinical signs:
Affected birds are most likely to be presented as chicks with 'curled toe paralysis', as the sciatic nerve is most often involved. The birds stand with a clenched foot on the dorsal aspect of the toes. If seen to move, these birds may be seen wing walking. Some chicks hatch without their feathers breaking the sheath – a condition known as 'clubbed down'. Adult hens affected have decreased egg production with decreased embryo vitality in breeding hens.

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Post-mortem findings:
Clubbed down, clenched feet and abrasions from wing walking may be seen. In hens, the liver may be enlarged with excessive fat content.

Treatment:
Affected chicks may spontaneously recover as the requirement for vitamin B2 rapidly decreases with age. Treatment with riboflavin can result in rapid recovery if the condition is not too longstanding.

NIACIN
Niacin (vitamin B3) is the vitamin component of coenzymes involved in the metabolism of fat, protein and carbohydrate. All species of birds at any age are susceptible.

Clinical signs:
Niacin deficiency is most likely to be seen as leg bowing in growing turkeys, ducks and pheasants due to chondrodystrophy and therefore may be difficult to distinguish from rickets and other mineralisation problems. However, with niacin deficiency, the gastrocnemius tendon rarely slips from its condyles, unlike with perosis. The long bones are often shorter in length than normal, and a marked swelling of the tibiotarsal joint may be seen. Reduced feed intake and slow growth may also be seen. Dermatitis and poor feathering may also be features.

Post-mortem findings:
Bowed and shortened legs are often seen together with a dark tongue and oral cavity. Dermatitis may also be seen.

Treatment:
Vitamin B3 or nicotinic acid can be added to the drinking water for 5 days whilst a balanced diet is introduced. The prognosis is guarded for large birds with bowing of the legs, and the welfare of the bird should be assessed before attempting treatment.

PANTOTHENIC ACID
All forms of poultry may be affected by a deficiency in pantothenic acid (vitamin B5).

Clinical signs:
The major lesions associated with vitamin B5 deficiency in poultry affect the skin, adrenal cortex and nervous tissue. Chicks have dermatitis around the eyes & beak and have lesions on the feet.

Post-mortem findings:
The PM exam may reveal liver hypertrophy and yellow discolouration of the liver

PYRIDOXINE
All types and ages of poultry with a dietary deficiency in vitamin B6 can be affected. Vitamin B6 is involved in the formation of several neurotransmitters and is essential for normal brain development and function.

Clinical signs:
Pyridoxine-deficient chicks show retarded growth, dermatitis and poor feathering. They also develop nervous signs. Initially, the chicks become very excitable, but as the condition progresses, the birds begin to tremble, and their movement becomes jerky. Further progression leads to convulsions and death through exhaustion.

A chronic deficiency can lead to perosis. Unilateral crippling may be seen, or one or two middle toes may be bent inwards at the middle joint.

In adults, vitamin B6 deficiency leads to inappetence and decreased egg production with reduced hatchability. Affected birds are anaemic, have increased serum iron levels and decreased serum copper levels. Vitamin B6 deficiency has also been associated with gizzard erosion. If the deficiency is corrected, hens may undergo a short moult of around 2 weeks' duration and then return to lay.

BIOTIN
Biotin (vitamin B7) is involved in gluconeogenesis, as well as in the manufacture of fatty acids and amino acids. Biotin deficiencies in poultry lead to reduced growth as well as skin and bone lesions. Due to the higher requirement at the time, biotin deficiency is most likely to be encountered in growing birds and is less common after maturity. Faster-growing breeds are more dependent on biotin. Biotin is also an important factor in the Krebs cycle, and disruption of this cycle results in the laying down of excessive fat in the liver and kidneys.

Clinical signs:
The first sign of deficiency is dermatitis with crusting around the eyes and beak, as well as the feet (as seen with vitamin B5 deficiency). However, it should be remembered that dermatitis around the eyes and beak is more likely to be seen with external parasites or poxvirus. Feet lesions can be confused with pododermatitis. Chicks hatched from eggs laid by deficient dams may have bent and shortened bones.

Post-mortem findings:
A fatty liver and/or kidneys with interstitial fat found on birds that have suddenly died is very suggestive of biotin deficiency.

FOLIC ACID
Poultry are the most susceptible of any farmed livestock to the effects of folic acid (vitamin B9) deficiency. Folic acid is necessary for cell multiplication, and macrocytic anaemia may result from the cessation of erythrocyte formation in bone marrow.

Clinical signs:
Clinical signs are non-specific and include poor appetite, poor growth and lethargy. These signs are most likely to be seen in young growing birds, although any bird can be affected. In cases of severe deficiency, anaemia may develop, resulting in a pale complexion and mucous membranes.

CYANOCOBALAMIN
Adult birds can tolerate cyanocobalamin (vitamin B12) deficiencies for a prolonged period (it takes 2-5 months to deplete stores to a clinically significant level). Birds fed a balanced commercial ration are unlikely to suffer from this condition.

Clinical signs:
Vitamin B12 deficiency in growing birds can result in poor growth, decreased feed intake, nervous disorders and abnormal feathering. It is also associated with perosis, and anaemia may be seen. Adult birds are asymptomatic and maintain their body weight and rate of egg production, although egg sizes are reduced. Poor hatchability is often seen.

Post-mortem examination:
Common findings on PM include gizzard erosion and fatty deposits around the heart, liver and kidney. Embryos appear haemorrhagic with oedema. Perosis and thigh muscle atrophy may also be seen.

Treatment:
Both oral and injectable products can be used alongside a commercial diet.

VITAMIN D3, CALCIUM AND PHOSPHORUS DEFICIENCIES

A total calcium deficiency and phosphorus imbalance should be rare in birds fed a commercial diet. Imbalances can occur in birds fed a home ration. Vitamin D3 is the most commonly recognised deficiency/imbalance in commercial poultry – especially when housed indoors. Vitamin D3, calcium and phosphorus are all metabolically linked. The ratio of Ca:P needs to be 1.5-2:1.

In addition, the bird needs sufficient circulating vitamin D3 to absorb and utilise both these minerals properly. Laying birds are particularly susceptible to deficiencies as they utilise medullary bone as a temporary store of calcium during lay.

Clinical signs:
In growing birds, clinical signs are likely to be caused by abnormal mineralisation of the bones, leading to rickets or tibial dyschondroplasia. In adult birds (especially in lay), deficiency may lead to osteoporosis, which can be seen as spontaneous fractures or neurological signs associated with spinal compression. Soft-shelled or thin-walled eggs may be encountered.

Post-mortem findings:
Soft, pliable bones with thin medullary walls that seem to readily fracture are found. The bones, especially the tibiotarsus, may be misshapen, and a clear joint exudate may be noted (especially the hock joint).

Treatment:
Overt vitamin D3 deficiency should be rare in birds allowed access to the outdoors, owing to synthesis when exposed to UV light. Vitamin D3 supplementation in water, along with provision of a commercial diet, should treat any mild manifestation of the condition.

Bones will re-mineralise, although misshapen bones will probably not correct. In high-producing laying birds, an added source of calcium, such as crushed oyster shell, crushed eggshells or feed lime grit, can be used alongside a commercial layer diet when poor shell mineralisation is noted.

CALCIUM TETANY
Calcium tetany is due to an acute onset of hypocalcaemia and is most likely to occur during periods of peak calcium mobilization such as the onset of the lay.

Clinical signs:
The clinical signs associated with sudden onset hypocalcaemia include paralysis, panting, lethargy and sudden death. Cyanosis of the comb may also be seen.

Post-mortem findings:
Lung congestion and a shelled egg in the shell gland may be found.

Treatment:
Vitamin D3 supplementation aids in calcium absorption. Calcium supplements can be given to birds that are eating and drinking. For severe cases, injectable formulations need to be used. It should be borne in mind that excess calcium administration to birds at inappropriate life stages (e.g. during rearing) can be injurious and can cause renal damage.

VITAMIN E DEFICIENCY

The role of vitamin E is closely linked to that of selenium. Deficiencies of either will lead to some clinical signs. Vitamin E and selenium are involved in the normal development of skin and muscles. There are 3 main syndromes recognized and they are mostly reported in chicks rather than adults.

- Exudative diathesis
- Muscular dystrophy
- Encephalomalacia

Clinical signs:

Exudative diathesis
The clinical signs of exudative diathesis result from plasma leakage caused by a marked increase in capillary permeability. There may be blue, green or black skin discolouration of the affected areas, typically the breast and wings. Chicks may be inappetent and have a much-reduced level of activity. An abnormal stance owing to muscle weakness may be seen.

Muscular dystrophy
The clinical signs of muscular dystrophy include weakness and poor thrift. This condition may overlap with exudative diathesis. Muscular dystrophy occurs when vitamin E deficiency is accompanied by a methionine or cysteine deficiency. The condition is most prevalent in the breast musculature and is most severe at around 4 weeks of age.

Encephalomalacia
Encephalomalacia (also known as 'crazy chick disease') leads to haemorrhage in the cerebellum, leading to ataxia, incoordination and torticollis. The head may be twisted such that the top of the bird's head is on the floor whilst it is standing.

Treatment:
For mild to moderate cases, administering vitamin E via the drinking water should be effective. If not treated, affected chicks usually die within 2-6 days. Severely affected chicks should be euthanised on humane grounds.

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QUESTION 1

In cases where nutritional imbalances occur, it is often difficult to ascertain the exact cause. What advice should be given to clients?

a. Always supplement backyard poultry with multivitamins regularly
b. Carefully formulate a rationale
c. Feed a commercial diet
d. Select hardy breeds as backyard pets
e. None of the above

QUESTION 2

What are some of the hallmark signs of perosis?

a. Retarded bone growth
b. Widened tibiotarsal joint
c. Bending of the tibia
d. Bending of the metatarsus
e. All of the above

QUESTION 3

Birds have a nutritional store of vitamin A in their livers. If fed a diet completely devoid of Vitamin A, how long would that store last?

a. 2 weeks
b. 2 months
c. 3 weeks
d. 3 months
e. 4 months

QUESTION 4

If a commercial diet has mycotoxin contamination, which deficiency is likely to be encountered?

a. Vitamin A
b. Thiamine
c. Niacin
d. Riboflavin
e. Commercial diets will be balanced regardless of mycotoxin contamination

QUESTION 5

On post-mortem examination of some chicks, you notice that they all have dark coloured tongues. What is the most likely cause?

a. Hypoxia
b. Cardiac failure
c. Pantothenic acid deficiency
d. Niacin deficiency
e. Thiamine deficiency

QUESTION 6

A deficiency of which B vitamin may reveal gizzard erosions on PM examination?

a. Pyridoxine
b. Pantothenic acid
c. Folic acid
d. Biotin
e. Riboflavin

QUESTION 7

What is the correct ratio of Ca:P in a balanced diet?

a. 1:2
b. 2:1
c. 1.5-2:1
d. 1:1.5-2
e. 1.5:2

QUESTION 8

What is a possible complication of excessive calcium supplementation for an inappropriate bird (e.g. cockerels or young chicks)?

a. Brittle bones
b. Renal damage
c. Exudative diathesis
d. Urolithiasis
e. Encephalomalacia

QUESTION 9

Which mineral is closely linked to vitamin E?

a. Zinc
b. Copper
c. Manganese
d. Selenium
e. Iron

QUESTION 10

In which form of vitamin E deficiency is one likely to encounter discoloured skin?

a. Exudative diathesis
b. Muscular dystrophy
c. Encephalomalacia
d. None of the above
e. All of the above

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