Broiler Disease Reference Guide

Brought to you by Elanco

Leaders in Intestinal Integrity



Contents

Intestinal Integrity

Respiratory Index

Other Lesions

Elanco™

Contents

Airsacculitis (ARS) 4-5

Alphitobius diaperinus—Darkling Beetle score (BTL) 6

Ammonia Burns in Cornea (AB) 7

Ascites (AC) 8-9

Aspergillosis (AP) 10-11

Burned Feet (BF) 12

Bursa Measurement (BSM) 13-14

Bursal Atrophy (BUR) 15

Bursal Damage (BDM) 16-17

Cardiovascular (CDV) 18

Cellular Sloughing (CS) 19

Color (CLR) 20

Crop Mycosis (CM) 21

Cull Bird (CL) 22

Excessive Bile (BL) 23

Excessive Intestinal Fluid (WC) 24

Excessive Intestinal Mucus (MC) 25

Feed Passage (FP) 26

Femoral Head Necrosis (FH) 27

Gizzard Erosion (GIZ) 28

Gross Examination for Coccidial Infections 29

Gross *Eimeria acervulina* (gAC) 30-31

Gross *Eimeria brunetti* (gBR) 32

Gross *Eimeria maxima* (gMX) 33-34

Microscopic *Eimeria maxima* (mMX) 35

Gross *Eimeria mitis* (gMI) 36

Gross *Eimeria necatrix* (gNX) 37

Gross *Eimeria tenella* (gTN) 38

Hyperemia (HY) 39-40

© 2010 Elanco Animal Health. All rights reserved.

Inflammatory Process (IP) 41
Intestinal Hemorrhage (IH) 42-43
Intestinal Integrity-Broilers (I^2) 44
Intestinal Tone (IT) 45
Litter Eater (LE) 46
Mouth Lesions (ML) 47
Necrotic Enteritis (NE) 48
Osteomyelitis (OM) 49
Pale Legs (PL) 50
Proventriculitis (PRV) 51
Retained Yolk (RY) 52
Rickets (RKT) 53
Roundworms (RW) 54
Scratches (SC) 55
Swollen Head (SH) 56
Swollen Hock (HK) 57-58
Tapeworms (TW) 59
Tenosynovitis (TN) 60
Thick Intestines (TK) 61
Thin Intestines (TH) 62
Thymus (THY) 63
Tibial Dyschondroplasia (TDS) 64
Time in Box/Transportation (BOX) 65
Tracheitis (TRA) 66-67
References 68-69

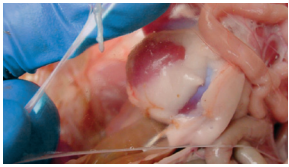
About the Health Tracking System (HTS)

HTS is a data management system that maps out the poultry flock health status over time, allowing you to relate efficiency obtained through your investment, resulting in a sustained maximization of your profits.

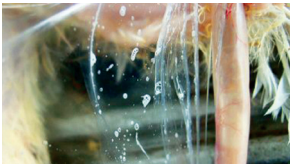
Documenting and analyzing your poultry flock health status and efficiency ultimately assures your product quality. Your brand relies on the assurance of quality.

© 2010 Elanco Animal Health. All rights reserved.

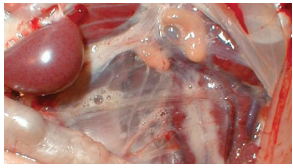
Airsacculitis[1] (ARS)



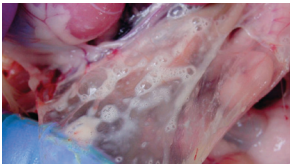
Score 0: Normal



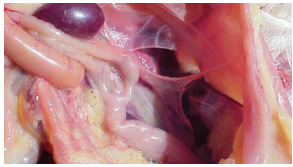
Score 1: Mild



Score 2: Moderate



Score 3: Marked



Score 4: Severe

HTS Definition

The air sacs in the abdominal cavity should be clear and free of exudate in the normal bird. Some mild airsacculitis may result from normal reaction to vaccination, but the moderate to severe airsacculitis is usually an indication of excessive reaction, field challenge or secondary bacterial involvement.

0 Normal. Normal air sacs should be clear and free of all suds and exudate. Occasionally in some older birds there may be a little fat deposition on the edges of the air sacs, and care must be taken to distinguish from exudate.

1 Mild Airsacculitis. Light suds in the air sacs. Lesions typical of what might be seen post-reaction with a mild respiratory vaccine.

2 Moderate Airsacculitis. Obviously heavy suds in the air sacs without consolidation of the exudate. Air sacs may feel slippery to the touch.

3 Marked Airsacculitis. Milky to cheesy exudate in the air sac confined to one air sac. Secondary bacterial infection often present.

4 Severe Airsacculitis. Milky to cheesy looking exudate involving more than one air sac. Secondary bacterial infection often present.

Contents | Intestinal Integrity | *(continued on next page)*

Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Airsacculitis (ARS) *cont.*

Clinical Significance

The presence of mild airsacculitis must be evaluated with the knowledge of the vaccination schedule, as some reaction is typical of certain vaccines. Moderate to severe airsacculitis can be an indication of excessive vaccine reaction, field challenge with a respiratory virus or secondary bacterial infection. Significant airsacculitis can impact overall bird performance, health, morbidity, mortality and processing ability.

Control Strategies

Quality control programs in the hatcheries are in place to help ensure that vaccine is administered properly to chicks. Maintaining good air and litter quality is important to assist birds while reacting to the vaccination both in the hatchery and any field boost that may be given. The bird's immune system also plays a role in limiting the impact of viruses and secondary bacteria.

Contents
Intestinal Integrity
Respiratory Index
Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Alphitobius diaperinus[2]—Darkling Beetle score (BTL)



Score 1: presence of beetles in crop

HTS Definition

Evaluation of the gizzard and/or crop for the evidence of beetle parts or beetles (larvae or adults)

0 No beetles or beetle parts

1 Beetles or beetle parts observed

Clinical Significance

The observation of beetle parts or beetles (adults or larvae) show birds are eating beetles, which are not as nutritious as feed. Data supports that chicks up to 7 days old that eat only beetles do not gain as much weight compared to chicks eating only feed.[2] The chicks never recover the weight not gained compared to the feed-only chicks. Also, excessive amounts of beetles or parts could cause blockages.

Control Strategies

An effective beetle management program will reduce beetle populations in poultry houses, thus reducing birds consuming beetles instead of feed.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Ammonia Burns in Cornea[3] (AB)



Score 1: Ammonia burn flourescein stained

HTS Definition

The bilateral, or less frequently unilateral, damage to the eye that is characterized by cloudiness and/or ulceration of the cornea.

0 Normal cornea

1 Bilateral or unilateral damage to the eye characterized by cloudiness and/or ulceration of cornea

Clinical Significance

Ocular tissue is known to be highly innervated. Ulcerations to the cornea are painful and result in a reduced state of animal welfare. Levels of pain are also directly correlated to bird health and performance. High ammonia levels directly impact respiratory health and bird performance.

Control Strategies

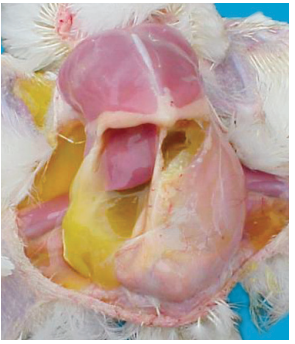
High ammonia levels indicate litter imbalance and/or improper ventilation. Rate of ammonia formation is directly related to litter pH. Litter pH can be regulated by fresh-litter management and litter amendments. Ammonia formation requires adequate litter moisture. Drinking sources should be managed to reduce water wastage. The moisture level of fecal matter will vary with feed formulations and intestinal health. Fresh feces should be observed for consistency, and appropriate feed testing and intestinal monitoring performed. The adequate movement of heated (drier) air into the house and subsequent removal of moist (wetter) air from the house are the primary means to reduce ammonia levels.

© 2010 Elanco Animal Health. All rights reserved.

Ascites[4] (AC)



Score 1: Significant distention of abdominal cavity



Score 1: Straw-colored abdominal fluid present

HTS Definition

The accumulation of variable amounts of straw-colored fluid in the abdomen.

0 Absence of the condition

1 Accumulation of straw-colored fluid in abdomen

Clinical Significance

This condition is most commonly associated with cardiovascular disease (CDV). Cardiac muscle damage is accumulative because the tissue is non-regenerative. Early oxygen deprivation in the hatchery and brooders can manifest itself as ascites as the bird grows rapidly. The modern bird's growth rate requires a high level of respiratory exchange of oxygen and carbon dioxide. The larger the bird and the more rapid the rate of growth, the greater the cellular respiration and therefore need for CO_2 and O_2 exchange. Insults to the cardiovascular system compound the condition and cause the heart to work harder and harder to keep up with the growing demand. The heart itself may weaken, and vascular pressure changes result in fluid movement and accumulation from the blood into the abdomen and pericardium. The fluid around the heart (hydro-pericardium) creates pressure on the heart and further exacerbates the condition. The increased pulmonary blood flow cannot be received by the avian lungs. This will result in vascular pressure changes and fluid shifts. It also complicates the oxygen deprivation. The liver enlarges from increased portal pressure. The lungs darken as evidence of pulmonary hypertension (DZ), which causes poor lung function.

(continued on next page)

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Ascites (AC) *cont.*

Primary liver damage can result in ascites without primary cardiopulmonary problems. In poultry, liver damage may be caused by aflatoxin or by toxins from plants such as *Crotalaria*, and obstructive cholangiohepatitis (caused by *Clostridium perfringens* infection) is the most common cause of the liver damage, which results in ascites.

Ascites results in increased mortality and reduced performance.

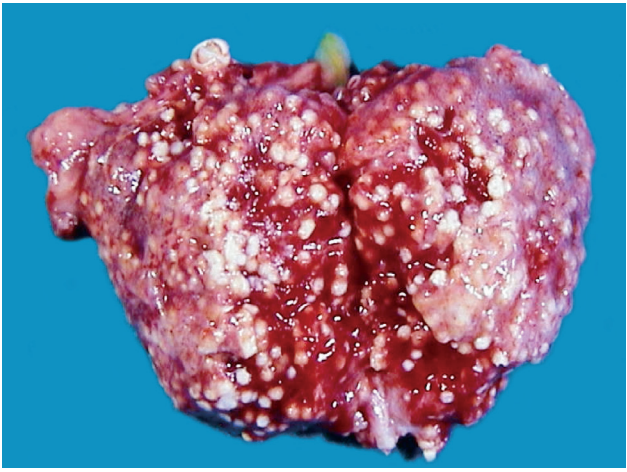
Control Strategies

Ascites can be best controlled by managing bird growth compatible with respiratory function. This includes maintaining optimal respiratory function. Poor air quality, low temperatures, dust and ammonia are all additive components that increase the oxygen requirements. Efficient air exchange is compromised by bacterial, viral and renal diseases. Good management practices and feeding programs could help to reduce the incidence of cholangiohepatitis from *C. perfringens*.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Aspergillosis[5] (AP)



Score 1

HTS Definition

Yellow or gray nodules and/or plaques in the lungs, air sacs or trachea. Found less frequently in peritoneal cavity, liver, brain or at other sites. Also can occur as a possible gray or white opacity in one or both eyes.

0 Absence of condition

1 Yellow or gray nodules and/or plaques in lungs, air sacs or trachea, peritoneal cavity, brain or other sites.

Clinical Significance

This is not a typical lesion found on necropsy evaluations for "normal/healthy flocks." It is, however, relatively common to find when exploring issues of chick quality involving high mortality during the first two weeks. This lesion is noted when chicks pick up spores for this fungus, usually from the hatchery, or at the time of placement on the broiler farm. The spores prefer an environment rich in oxygen, so it usually grows in the respiratory tract or in the eyes. It can be particularly serious when growing in an area of limited space for expansion, such as the trachea, where airflow obstructions can lead to death.

(continued on next page)

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Aspergillosis (AP) *cont.*

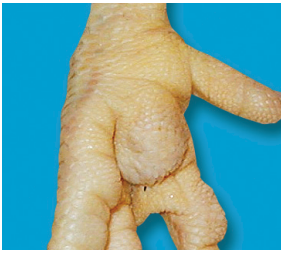
Control Strategies

The control strategy should involve an attempt to locate the source of infection. Eggs that are sanded or allowed to sweat due to rapid temperature shifts provide an opportunity for introduction of spores through the protective surface of the eggshell. Contaminated eggs can become exploders in the hatchery and infect a large number of eggs via airborne exposure. In some cases where hatcheries are located near feed mills, exposure resulting from the loading and unloading of grains high in mold contamination can contribute to the problem. Hatchery sanitation programs fight against constant exposure and potential threat from incoming eggs and from airborne particles. Hatchery modifications involving ventilation ducts can lead to significant Aspergillus challenge as spores that have been present for years can be dislodged while remodeling. The addition of "fresh" litter in a poultry house while young birds are present is very risky with regard to Aspergillus challenge.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Burned Feet[6] (BF)



Score 0



Score 1



Score 2



Score 2

HTS Definition

Usually bilateral dark lesions on feet due to poor litter conditions.

0 No lesions. No or very small superficial lesions, slight discoloration on a limited area, mild hyperkeratosis

1 Mild lesion. Discoloration of the foot pad, superficial lesions, dark papillae

2 Severe lesion. Ulcers or scabs, signs of hemorrhages or swollen foot pads

Clinical Significance

Ammonia burns can be a site of introduction of bacteria into the footpads and tendon sheaths of birds causing lameness. The incidence of burned footpads is also being used as an indication of animal welfare by many customers. Footpad lesions can be a cause of significant downgrades and decreased economic returns in plants harvesting paws.

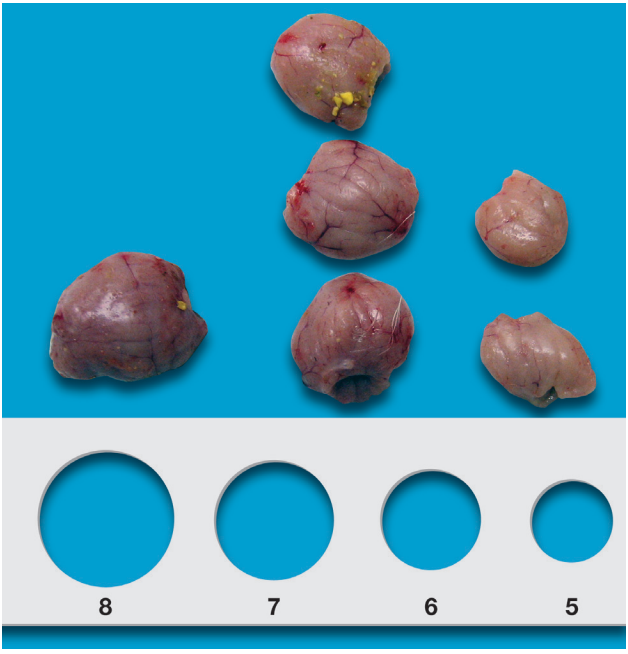
Control Strategies

Mainly centered on controlling litter moisture and optimizing ventilation. Close attention should be paid to maintaining high-quality litter throughout the life of the bird as this impacts the incidence of burned feet as well as other animal health and welfare issues.

Contents | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Bursa Measurement[7,8] (BSM)



HTS Definition

An instrument to measure the bursa with holes of different sizes is used to rate the bursa from 1 to 8, with 1 being very small and 8 very large. The smallest hole that the bursa will easily pass through indicates the bursa score. The bursa should not need to be forced through the hole and it should not bulge significantly past the edges of the hole once it passes through.

Clinical Significance

The size of the bursa in a broiler reflects the birds' health status with regard to B-cell production and the capacity to mount an immune response. This organ typically grows proportionally as the bird grows until sexual maturity. Sick or stressed birds may have smaller bursas, while healthy productive birds may tend to have larger bursas. There are many things that can impact the size and age at which a bursa experiences atrophy: disease challenge, vaccination programs and environmental factors, just to name a few. Monitoring bursa size is one piece of information that can help to tell a producer how the birds are responding to stresses, challenges and vaccination programs on the farm.

(continued on next page)

© 2010 Elanco Animal Health. All rights reserved.

Bursa Measurement (BSM) *cont.*

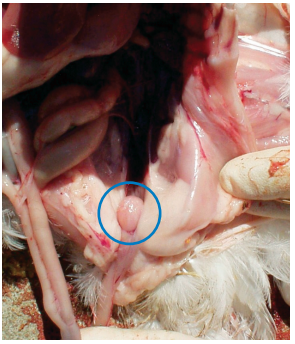
Control Strategies

Measuring bursa size should start by establishing a normal baseline for the flock. It is important to take into consideration the age of the bird and the vaccination practices that are implemented such as IBDV field vaccine. Evaluation of the bursa should be done by selecting normal, healthy birds that represent the flock and not cull birds. After several bursa measurements are performed, the producer can learn what to consider as "normal size range" for the flock according to the bird's age. After establishing the bursa size baseline, if a flock is evaluated and bursa size is out of the "normal size range" then it is important to investigate the possible cause/s for this occurrence. Reasons for small bursa size: Infectious Bursal Disease Virus (IBDV), Marek's Disease Virus (MDV), bacterial infections, reovirus, toxins, environmental or physiologic stress, etc.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Bursal Atrophy[8] (BUR)



Score 0: Location of normal bursa in bird



Score 0: Bursa, out of bird, opened showing bursal folds

HTS Definition

Gross examination of the bursa of Fabricius for evidence of Infectious Bursal Disease (IBD) challenge. Birds up to 28 days of age recorded.

0 Normal bursal color. No change (reduction) in size due to virus challenge.

1 Mild bursal atrophy (25% atrophy). May see evidence of longitudinal striations and/or yellowish transudate covering the serosal surface; starting to lose the "rosing out" response when cut.

2 Moderate bursal atrophy. As much as 50% of normal size; tissue may have changed to yellow color; no "rosing out" response.

3 Severe bursal atrophy (more than 75% atrophy). Minimal to non-detectable size.

Clinical Significance

Bursal atrophy indicates the possibility of a degraded immune system and increased susceptibility to disease. If bursal atrophy is observed in birds less than 15 days of age, a variant IBDV strain may be a factor in causing this atrophy. Affected birds may exhibit very strong negative impacts from otherwise mild or even non-pathogenic challenges. Increased incidence and severity of IP, dermatitis, coccidiosis, bacterial or viral enteritis and respiratory disease are common.

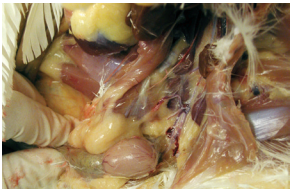
Control Strategies

Various vaccines are available for prevention of bursal disease. Biosecurity and adequate lay-out time between flocks can help in control programs.

Note: Bursal size varies with size and age of bird. As birds mature, bursal size regresses. Size and age of bird must be considered when scoring bursal size.

© 2010 Elanco Animal Health. All rights reserved.

Bursal Damage[8,9] (BDM)



Score 0



Score 1



Score 3

HTS Definition

Birds challenged with Infectious Bursal Disease (IBD), an acute contagious viral disease of young chickens, could exhibit clinical signs such as diarrhea, incoordination, vent picking behaviors, trembling, dehydration and immunosuppression. The main gross lesion induced by classic IBDV strains is characterized by acute inflammation followed by atrophy of the bursa of Fabricius (the major affected organ). By second and third day post-infection, the bursa contains a gelatinous yellowish transudate at the serosal surface, then bursa returns to normal size and the organ is gray and hard followed by atrophy. Variant IBDV strains may not cause inflammation; instead they result in early atrophy of the bursa and severe immunosuppression.

0 Normal

1 Yellow edematous in serosa mainly due to classic strains

2 Obvious hemorrhage internally

3 Cherry-like bursa

Clinical Significance

IBD occurs in young chickens, and clinical signs can be more severe in birds that are 3 to 6 weeks old. Chickens less than 3 weeks may not show clinical signs but will have destruction of the bursa of Fabricius, resulting in various degrees of immunosuppression. The younger the chicken at the time of challenge—especially with variant IBDV strains—the more immunocompromised is the bird, resulting in a higher degree of susceptibility to other pathogens and poor response to routine poultry vaccination programs. Other lymphoid organs that can be damaged to a

(continued on next page)

© 2010 Elanco Animal Health. All rights reserved.

Bursal Damage (BDM) *cont.*

lesser extent are the thymus, the cecal tonsils and the spleen. In addition, gross lesions such as hemorrhages of the leg and pectoral muscles, sometimes a hemorrhagic area at the proventricular-gizzard junction, swollen kidneys and increased mucus in the intestine can be seen. The kidneys may be affected due to dehydration. Because IBDV impacts the bird's immune system, several diseases have been correlated with IBDV infection; these include inclusion body hepatitis, chicken infectious anemia, gangrenous dermatitis and coccidiosis, among others.

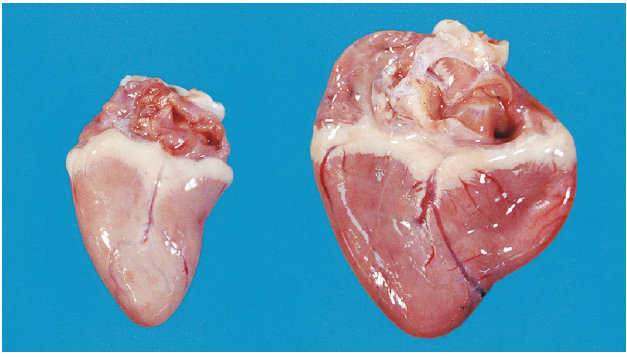
Control Strategies

A common practice involves the vaccination of breeders to provide passive immunity to the progeny, especially during the first three weeks of life. Broiler chickens can be vaccinated against IBDV; however, the timing of the vaccination in maternally immune chicks can be a challenge. If a "hot" or "intermediate" IBDV vaccine is used in chicks with low maternal immunity, it may result in bursal atrophy. However, vaccination with "mild" IBDV vaccine will not be effective in birds with high levels of maternal IBDV antibodies. Therefore, it is important to evaluate the passive immunity of the chicks prior to vaccination for proper timing of the vaccine if vaccination will be given at the hatchery and/or in the field.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Cardiovascular[10] (CDV)



Normal Score 2

HTS Definition

The heart undergoes some rather characteristic changes as congestive heart failure progresses. Care must be taken to observe before the pericardial sac and large vessels on the heart are disturbed by reflecting the breast and frame.

0 Normal. Pyramid or cylindrical shaped heart, relatively firm, with a very small amount of straw-colored pericardial fluid at the base of the heart.

1 Mild. Excess of pericardial fluid and a slight enlargement of the right side of the heart.

2 Moderate. Obvious enlargement of the right side of the heart. The wall of the right side of the heart becomes very flaccid, and a moderate-size clot will remain in the right chamber even when the muscles are contracted in death.

3 Severe. Same as No. 2 but the signs of congestive heart failure have begun to affect the other organs of the body. Ascites may be present. The liver may be swollen with rounded edges, and perihepatitis may be present.

Clinical Significance

Associated with oxygen levels in the body tissues. As the heart has to work harder to compensate, nutrient resource are expended versus directed toward growth. Fastest-growing birds are most susceptible.

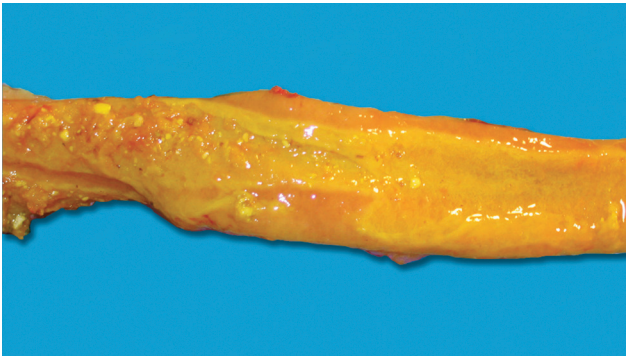
Control Strategies

Management measures to ensure adequate ventilation and temperature management greatly reduce the finding.

Contents Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Cellular Sloughing[11] (CS)



Score 1

HTS Definition

The presence of excessive cellular debris in the proximal intestine. May be mixed with excessive mucus. Typically a white pasty consistency in the proximal intestine and may be mixed with orange digested mucus more distally.

0 Absence of the condition

1 Presence of excessive cellular debris in proximal intestine, possibly mixed with excessive mucus

Clinical Significance

Infectious organisms such as coccidia, bacteria and/or viruses can accelerate the normal turnover of intestinal-lining cells. Excessive cell death can lead to decreased absorptive ability and poor performance. Secondary disturbance of normal intestinal bacterial flora can also impair performance.

Control Strategies

Ingredient quality control and prevention of intestinal disease are a key part of controlling excessive cell necrosis. Attention to anticoccidial programs and ingredient quality control greatly reduces the risk. Acidified water treatments can reduce the amount of mucus and debris in the intestine; however, addressing the underlying cause is the most effective manner of control.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Color[12] (CLR)



Score 1



Score 2



Score 3



Score 4

HTS Definition

Color scores pertain to the pigmentation of the skin and are usually scored in the shank region of the bird. This system is most applicable to those companies growing a pigmented bird. Note: Because of differences in pigmentation grading systems between companies, inter-company comparisons are invalid.

0 Not scored.

1 Ideal pigmentation (deep yellow to orange). Not scored for those companies where color is not of interest.

2 Average pigmentation (yellow).

3 Below average pigmentation (pale yellow).

4 Devoid of pigmentation (white).

Clinical Significance

The color of the skin and shanks is dependent on the bird's ability to absorb pigments contained in the diet. Poor Intestinal Integrity due to enteritis, coccidiosis or other factors may impair a bird's ability to absorb not only pigment but also other nutrients in the diets.

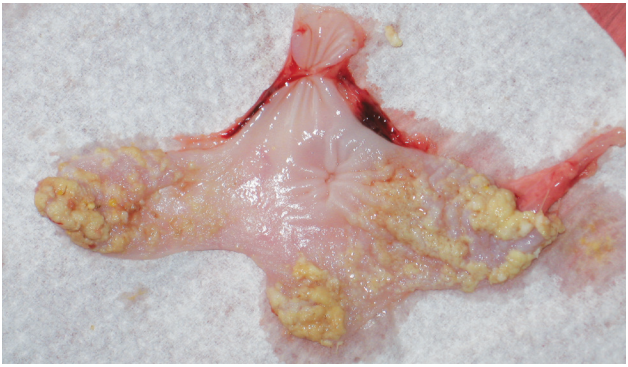
Control Strategies

Intestinal health is protected by the use of anticoccidials and antimicrobials in the diets. In companies where pigment is particularly important, ingredients are used that are rich in yellow pigments, such as corn, or additional pigments may be added to the diets.

Contents | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Crop Mycosis[13] (CM)



Score 1

HTS Definition

Mycosis of the digestive tract (also known as thrush, moniliasis, candidiasis, soor, sour crop, levurosis).

0 No gross lesions

1 Whitish pustules or nodules in mouth, crop and esophagus, and white towel appearance in upper digestive tract are common.

Clinical Significance

Crop mycosis is caused by the yeast-like fungus *Candida albicans*. The disease involves the upper digestive tract and is associated as secondary infection. Clinical signs are nonspecific (poor growth, stunted, listlessness, inappetence, ruffled feathers and diarrhea in advanced cases). The crop is the primary organ to be affected and in severe cases may become extended and cannot be emptied; fluid is regurgitated by the bird and has a characteristic sour, fermentative odor (sour crop). Affected mucosa may be thickened (diffusely or focally), raised, corrugated and white similar to a terry cloth. Severe cases showed white to gray pseudomembrane or diphtheritic patches or shallow ulcers. Necrotic membrane may slough into the lumen as soft cheese material. Lesions can be found in the crop, pharynx, and esophagus.

Control Strategies

This condition is associated with unhygienic, unsanitary, overcrowded conditions and occasionally with the extended use of certain antibiotics. Therefore, high standard of sanitation practices should be implemented in the operation. Disinfectants (phenolic or iodine) should be used for equipment sanitation. Prevention of primary predisposing diseases—in particular search for evidence of parasitism, malnutrition and coccidiosis, among other causes.

© 2010 Elanco Animal Health. All rights reserved.

Cull Bird[14] (CL)



HTS Definition

Culling involves the removal of inferior birds from a group of healthy birds. Birds are culled due to disease, failure to produce or reproduce, inherited defects or because of undesirable conformation.

0 Healthy bird

1 Unhealthy or inferior bird (>15% lighter compared to breed standards); non-conforming with the majority of the birds

Clinical Significance

By culling birds properly and on time, the flock's FCR is greatly improved, as each runt has a potential to consume good amounts of feed and not grow to its full genetic potential. As almost 70% of the cost of production is feed-related and with feed prices escalating such as they are, it is imperative to cull properly to avoid any unnecessary costs to the farm.

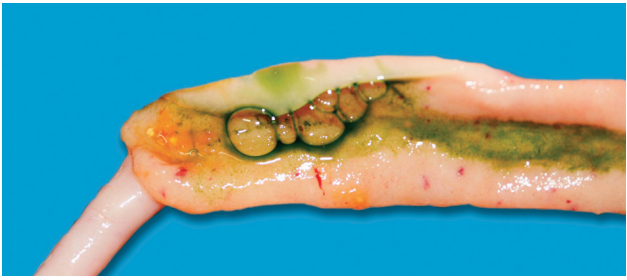
Control Strategies

Culling is an essential management process usually performed to avoid disease transmission within a flock and/or to avoid any unnecessary costs. Culling is usually performed either after hatch and/or during the first two weeks of a bird's life.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Excessive Bile[12] (BL)



Score 1

HTS Definition

Excessive bile is marked by the presence of bile or excessive bile staining in the intestines due to extended period off feed or hepatic disease.

0 Absence of the condition

1 Presence of bile or excessive bile staining the intestines

Clinical Significance

The presence of bile in the digestive tract—particularly in the gizzard—is an indication of how long the bird has been off feed. With extended feed withdrawals, birds begin to release bile into an empty intestinal tract. Normal intestinal contractions cause the bile to move up to the gizzard, where the bile stains the contents of the gizzard green. This occurs roughly 13 hours after removal of the feed. Normal movement of feed through the digestive tract of birds (not feed-restricted) prevents this bile staining of feed ingredients in the gizzard. When birds are off feed for as much as 13 hours during their growing period, they lose efficiency in weight gain and feed conversion. Increased mucus secretion in the intestinal tract is a natural protective mechanism utilized by the birds when the digestive tract is empty, and this can lead to bacterial population changes favoring the growth of mucolytic bacteria such as those organisms responsible for necrotic enteritis. Excessive bile in the digestive tract is merely a sign that the bird evaluated had experienced an extended period of time off feed. Reasons for the bird being off feed may be as simple as a feed outage, inability of the bird to access the feeder, or some sort of illness that resulted in the bird's lack of desire to eat the feed that was available. It may also be an artificial condition created by too much time between the capture of the birds and necropsy evaluation.

Control Strategies

Evaluate the possibility of feed outages based on history and scheduled feed deliveries. There may be a variety of mechanical problems with automated feeding systems, including bridging of feed in the bulk bins, equipment failures, feeder height or restrictive feeding programs. The birds may have other diseases, such as leg problems or airsacculitis, which made it difficult or impossible to eat the feed that was available. In those situations it is important to address the inciting cause.

© 2010 Elanco Animal Health. All rights reserved.

Excessive Intestinal Fluid[12] (WC)



Score 1

HTS Definition

The presence of excessive fluid in the intestinal tract upon opening, or noticeably increased content in droppings. May be evaluated by other diagnostics.

0 Absence of the condition

1 Presence of excessive fluid in intestinal tract, or noticeably increased content in droppings

Clinical Significance

An excessive watery content in the intestinal tract is commonly associated with electrolyte or mineral imbalances in the diet, particularly salt content. Some viral diseases may contribute to damage in the intestinal tract resulting in a net fluid loss into the lumen. Increased flushing can result in decreased transit time in the intestinal tract of feed, and therefore may impact the bird's ability to absorb nutrients. Additionally, excessive flushing may cause a decrease in the cleanliness of birds being processed, which may result in increased carcass contamination.

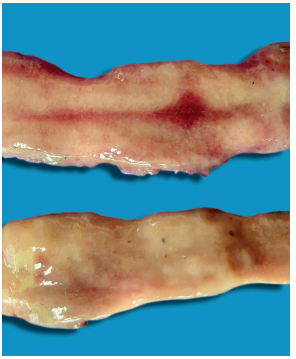
Control Strategies

Quality control standards in regards to feed ingredients must be maintained to ensure that diets are being formulated with the correct mineral levels.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Excessive Intestinal Mucus[12] (MC)





Score 1

HTS Definition

The presence of excessive mucus in the intestine.

0 Absence of the condition

1 Presence excessive mucus in intestine

Clinical Significance

Although mucus production is a normal digestive function, certain disease agents (coccidia, bacteria, viruses) and feed toxins can stimulate excessive production. Research has shown that certain bacteria such as *Clostridium perfringens*, the leading cause of bacterial enteritis, can use mucus as a growth medium and energy source, further exacerbating bacterial enteritis.

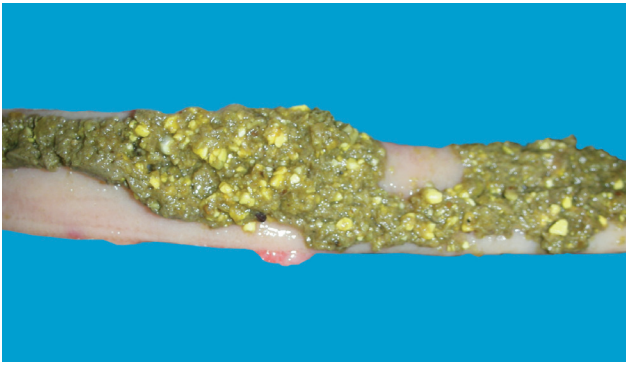
Control Strategies

Ingredient quality control and prevention of intestinal disease are a key part of controlling excessive cell necrosis. Attention to anticoccidial programs and ingredient quality control greatly reduces the risk. Acidified water treatments can reduce the amount of mucus and debris in the intestine; however, addressing the underlying cause is the most effective manner of control.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Feed Passage[12] (FP)



Score 1

HTS Definition

The presence of undigested feed in the large intestine or feces, comprising greater than 25% content.

0 No presence of undigested feed at the end of the GI tract

1 Presence of undigested feed in large intestine or feces, comprising greater than 25% content

Clinical Significance

Feed passage is an indicator that digestion is sub-optimal or transit time is too fast and adversely affects caloric conversion.

Control Strategies

Specific causes for the feed passage must be identified and can include toxins in the feed, various gastrointestinal pathogens and stress-induced hypermotility. The particle size as a result of corn grid is also very important with regard to feed passage. Remove or control the inciting cause, provide high-quality feed presentation, acidify drinking water and maintain good ventilation.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Femoral Head Necrosis[15] (FH)



Score 1

HTS Definition

The shattering of the femoral head or the fracturing of the neck of the femoral head with the femoral head remaining in the acetabulum during normal disarticulation of the coxofemoral joint. Detachment of the musculature from the proximal femur also is present. Not to be confused with detachment of the cap of the head of the femur only.

0 Absence of the condition

1 Shattering of femoral head or fracturing of the neck of the femoral head

Clinical Significance

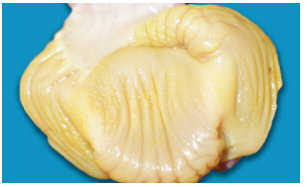
Femoral head necrosis results in painful bone deterioration, and birds become reluctant to move. As the birds grow larger, mortality may increase due to down birds; loss of uniformity will occur as lame birds do not eat well; increased leg breakage and mortality during live haul may be evident; and at the processing plant birds will be downgraded. The causes of FH may reside in the breeder flock, hatchery or on the farm. Systemic bacteremia preceding the onset of FH may be noted as increased airsacculitis.

Control Strategies

The focus of control should be on identifying the source of infection. Hatchery sanitation and incubation can be responsible for significant incidence of FH. Placing "green" chicks at the farm may create a false impression that the issue is farm-related, but careful analysis should indicate wider distribution. Tracing back to specific breeder flocks allows for intervention at the breeder level or the farm level to minimize the impact. Good breeder and chick immune system management will reduce the incidence. Birds raised under stressful conditions have difficulty activating vitamin B, and the result can be fracture of the femoral head without bacterial involvement.

© 2010 Elanco Animal Health. All rights reserved.

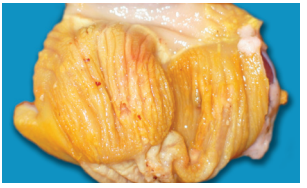
Gizzard Erosion[12] (GIZ)



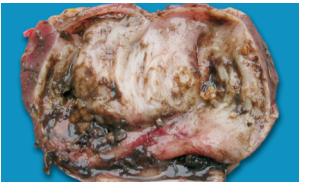
Normal



Score 1



Score 2



Score 3

HTS Definition

Examination of the gizzard lining for evidence of erosions and ulcerations.

0 Normal smooth lining of the gizzard; no roughening of the lining surface.

1 Rough appearance of the lining with no ulcerations or hemorrhages.

2 Erosion of the gizzard lining not extending into the mucosal surface; may see enlargement in the distance of the junction with the proventriculus; evidence of hyperemia may be present in affected areas.

3 Severe erosion of the lining extending into the mucosal area; may have hemorrhages in both the lining and junction with the proventriculus.

Clinical Significance

Even though the lining of the gizzard is very tough, certain toxic compounds associated with feed can erode it. Biogenic amines result from spoilage or improper processing of certain proteins, especially meat meals and fish meals. Increased amounts of copper sulfate can increase gizzard erosion. In addition to the gizzard damage, these issues will also damage the small intestine. Gizzard erosion is a good lagging indicator for ingredient quality.

Control Strategies

Ingredient quality is the most effective strategy in prevention of gizzard erosion. Once lesions are present, very little can be done to address the disease process.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Gross Examination for Coccidial Infections

Guide to Diagnosis

Coccidia (*Eimeria*) are the most common enteric parasites found in commercial poultry. Several species of cocci have been identified. Species are generally host specific and can infect birds of all ages. The economic impact of coccidial infection on commercial poultry production ranges from insignificant to catastrophic depending upon the species and the severity of infection. The ability to accurately diagnose and quantify the severity of coccidial challenge is critical to designing management, medication and feeding programs to maintain flock health and production efficiency.

An effective coccidial diagnosis begins with the removal of the entire intestine—including the ceca—and freeing it from associated mesenteric tissue. The gross assessment should always begin with a thorough examination of the serosal surface of the unopened intestine under bright light. Look for pinpoint lesions, white plaques, ballooning, thinning or thickening, and changes in color. After the serosal surface is examined, open the intestine down its length and observe the contents looking for signs of blood, mucus, undigested feed and excess fluid. Carefully clean the intestine of its contents and continue the examination, paying particular attention to intestinal tone, coagulation necrosis, caseous material, thickness, color, cellular sloughing and the presence of lesions, which may include petechiae, white plaques, and/or cecal cores.

A confirmatory diagnosis is made by scrapping the infected area of the intestine, placing the scraping on a slide, preferably adding a drop of saline (water is acceptable) to the sample, and covering with a cover slip. A microscopic examination of the slide (10x or 20x) will allow easy detection of oocysts or other life stages. The size, shape, and appearance of the oocyst will assist in species identification. Although confirmation of a coccidial infection can be made using microscopic visualization, the mere presence of the parasite is not enough to make a diagnosis of clinical coccidiosis. The detection of oocysts in the intestine of apparently normal birds is not uncommon, as some degree of coccidial cycling occurs in most every flock regardless of age and the use of coccidial control or treatment methods. Clinical coccidiosis is best diagnosed when gross lesions are observed, production parameters are adversely affected, and oocysts of the suspected species are present upon microscopic examination.

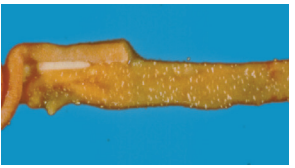
Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Gross *Eimeria acervulina*[16,17] (gAC)



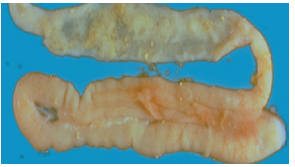
Score 1



Score 2



Score 3



Score 4

HTS Definition

E. acervulina invades the upper intestinal tract and is characterized by white elongated lesions found on the inner intestinal lining. Most infections are limited to the duodenal loop but may extend to Meckel's diverticulum.

0 No gross lesions.

1 Scattered, white plaque-like lesions containing developing oocysts are usually confined to the duodenum but mucosal surface appears relatively normal. Lesions are elongated with the longer axis transversely oriented on the intestinal walls. There may be up to 5 lesions per square centimeter. Lesions may be seen from either the serosal or mucosal surfaces.

2 Lesions are much closer together and more numerous, but not coalescent. Lesions may extend below the duodenum. The intestinal wall shows no thickening. Digestive tract contents appear relatively normal.

3 Lesions are numerous enough to coalesce, lesion size may be reduced, and give the intestine a coated appearance. The intestinal wall may be thickened or thinned and the contents are watery. Lesions and/or mucosal damage may extend as far posterior as the Meckel's diverticulum.

4 The mucosal wall is pale in color with lesions completely coalescent. Individual lesions are usually indistinguishable. Lesions may appear in the middle part of the intestine. The intestine may be thickened or very thin. The entire intestine is pale and is filled with a creamy or watery exudate.

(continued on next page)

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Gross *Eimeria acervulina* (gAC) *cont.*

Clinical Significance

Coccidiosis is one of the most prevalent enteric diseases of poultry. *E. acervulina* can impact feed efficiency, weight gain and pigmentation; however, mortality is rarely associated with coccidia unless secondary bacterial infections are also present.

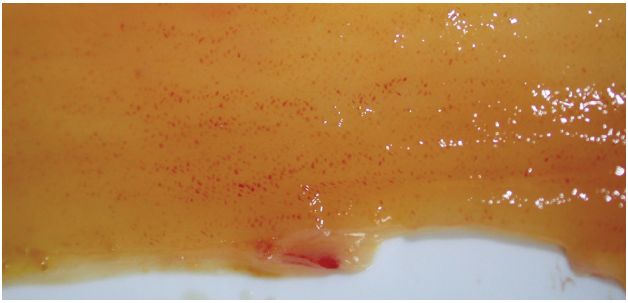
Control Strategies

Intestinal health is protected by the use of anticoccidials in the feed. Attention to management practices to control litter moisture is also important. The bird's immune system plays a role in limiting the impact of the disease.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Gross *Eimeria brunetti*[18,19] (gBR)



Score 1 (Photo courtesy of AFSSA - France)

HTS Definition

E. brunetti usually invades the lower intestine, large intestine and rectum but can be seen throughout the jejunum and ileum in moderate or severe infections.

0 No gross lesions

1 Infections of *E. brunetti* are characterized by red pinpoint lesions (petechiae) in the lower intestine extending from the mid-small intestine into the rectum. The petechiae become more numerous in severe infections and may be found throughout the intestine. The intestinal contents may be watery, slightly mucoid or empty. In light infections, petechiae may not be seen and the mucosal surface in the lower intestine can take on a pink to red roughened appearance. In severe infections, coagulation, necrosis and cheesy cores may be seen in the rectal area and fecal droppings may be blood-tinged. Oocysts are similar in size to *E. tenella* but more ovoid in appearance.

Clinical Significance

E. brunetti is markedly pathogenic, and infections can produce reductions in weight gain and feed utilization greater than that seen with the more common specie *E. maxima*. Severe infections can cause death. Fortunately, *E. brunetti* is not commonly found in broiler chickens.

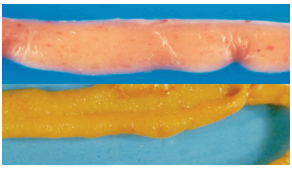
Control Strategies

All the ionophores and the commonly used chemical anticoccidials appear to have efficacy against *E. brunetti*.

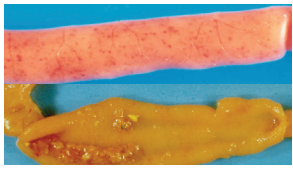
Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

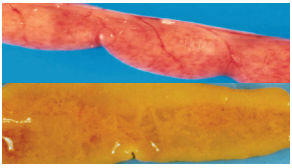
Gross *Eimeria maxima*[20,21] (gMX)



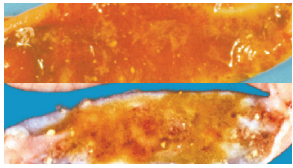
Score 1



Score 2



Score 3



Score 4

HTS Definition

E. maxima typically invade the middle section of the intestine but will migrate throughout most of the intestine. Lesions appear as small, discrete red hemorrhages on the outside of the intestine, and orange mucus is often present. Since numerous factors can cause intestinal hemorrhaging and mucus accumulation, a microscopic examination is recommended to confirm the presence of oocysts. *E. maxima* oocysts can be easily identified because of their large size, characteristic brownish color and rough outer surface. *E. maxima* is thought to be the most immunogenic of the chicken species.

0 No gross lesions.

1 Small red petechiae (pinpoint hemorrhages) may appear on the serosal side of the intestine at any location. There is no ballooning or thickening of the intestine.

2 Serosal surface may be speckled with numerous red petechiae. The intestine may contain orange mucus. The intestinal wall may be thickened but little or no ballooning is evident.

3 Intestinal wall exhibits ballooning and may be thickened. The mucosal surface is roughened. Intestinal contents may contain significant amounts of orange or brown mucus and perhaps some specks of blood.

4 The intestinal wall may be severely ballooned in one or more areas and the intestine contents may contain large quantities of mucus, specks of blood and digested red blood cells giving a reddish brown color and putrid odor. The intestinal wall can be greatly thickened or very thinned.

(continued on next page)

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Gross *Eimeria maxima* (gMX) *cont.*

Clinical Significance

E. maxima may impact feed efficiency, weight gain and pigmentation. Severe lesions may contribute to an increase in mortality (although rare), and it may be a contributing factor in bacterial diseases, such as necrotic enteritis. For the untrained eye, *E. maxima* can be one of the more difficult species of coccidia to recognize grossly. The reason for this difficulty in diagnosis is that lesions similar to those of *E. maxima* may be produced by a variety of other conditions and diseases.

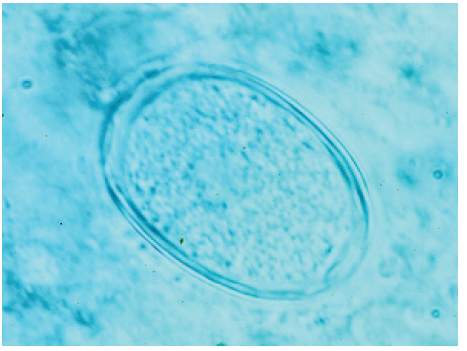
Control Strategies

Intestinal health is protected by the use of anticoccidials in the feed. The bird's immune system also plays a role in limiting the impact of this disease. Attention to management practices to control litter moisture is important to decrease the level of challenge in the houses.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Microscopic *Eimeria maxima*[20] (mMX)



E. maxima oocyst

HTS Definition

N	Not evaluated-Null
0	No oocysts present
1	1-10 oocysts per 100x field
2	11-20 oocysts per 100x field
3	21-30 oocysts per 100x field
4	More than 30 oocysts per 100x field

Clinical Significance

Coccidiosis is one of the most prevalent enteric diseases of poultry. *E. maxima* may impact feed efficiency, weight gain and pigmentation; however, mortality is rarely associated with coccidia unless secondary bacterial infections are also present. By observing oocysts for *E. maxima* under the microscope, it aids in the confirmatory diagnosis of *E. maxima*, as gross lesions are not pathognomonic.

Control Strategies

Intestinal health is protected by the use of anticoccidials in the feed. Attention to management practices to control litter moisture is also important. The bird's immune system also plays a role in limiting the impact of the disease.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Gross *Eimeria mitis*[22,23,24] (gMI)

HTS Definition

Although discrete, intestinal lesions are not seen with *E. mitis* infections, other pathological signs may be present, and growth performance and feed efficiency can be adversely affected.

0 No gross lesions

1 While not pathognomonic, signs of reduced pigmentation, fluid accumulation and mucosal erosion may be suggestive of *E. mitis* infection, and small, round oocysts (smaller and rounder than *E. acervulina*) can be seen with a microscopic evaluation of intestinal scrapings. *E. mitis* was first described in the anterior small intestine and occasionally in the middle and lower small intestine. However, more recently *E. mitis* has been described predominately in the posterior small intestine from the yolk sac to the cloaca.

Clinical Significance

E. mitis is a relatively non-pathogenic species of coccidia, but severe infections can result in reduced weight gain and feed utilization.

Control Strategies

Intestinal health is protected by the use of anticoccidials in the feed. Attention to management practices to control litter moisture is also important. The bird's immune system also plays a role in limiting the impact of this disease.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Gross *Eimeria necatrix*[19,25,26] (gNX)



Score 1 (Photo courtesy of AFSSA - France)

HTS Definition

E. necatrix infections are mid-intestinal and characterized by hemorrhage and ballooning.

0 No gross lesions

1 Classic "salt-and-pepper" lesions and marked ballooning are observed in the mid-intestine in the area similar to that where *E. maxima* lesions are seen. The black/red-and-white lesions result from both petechiae and white plaques of the large developing second generation schizonts. Birds with light infections may only exhibit petechiae. Oocysts develop in the cecal pouches and will not be found in the small intestine. Oocysts are slightly smaller than those of *E. tenella* and have the same slightly ovoid shape.

Clinical Significance

Even moderate *E. necatrix* infections may cause severe weight loss, morbidity and mortality. This species does not appear to compete well when other *Eimeria* species are present and, therefore, is usually only seen in older birds. *E. necatrix* is rarely seen in broilers but can be seen in breeders, layers and birds older than 8 weeks of age. Rate of egg production will be significantly decreased if laying birds are infected.

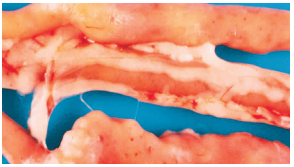
Control Strategies

All the ionophores and the commonly used chemical anticoccidials appear to have efficacy against *E. necatrix*.

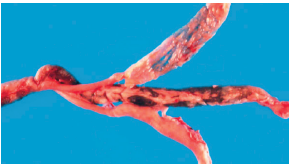
Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

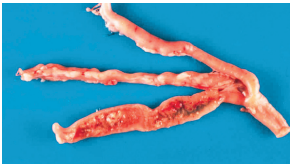
Gross *Eimeria tenella*[27] (gTN)



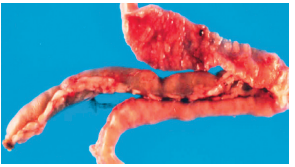
Score 1



Score 2



Score 3



Score 4

HTS Definition

This species is confined to the ceca. Lesions can be seen on the outside of the ceca and the ceca often contain blood. Observations may be associated with one or both ceca.

Note: Gross lesions do not directly correlate with bird performance.

0 No gross lesions.

1 A few scattered petechiae are found on the cecal wall. There is no thickening of the cecal walls or blood present. Cecal contents are normal.

2 Petechiae are more numerous and the cecal wall is somewhat thickened. Cecal contents are of normal consistency but may contain streaks of blood.

3 Cecal walls are greatly thickened with scattered petechiae. The ceca may contain little fecal contents; blood and white caseous material may be present.

4 The cecal wall is distended with blood and/or caseous cores. Normal fecal debris is lacking or included in cores. Dead birds scored as 4.

Clinical Significance

E. tenella has little to no impact on feed efficiency or weight gain. Mortality can occur due to endotoxic shock in severe cases.

Control Strategies

Intestinal health is protected by the use of anticoccidials in the feed. Attention to management practices to control litter moisture is very important. *E. tenella* generally produces a very poor immune response.

© 2010 Elanco Animal Health. All rights reserved.

Hyperemia[28] (HY)



Score 0



Score 1

HTS Definition

Hyperemia describes an increased blood flow to the intestine and/or congestion of the vascular structure on the intestinal tract. While more blood is present in the digestive tract, it remains within the vascular structure. It can occur as a normal physiological response to a number of variables including (but not limited to) ingestion of food, or a general response to any irritation of the intestinal tract, including digestive enzymes or acute stages of bacterial or viral enteritis. It does not, when observed as the only finding in the intestinal tract, necessarily denote a pathological condition. People performing postmortem evaluations should be aware that if birds are euthanized for a posting session by means of CO_2, the normal response is dramatic hyperemia of the intestinal tract. For uniformity sake, the portion of the intestinal tract observed for hyperemia should be the jejunum. Observation of the first loop (or duodenum) can be misleading due to the impact of digestive enzymes on that portion of the intestinal tract due to feed outages and treatments with water acidifiers. The jejunum offers a more consistent response.

0 No gross lesions. In the absence of dehydration, the mucosal surface of the jejunum should be approximately the same color as the breast muscle. Dehydration may cause the breast to be a little darker than normal, so be sure the birds are hydrated normally for the purpose of this comparison.

1 Color of the mucosal surface of the intestine will have a uniform, diffuse rosy pink to red color that is dramatically different to the color of the breast muscle tissue. The color is due to the increased blood flow to the tissue, but because it remains within the vascular structure it is not well delineated as you might see with actual hemorrhage.

(continued on next page)

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Hyperemia (HY) *cont.*

Clinical Significance

There is no real clinical significance to hyperemia, particularly if that is the only lesion noted in the intestinal tract. There are a number of normal conditions that can lead to a physiological response of hyperemia, and therefore it is not wise to jump to any conclusions regarding the health status of a flock if this is the only condition noted. It can be an indication of almost any irritation to the intestinal tract, including some that are quite normal conditions for the bird, as well as some others that are pathogenic (early stages of viral or bacterial enteritis). It is wise to look for other lesions that may have greater significance with regard to the health status of the flock or to try to understand what "normal" conditions may have contributed to the hyperemia noted on the posting session (such as time off feed or acidification products added to the water). Hyperemia is such a generalized response, you may never be able to fully appreciate or identify the actual cause.

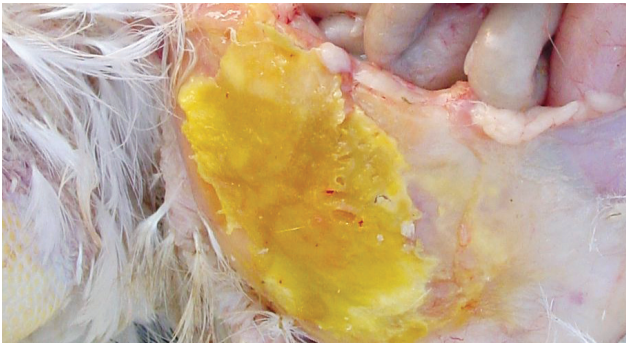
Control Strategies

There is no real control strategy required for hyperemia, as it is frequently a normal physiological response to entirely normal conditions. In fact, some people believe that a certain degree of hyperemia may actually contribute to more efficient absorption and distribution of nutrients from the intestinal tract. If it is a sign of some abnormal irritation to the intestinal tract, such as early stages of bacterial or viral enteritis, lesions characteristic of those conditions will manifest themselves very quickly so that appropriate action for diagnosis and treatment can be made. But hyperemia of the intestinal tract, as such, does not require any control strategy as it is frequently just a normal response in a bird that could be due to a number of factors.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Inflammatory Process[29] (IP)



Score 1

HTS Definition

The presence of white-to-yellow material located underneath the skin, primarily in the region of the ventral abdomen. Also referred to as cellulitis.

0 Absence of the condition

1 Presence of white-to-yellow material underneath skin

Clinical Significance

Inflammatory response results in lost performance related to pyrexia and anorexia, as well as direct tissue damage. A significant loss is realized through condemnation of parts and carcasses at processing. The subcutaneous material is a product of the immune response to foreign material, including bacteria. The most probable bacteria implemented in IP are *Escherichia coli*, *Staphylococcus aureus* and epidermitis. The insulting bacteria are likely introduced during cutaneous trauma associated with equipment and chicken toenails (scratches).

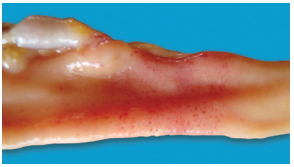
Control Strategies

The prevalence of scratches has been most closely linked to the incidence of IP. Care should be used to limit bird crowding, especially during older ages. Limited feeder and water space will become problematic as the birds reach mature size. This can lead to climbing and piling activity to compete for limited space. These actions are exaggerated by restricted feeding and/or water and feed outages. Both light intensity and light restriction influence bird activity and should be considered with feeding schedules. Management should give consideration to activities inside and outside the house which will result in bird climbing and piling. The management of equipment surfaces and equipment heights should attempt to reduce the incidence of traumatic insults to the birds.

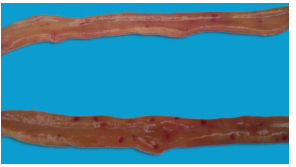
Contents | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

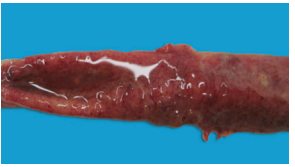
Intestinal Hemorrhage[30] (IH)



Score 1



Score 2



Score 3

HTS Definition

Intestinal hemorrhage describes the escape of blood from the vascular system of the intestinal tract into the surrounding tissue. This can be observed from either the serosal surface or the mucosal surface of the intestinal tract, and the lesion is described very basically in terms of the extent or size of the lesion. As opposed to hyperemia, which has very diffuse borders, hemorrhage typically has borders of relatively sharp contrast.

0 Normal intestine with no hemorrhage

1 Petechial Hemorrhage: Very small "pinpoint" hemorrhage, often multifocal. This is typically seen with *Eimeria maxima*, and can be seen with *Eimeria necatrix*. Other causes that must be differentiated from coccidial lesions would include damage caused by roundworms and tapeworms, and bacterial or viral enteritis. Multifocal petechial hemorrhage can be in a very limited area or more diffuse in nature, but close examination reveals a very well-defined border to each small point of hemorrhage.

2 Echymotic Hemorrhage: Larger than a pinpoint hemorrhage up to about the size of a marble. Causes may vary from agonal hemorrhage (that which occurs as the bird is dying from euthanasia) to more serious concerns such as enteritis of various etiologies. While larger than petechial hemorrhage, the borders of this particular hemorrhage are still very well-defined.

(continued on next page)

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Intestinal Hemorrhage (IH) *cont.*

3 Diffuse Hemorrhage: Widespread hemorrhage, larger than echymotic hemorrhage, but again with reasonably well-defined borders (as opposed to hyperemia, which tends to not have well-defined borders). Diffuse hemorrhage results in "angry-looking" intestinal tracts, which may be an indication of serious pathology in progress (enteritis) and potentially significant losses in performance. Potential causes would include (but not be limited to): enteritis, and intussusception (a folding over of the intestinal tract onto itself, cutting off the blood supply). Diffuse hemorrhage can be rather spread out but should still have rather distinctive borders. This is the most difficult form of hemorrhage to differentiate from hyperemia, and because of the difference in terms of impact on performance of the flock, it is very important to be able to tell the difference based on gross appearance.

Clinical Significance

Almost always a sign of significant concern, it is of utmost importance when seeing hemorrhage in the intestinal tract to characterize the nature of the hemorrhage, and to try to understand the cause. As noted above, the causes are many, and some are more serious than others. Petechial and echymotic hemorrhage are relatively easy to diagnose, but diffuse hemorrhage can be difficult at times to differentiate from hyperemia, which is of far less concern. With regard to clinical significance, the hemorrhage is not so much of concern as the cause to which it points.

Control Strategies

Determine the initial cause and address that issue. Petechial hemorrhage may be the result of coccidia, roundworms, tapeworms, or early stages of bacterial or viral enteritis. Echymotic hemorrhage may be the result of numerous causes, ranging from agonal hemorrhage (considered to be made worse as a result of capillary fragility caused by mycotoxins) to various causes of enteritis. And diffuse hemorrhage may be caused by anything from the physical trauma of intussusception (caused by some irritation of the GI tract) to various causes of enteritis.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

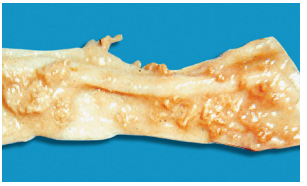
Intestinal Integrity-Broilers[12] (I[2])



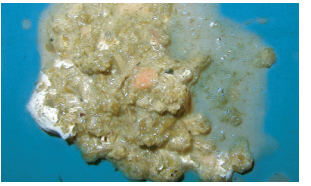
Feed passage



Wet litter



Thin, watery intestine



Diarrhea

HTS Definition

Evaluation of the intestinal tract for evidence of inflammation that would result in performance loss. Cumulative assessment of all enteric categories. Score range from 0-100 based on a weighted average of all intestinal parameters, with the most weight given to coccidiosis prevention. A score of 100 is considered perfect. Score decreases based on degree of loss of Intestinal Integrity.

Clinical Significance

As Intestinal Integrity deteriorates, the ability to digest and absorb nutrients decreases. In addition, the expenditure of protein for cellular repair and inflammatory response, as well as protein loss to the alimentary tract through secretion, diminishes its availability for muscle growth.

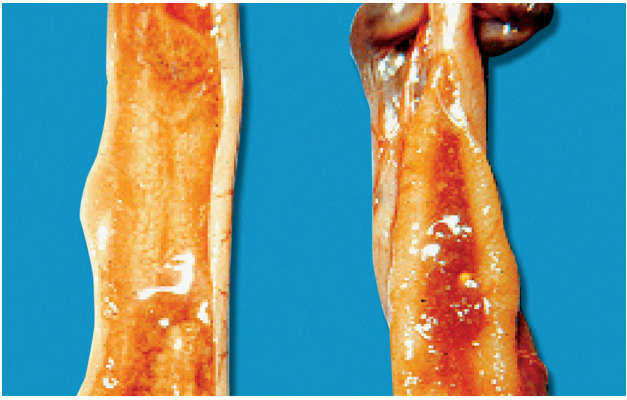
Control Strategies

Individual control strategies are discussed under the specific clinical sign. In general, preventing coccidiosis, maintaining high-quality feed ingredients free of toxins, managing the GI microflora, providing good air quality and reducing preventable stressors will help ensure good Intestinal Integrity.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Intestinal Tone[12] (IT)



Score 1

HTS Definition

Loss of folding and muscular function of the intestine upon opening. Tensile strength may be affected. It is very important to evaluate this lesion in fresh dead birds. Birds that have been dead for a period of time will lose intestinal tone very quickly.

0 Absence of the condition

1 Loss of folding and muscular function of the intestine

Clinical Significance

Optimal digestion and absorption requires sufficient cellular function and intestinal peristalsis. Insufficient musculature reduces digestive mixing and movement. This reduces the efficacy of the digestive tract. Further, intestinal stasis can result in ballooning associated with microflora imbalance and enteritis.

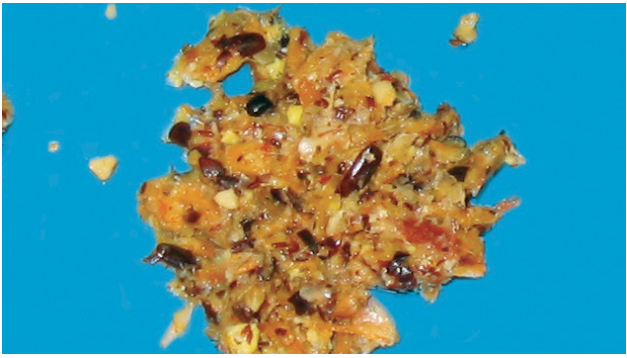
Control Strategies

A feed formulation providing particle sizes and food products that are required for intestinal cell health and integrity is a key to intestinal tone. Anticoccidials and antibiotics reduce intestinal insult and inflammation that can result in intestinal stasis and atrophy.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Litter Eater[12] (LE)



Score 1

HTS Definition

The presence of 50% or more of the gizzard contents is made up of litter. To some degree, litter eating is natural for birds. They want coarse materials in the gizzard to help the digestion of their food.

0 Presence of minimal to no litter in gizzard contents

1 Presence of 50% or more of gizzard contents is made up of litter

Clinical Significance

Excessive litter eating can be associated with enteritis. Birds consuming litter increase their pathogen exposure, miss out on a balanced nutritional ration, fail to get the medications they need and have weight suppression with resulting loss of uniformity. Gizzards may become impacted, punctured and/or ulcerated.

Control Strategies

Causes for litter eating can range from normal bird behavior to substantial enteric insult. Identification and elimination of the inciting cause will reduce—but may not eliminate—litter eating, as some birds will become "trained" and continue to peck at the litter.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Mouth Lesions[12] (ML)



Score 1

HTS Definition

The presence of any erosion, ulceration, necrosis, scabbing or proliferation of tissue in the oral cavity, at the base of the tongue or anterior portion of the esophagus.

0 Absence of the condition

1 Erosion, ulceration, necrosis, scabbing or proliferation of tissue in the oral cavity, base of tongue or anterior esophagus

Clinical Significance

Mucosal ulcerations most likely result from exposure to toxins produced by molds growing on feedstuffs more commonly known as mycotoxins. The primary molds are *Aspergillus*, *Penicillium*, *Fusarium*, *Claviceps* and *Chaetomium*. These molds use a variety of feed ingredients as substrates and can produce a multitude of toxic metabolites. Mycotoxins negatively impact all metabolic systems, such as nervous, renal, hepatic, respiratory, circulatory, reproductive, immunological and mucosal/intestinal. These mycotoxins affect production directly through tissue damage and feed-ingredient deterioration, as well as indirectly through reduced bird health and performance. Finally, mycotoxicosis is painful and at high levels can result in death and food adulteration.

Control Strategies

Mycotoxins are effectively reduced through feed-ingredient quality control. This includes all points from selection/purchase through in-house consumption. Mycotoxins can be formed or controlled in the feed pans, feed lines and feed bins, as well as in the field where grain is grown and harvested. There are various preventative strategies (GAPs) and chemical applications (inhibitors). The environmental conditions (temperature and humidity) should be closely monitored in all areas of feed handling and storage. Feed areas should be cleaned regularly and treated with appropriate antifungal agents.

© 2010 Elanco Animal Health. All rights reserved.

Necrotic Enteritis[31,32] (NE)



Score 1

HTS Definition

The diagnosis of necrotic enteritis due to *Clostridium perfringens*.

0 Small intestine is grossly normal

1 Severe extensive necrosis. Large confluent areas of full thickness mucosal necrosis of the small intestine affecting 25% or more of the small intestinal surface area and involving the entire internal circumference of the affected small bowel. The surface of these lesions is generally raised above the surrounding tissue and consists of orange/brown necrotic debris.

Clinical Significance

Clinical necrotic enteritis results in substantial intestinal erosions and can lead to marked increase in mortality. The performance and financial significance is readily recognizable. These clinical flocks will also suffer from uniformity issues due to high levels of morbidity.

Subclinical necrotic enteritis presents the larger challenge for the poultry industry. This condition develops from compromised Intestinal Integrity and reduces performance without overt signs of mortality or even morbidity.

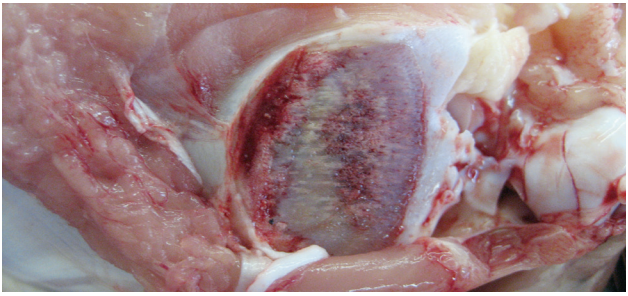
Control Strategies

Necrotic enteritis is a result of bacterial toxins produced during enteric overgrowth of *C. perfringens*. Control strategies should target the reduction of conditions that lead to overgrowth of *Clostridium* species. A program designed to reduce cycling of coccidia species is primary in control of necrotic enteritis. The cycling coccidia cause intestinal damage, which promotes growth of *Clostridium* species. Coccidia are best managed by planned anticoccidial programs. It has been shown that certain feed ingredients such as wheat and fishmeal create intestinal environments that are conducive to clostridial growth.

Clostridium species are known to be mucolytic, or use mucus as a food source and a physical protective device against other bacteria and immune recognition. A control strategy should restrict conditions that promote enteric mucus production, such as excessively coarse ingredients, cocci cycling and non-specific enteritis (dysbacteriosis).

© 2010 Elanco Animal Health. All rights reserved.

Osteomyelitis[33] (OM)



Score 1

HTS Definition

Osteomyelitis is inflammation of the bone caused by *Staphylococci*, *Escherichia coli*, *Mycoplasma avium*, or a variety of other micro-organisms. Certain forms of Osteomyelitis are caused by fungi. Bacteria may enter through damaged skin or other portals of entry, are transported in the blood and lodge in the area of fenestrated blood vessels. In this area, bacteria multiply without being disturbed by the bird's body defense mechanisms. Bones and sites most frequently involved are the proximal tibiotarsus and proximal femur. Gross lesions of Osteomyelitis in bone consist of focal yellow areas of caseous exudate or lytic areas, which cause affected bones to be fragile.

0 No gross lesions

1 Focal yellow areas of caseous exudate or lytic areas mainly in proximal tibiotarsus and proximal femur

Clinical Significance

Early clinical signs include ruffled feathers, lameness of one or both legs, drooping of one or both wings, reluctance to walk, and fever. Staphylococcal infection may frequently lead to acute death in immunocompromised birds.

Control Strategies

Any management procedure reducing damage to host defense mechanisms will help prevent Osteomyelitis. Because wounds are a portal of entry for *S. aureus* and other bacteria into the body, anything reducing the chance of injury will help prevent infection. Particular attention should be given to hatchery management and sanitation as well as the maintenance of good litter quality. *S. aureus* infection sometimes can be treated successfully, but sensitivity tests should always be performed, because antibiotic resistance is common.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Pale Legs[34] (PL)



Score 1

HTS Definition

Bilateral loss of color due to malabsorption and chronic infections. Care should be taken in evaluating this on different diets.

0 Absence of the condition

1 Bilateral loss of color

Clinical Significance

Indicator of color absorption from the diet. Color is the most difficult portion of absorption and is the most sensitive indicator of intestinal health. Variation and other pigmentation can vary with genetic lines. Pigments contained in the corn and other feed ingredients may decrease with storage age.

Control Strategies

Protection of intestinal health is the optimal goal in maintaining performance and pigmentation. Ingredient quality plays a direct and indirect role in pigmentation.

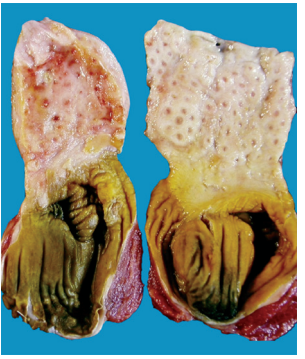
Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Proventriculitis[12] (PRV)



Normal Score 2



Score 2 opened Score 2 opened

HTS Definition

Examination for evidence of inflammation of the proventriculus.

0 Normal size and shape of the proventriculus and of the glands and mucosal surface.

1 Mild edema of the tissue with hypertrophy of the glands; may see some enlargement of the organ.

2 Marked enlargement of the proventriculus with edema of the glands and loss of normal pattern of glandular alignment; some loss of gizzard tone.

3 Severe enlargement of the proventriculus to 2X or more normal size; larger than gizzard. Glands may be lost or severely enlarged and edematous; may have erosion of the mucosal surface; gizzard will be very flaccid and small.

Clinical Significance

The exact cause has not been identified, but proventriculitis has been linked to several viruses. Clinical signs attributed to proventriculitis have been stunted growth, unthriftiness, feed passage and poor performance. Additionally, enlarged proventriculi have been linked to increased carcass contamination in the processing plant due to breakage at the proventricular junction.

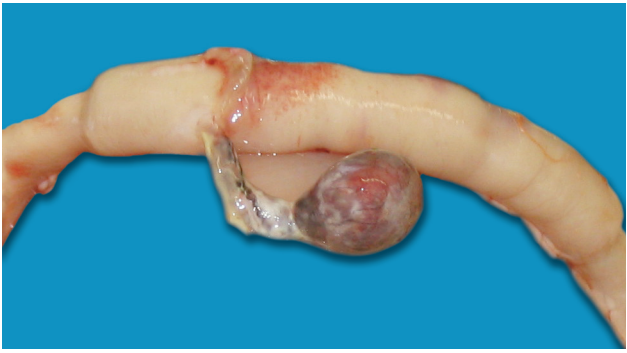
Control Strategies

There are no specific control or prevention strategies at this time.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Retained Yolk[12] (RY)



Score 1

HTS Definition

Any portion of the yolk sac that is present on Meckel's diverticulum or that is remaining in the abdominal cavity after seven days of age.

0 No remains

1 Any portion of yolk sac present on Meckel's diverticulum, or remaining in abdominal cavity after seven days of age

Clinical Significance

When due to bacterial infections associated with hatching, this can serve as a source of bacteria for other types of infections. In some severe cases, the retained yolk can also result in bird contamination at processing. Typically associated with heat and humidity issues in incubation or bacterial contamination of hatching eggs. Used as an indication of chick quality.

Control Strategies

Attention to hatchery and egg sanitation as well as temperature and humidity control in the hatchery and dehydration in the broiler house yield the best control of retained yolks.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Rickets[35] (RKT)



Score 1

HTS Definition

The folding without fracturing or slight breaking of long bones, the bending of the lower beak without fracturing, pronounced widening of the growth plate in long bones, or beading of the ribs.

0 Normal presentation of the bone

1 Folding without fracturing or slight breaking of long bones, bending of lower beak without fracture, pronounced widening of growthplate in long bones, or beading of ribs

Clinical Significance

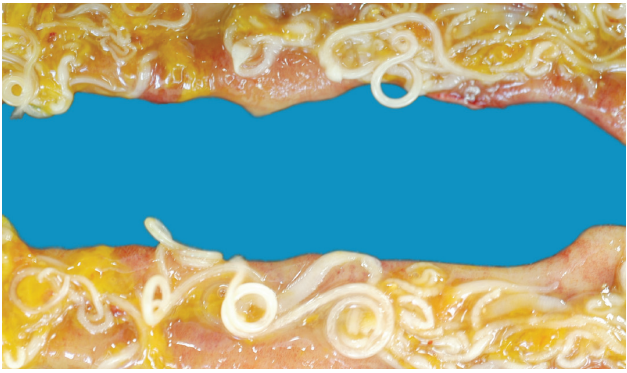
The presence of rickets may contribute to an abnormal growth rate and a potential altered gait. Abnormal skeletal growth results in poor performance. Skeletal variation can increase plant errors and reduce yield. Rickets most commonly results from relative or absolute calcium deficiencies. A relative calcium deficiency is the result of excessive phosphorous or reduced vitamin D (fat-soluble vitamin), which aids in calcium absorption. Reduced absorption can also indicate poor feed quality, altered particle size, fat source errors and a general reduction in intestinal health.

Control Strategies

Care must be taken in producing feeds with an adequate calcium and phosphorous ratio. This is particularly important when using phosphorous sparing enzymes. The metabolic level of calcium is most influenced by the feed particle size, the true available level of the formulated phosphorous and vitamin D. Special care must be taken to evaluate the interaction between all the factors influencing calcium homeostasis. Although rickets can occur at any age, the rate of bone growth is most dramatic from 4 days to 18 days of age. The incidence of rickets will be best controlled through management of feed, vitamin D, growth rate and intestinal health during this period of skeletal development.

© 2010 Elanco Animal Health. All rights reserved.

Roundworms[12] (RW)



Score 1

HTS Definition

The presence of any roundworms in the intestinal lumen.

0 Absence of parasites

1 Presence of roundworms

Clinical Significance

An infection with roundworms may cause a decrease in weight gain in birds with abundant infection. Additionally, if birds are processed with a large worm burden, it may increase the intestinal breakage in the processing plant and result in increased carcass contamination.

Control Strategies

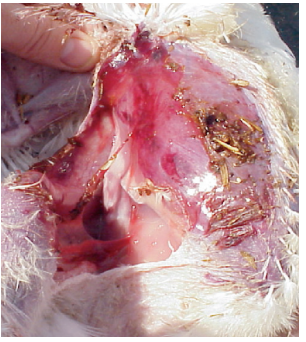
Several water-soluble products are available to treat a roundworm infection in chickens; however, most require a prescription from the treating veterinarian.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Scratches[12] (SC)





Score 1

HTS Definition

The presence of cuts or lacerations on the skin.

0 No cuts or lacerations on skin

1 Cuts or lacerations on skin

Clinical Significance

Scratches are a portal for entry of bacteria and may result in inflammatory process or gangrenous dermatitis. Scratches may indicate competition at the feeder or drinker lines, or heightened activity within a flock. Downgrades and increased mortality are often sequelae.

Control Strategies

Ensuring constant and consistent food/water supply, managing lighting programs to minimize activity and reduction of activities that excite the birds will help reduce scratches. Toenail removal for larger birds may be beneficial.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Swollen Head[12] (SH)



Swollen head

HTS Definition

Swelling of the peri- and infra-orbital sinuses, generally appearing as a "swollen head." In live chickens also observe depression, torticollis and cerebral disorientation.

0 No clinical signs

1 Swelling of peri- and infra-orbital sinuses

Clinical Significance

Swollen head may have a variety of causes. Physical trauma from inappropriately adjusted feeder slots, bronchitis, mycoplasma, coryza, cholera, bordetellosis and pox are the most common causes, but others are possible. Depression, blindness and disorientation result in poor feed intake and loss of uniformity.

Control Strategies

Disease control strategies have greatly reduced the incidence of swollen head. Most often it is seen in an individual flock and the specific cause should be identified and eliminated.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Swollen Hock[36,37,38] (HK)



Score 1

HTS Definition

Presence of swelling signs at the hock joint.

0 Normal

1 Swollen hock

Clinical Significance

Several factors can induce swollen hock in chickens. This condition can be the result of physical stress on the intertarsal joint of growing heavy broilers, which frequently can result in rupture of the gastrocnemius or peroneous tendons. Clinical signs are described as swelling and red to green discoloration at the affected area. Viral infections with reovirus (Tenosynovitis) and Marek's disease virus (MDV) also can induce swollen hock. In addition, bacterial infections such as *Mycoplasma synoviae* (infectious synovitis), *Streptococcus*, *Staphylococcus*, *Enterococcus*, *Pasteurella*, *Erysipelas* and others can result in swollen hocks, and the condition is commonly known as bacterial arthritis. Swollen hock can be characterized by tenderness, warm to the touch at the affected area and fluid accumulation. The fluid could be clear, bloody or yellow pus, depending on the degree of infection. In chronic cases the affected tendon has fibrosis and less inflammatory exudates. Other non-infectious factors (such as nutritional disease including biotin deficiency, vitamin D3 and phosphorous deficiencies) should be considered as possible causes of swollen hock.

(continued on next page)

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Swollen Hock (HK) *cont.*

Control Strategies

It is important to evaluate the situation and rule out the possible causes of swollen hocks, including viral, bacterial or non-infectious, by using history of the flock, serology test, culture, histology evaluation and/or virus isolation. If the condition is related to viral infections such as reovirus and/or MDV, proper vaccination of the birds and breeder flocks is required. If the condition is related to bacterial arthritis, then culture of the affected area will give the indication of the most common isolated bacteria and treatment can be performed. If *Mycoplasma synoviae* is the primary cause in broilers, then evaluation at the breeder flock is essential so corrective measurements can be taken. If swollen hock is not related to infectious conditions, then evaluation of the feed formula should be performed.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Tapeworms[12] (TW)



Score 1

HTS Definition

The presence of any tapeworms within the intestinal lumen.

0 Absence of parasites

1 Tapeworms within intestinal lumen

Clinical Significance

Survival of the bird is rarely threatened with even the most severe cases of tapeworms. They do, however, contribute to inefficiency of production by absorbing nutrients that would otherwise be available to the birds and by physical damage, which occurs in the lining of the intestine at each location where the tapeworm attaches to the wall by mechanical means. Those attachments result in petechial hemorrhage in the wall of the intestine that can be mistaken grossly for *E. maxima*, particularly when observed from the outside of the intestinal wall. As tapeworms are usually picked up by birds that have been eating litter beetles, the presence of tapeworms is generally considered an indication that the bird has been diverting time and energy from eating balanced nutritional rations at the feeders to eating insects from the litter.

Control Strategies

Control strategies for tapeworms are generally directed toward the next flock in the house, following identification of the problem. There is little that you can do to cost effectively treat the existing problem, so attention is generally directed toward control of the intermediate host, or litter beetle, while the farm is between flocks.

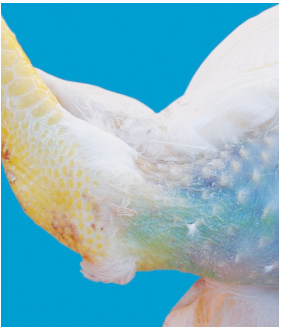
Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Tenosynovitis[39] (TN)



Score 0 Right: Score 1



Score 1

HTS Definition

Unilateral or bilateral swelling of the tendons of the shank and above the hock. Rupture of the gastrocnemius tendon might be associated with it; includes swollen joints.

0 Normal joint

1 Unilateral or bilateral swelling of shank tendons above the hock

Clinical Significance

Tenosynovitis is reported in the literature to be caused by a reovirus. It causes the lesions described above, such as swelling of the tendons, occasional rupture of the gastrocnemius tendon (right photo), excessive joint fluid, lameness, gizzard myopathies and malabsorption syndrome. The disease can be costly in terms of lost performance as well as downgrades for bad legs at the processing plant. Malabsorption syndrome is often seen in conjunction with tenosynovitis and can have a tremendous impact on performance resulting in smaller, stunted birds in a house with very poor feather conditions (bent feather shafts contribute to this disease sometimes being called “helicopter disease”). There are other situations that can cause lesions very similar to viral tenosynovitis, and it is important to verify the gross diagnosis by other means to be certain that reovirus is the cause.

Control Strategies

Birds are most susceptible to reovirus infections during the first week of life. The most effective means of control is to provide the breeders with very high levels of protection by vaccination programs, and therefore protect their progeny via maternal antibody protection. This disease is usually seen when poorly designed vaccination programs are utilized by breeders, or certain flocks have been missed with regard to their reovirus vaccination.

© 2010 Elanco Animal Health. All rights reserved.

Thick Intestines[12] (TK)



Score 1

HTS Definition

This lesion refers to a marked thickening of the epithelial layer of the intestinal tract. With this lesion you may also have evidence of gross inflammatory changes including hyperemia, lymphocytic infiltration or hypertrophy of Peyer's patches.

0 Normal intestine

1 Marked thickening of epithelial layer of intestinal tract

Clinical Significance

Thickening of the intestine occurs as a result of a bird's natural immune response to an inflammatory agent or physical damage. The normal tissue of the intestinal epithelium is infiltrated with cellular components of the bird's immune system in an effort to keep the intestinal tract healthy. Thickening of the intestine is an indication that something has happened to call the bird's defense system into play, resulting in decreased efficiency as proteins that are important for growth have been diverted to protection and immune response. Thickening of the intestinal wall with cellular infiltrates may also interfere with the physical efficiency of absorption of nutrients across the epithelium of the intestinal tract, adding to the loss of performance.

Control Strategies

Thickening of the intestinal tract is actually a normal response to threats imposed on the health of the intestine. Such a response is designed to keep the bird alive, although at the expense of efficient conversion of nutrients to proteins required for growth. Rather than attempting to control the thickness of the intestinal tract, which is a normal bird response, attention should be given to controlling the inciting cause of the immune response that is calling for this cellular infiltration. The inciting cause may be excessive coccidiosis, bacterial enteritis, or even physical trauma caused by toxins or certain dietary factors such as coarse or abrasive feed ingredients.

© 2010 Elanco Animal Health. All rights reserved.

Thin Intestines[12] (TH)



Score 1

HTS Definition

Marked loss of entire intestinal wall thickness. Intestine may be friable and transparent prior to opening.

0 No gross lesions

1 Marked loss of entire intestinal wall thickness

Clinical Significance

The loss of the mucosal surface, including the villi, results in substantial reduction in absorptive surface and removes the protective capacity of the mucus layer. Continuing degradation results in submucosal/stromal loss and friable intestines, which are easily torn during processing. Substantial fluid and protein loss may occur and is often noted by very watery contents.

Control Strategies

Thin intestines most often occur as the result of viral, bacterial or protozoal insult. Provide intervention or control strategies to reduce introduction or maintenance of pathogenic organisms. Maintaining a vigorous immune system through quality vaccination programs reduces the impact of viral organisms. Protozoal organisms such as coccidiosis can be controlled using various products. Bacterial organisms are generally secondary invaders and often respond well to therapeutic treatment as well as preventative intervention with antibiotics.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Thymus[40] (THY)



Score 0



Score 1

HTS Definition

Thymus is a primary immunologic organ that arises from epithelial cells of the third and fourth pharyngeal pouch during embryogenesis. It consists of 7 irregularly shaped lobes located along each side of the neck close to the jugular vein.

0 No change (reduction) in size

1 Marked atrophy of thymus size

Clinical Significance

In young birds the thymus is active and produces mature T-cells until sexual maturation. It provides an environment for differentiation of stem cells to T-lymphocytes, and thymic processing takes place with the purpose of T-cell selection prior to travel via bloodstream to the secondary lymphoid tissues. Its maximum size is reached at 16 weeks of age, and it regresses at sexual maturity. Atrophy of the thymus may indicate the bird is in a state of immunosuppression. Thymus size can be affected by many factors such as stress, malnutrition, mycotoxins and infectious agents (Chicken Infectious Anemia Virus-CIAV, Marek's Disease Virus-MDV, Runting Stunting Syndrome-RSS, etc.)

Control Strategies

Minimize environmental, nutritional and infectious factors that can diminish thymus activity and function. An adequate vaccination program should be performed to breeders and progeny for the protection against common infectious agents (especially CIAV in breeders).

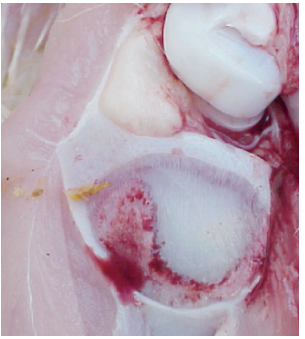
Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Tibial Dyschondroplasia[41] (TDS)



Score 0



Right: Score 2

Score 2

HTS Definition

The lesion of TDS is typically evaluated by making a cut through the bone on the medial side of the proximal end of the tibiotarsal bone. The growth plate is then evaluated. There are other locations to observe this lesion, but this is one of the most frequently used.

0 Normal. Growth plate is normal in thickness all the way across the cut, and it is uniform in thickness from one end of the cut to the other.

1 Mild TDS. Slight increase in thickness from normal on the anterior edge to 3 to 4 times the normal thickness of the growth plate on the posterior edge.

2 Moderate TDS. Greater than 3 to 4 times the normal thickness of the growth plate, but still roughly one-third of the length of the growth plate (usually the anterior portion) being normal thickness.

3 Severe TDS. Little or no normal growth plate left. Cartilaginous plug extends down the shaft of the bone and may have an area of central necrosis as the blood supply has a difficult time penetrating this tissue with oxygen and nutrients.

Clinical Significance

Most losses associated with TDS are the result of reluctance or inability to move. This can result in increased scratches, inflammatory process or Gangrenous Dermatitis. In severe cases, fractures can occur resulting in trims at the plant and carcass downgrades. Generally found in the fastest-growing birds in the house.

Control Strategies

Genetics, calcium:phosphorus ratio and chloride ion balance are all considered important control points for TDS.

© 2010 Elanco Animal Health. All rights reserved.

Time in Box/Transportation (BOX)



Time in box/transportation

HTS Definition

Record how many minutes (0 to 300) have elapsed between the time the birds were picked up from the farm and were necropsied.

Clinical Significance

Keeping birds in less-than-ideal housing conditions and off feed and water for too long can result in misleading clinical findings.

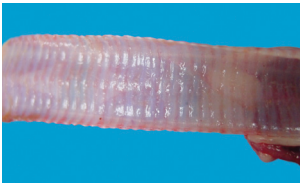
Control Strategies

The period of time between pickup from the farm and necropsy should be kept to a minimum. Ensure that birds are kept comfortable and as close to their thermo-neutral zone as possible. Accommodations for feed and water should be made if the period of time between pick up and necropsy are expected to be greater than 4 hours.

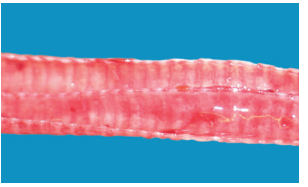
Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

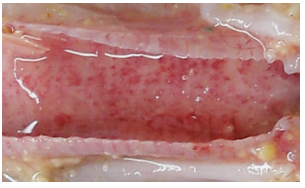
Tracheitis[12] (TRA)



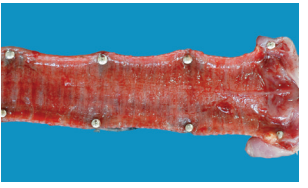
Score 0



Score 1



Score 2



Score 3

HTS Definition

The gross appearance of the trachea may be a reflection of the bird's exposure to respiratory disease or an indication of the air quality (ammonia, dust, etc.) in the poultry house.

0 Indicates normal trachea. Pearly white color on the mucosal surface of the trachea with no sign of excessive exudate.

1 Indicates mild tracheitis. Slight rosy color to mucosal surface of trachea due to petechial hemorrhage in the wall of the upper one-third of the trachea.

2 Indicates moderate tracheitis. Similar to a lesion score of 1 but extending farther down the trachea. May be some excess mucus present in the lumen of the trachea.

3 Indicates severe tracheitis. Similar to lesion score of 2, but necrotic debris and/or blood accumulates in the lumen of the trachea resulting in obvious physical restriction of the airflow through the trachea. Be careful not to confuse with blood that may have been inhaled as the bird was euthanized for postmortem evaluation.

(continued on next page)

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Tracheitis (TRA) *cont.*

Clinical Significance

A healthy trachea is critically important to the health of the bird. The normal lining of the trachea is composed of ciliated epithelial cells. These cilia, or hair-like projections, are important because they help to sweep dust and debris containing bacteria and viruses out of the respiratory tract, to a point where the bird can swallow them to get rid of the potential threat. When damaged, the trachea loses this protective mechanism resulting in a bird that is more susceptible to viral and bacterial disease. While mild damage to the trachea results in increased susceptibility to disease, more severe damage may be a reflection of direct pathology on the trachea. Specific diseases of the respiratory tract can be difficult to differentiate based on gross lesions. Mild to moderate lesions may be noted on everything from high levels of ammonia to diseases such as Infectious Bronchitis, Laryngotracheitis, Newcastle Disease or even Avian Influenza. If widespread tracheitis is noted, additional diagnostic tests may be required to determine the actual cause.

Control Strategies

The most common cause of tracheitis, and the one factor over which we have most immediate and direct control, is air quality. Air quality should always be of utmost importance because it can lead to various other respiratory problems, and good air quality can help to minimize problems from other disease conditions. One should keep in mind, however, that almost all of the respiratory conditions, which cause us great concern, could appear early on as tracheitis. If the tracheitis is serious (lesion scores of 2 or 3) or widespread, additional diagnostic tests should be considered to determine the specific cause.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

References

[1] Calnek, W., Barnes, H., Beard, C. et al.1997. "Respiratory Tract Infection." Diseases of Poultry 10th ed.: 134-135.

[2] Roche, A., Buhr, R. 2008. "Contaminated larval and adult darkling beetles can serve as vectors in transmission of Salmonella Typhimurium in a broiler flock." International Poultry Scientific Forum, Southern Poultry Science Society/Southern Conference on Avian Diseases. Universiy of Georgia, Poultry Microbioligical Safety Research Unit, Russell Research Center, Athens, GA.

[3] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Ammonia Burn." Diseases of Poultry 10th ed.: 939.

[4] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Ascites." Diseases of Poultry 10th ed.: 926-929.

[5] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Aspergillosis." Diseases of Poultry 10th ed.: 351-360.

[6] Dec. 2008. "Broiler Foot Health—Controlling Food Pad Dermatitis." Ross Tech Notes.

[7] Bursa meter leaflet. Solvay Animal Health Inc.

[8] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Enteric Disease Complex." Diseases of Poultry 10th ed.: 721-738.

[9] 2006. Avian Disease Manual 6th ed. American Association of Avian Pathologists: 50-51.

[10] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Diseases of the Circulatory System." Diseases of Poultry 10th ed.: 925.

[11] Louvard, D., Kedinger, M. and Hauri, H. 1992. "The Differentiating Intestinal Epithelial Cell: Establishment and Maintenance of Functions Through Interactions Between Cellular Structures." Annu. Rev. Cell Biol. 8: 157-195.

[12] 2006. Broiler Disease Reference Guide. Health Tracking System (HTS), Elanco Animal Health.

[13] Calnek, W., Barnes, H., Beard, C. et al. 1997. Diseases of Poultry 10th ed.: 361-362.

[14] Van der Sluis, W. 2003. "Culling birds quickly and humanely." World Poultry 19.11.

[15] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Osteochondrosis." Diseases of Poultry 10th ed.: 920-922.

[16] Calnek, W., Barnes, H., Beard, C. et al. 1997. Diseases of Poultry 10th ed.: 868.

[17] Reid, W. and Johnson, J. 1970. "Pathogenicity of *Eimeria acervulina* in Light and Heavy Coccidial Infections." Avian Diseases 14.1: 166-171.

[18] Levine, N. 1973. "Protozoan Parasites of Domestic Animals and of Man." Burgess Publishing Company, Minneapolis, MN: 201-203.

[19] Long, P. and Reid, W. 1982. "A guide for the diagnosis of coccidiosis in chickens, Research Report 404." Univ. of Georgia College of Agriculture Experiment Stations.

[20] Calnek, W., Barnes, H., Beard, C. et al. 1997. Diseases of Poultry 10th ed.: 869-870.

[21] Rose, M. and Long, P. 1962. "Immunity to four species of *Eimeria* in fowls." Immunol. 5.79: 79-92.

[22] Levine, N. 1973. "Protozoan Parasites of Domestic Animals and of Man." Burgess Publishing Company, Minneapolis, MN: 205-206.

[23] Novilla, M., Jeffers, T. et al. 1987. "A Redescription of the Life Cycle of *Eimeria mitis* Tyzzer, 1929." J. Protozool. 34.1: 87-92.

[24] Watkins, K., Bafundo, K. and Donovan, D. 1990. "Anticoccidial Effect of Monensin Against *Eimeria mitis* and *Eimeria dispersa*." Poultry Sci. 69: 1009-1011.

(continued on next page)

© 2010 Elanco Animal Health. All rights reserved.

References *cont.*

[25] McDougald, L. 2003. "Protozoal Infections." Diseases of Poultry 11th ed. 979-980.

[26] Levine, N. 1973. "Protozoan Parasites of Domestic Animals and of Man." Burgess Publishing Company, Minneapolis, MN: 200-201.

[27] Calnek, W., Barnes, H., Beard, C. et al. 1997. Diseases of Poultry 10th ed.: 872.

[28] 1974. Dorland's Illustrated Medical Dictionary 25th ed.: 738.

[29] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Avian Cellulitis." Diseases of Poultry 10th ed.: 136-137.

[30] 1974. Dorland's Illustrated Medical Dictionary 25th ed.: 699-700.

[31] Collier, C., Van der Klis, J., Deplancke, B. et al. 2003. "Effects of Tylosin on Bacterial *Mucolysis*, *Clostridium Perfringens* Colonization, and Intestinal Barrier Function in a Chick Model of Necrotic Enteritis." Antimicrobial Agents and Chemo. 47.10: 3311-3317.

[32] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Necrotic Enteritis." Diseases of Poultry 10th ed.: 261-264.

[33] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Osteomyelitis." Diseases of Poultry 10th ed.: 920-921.

[34] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Enteric Disease Complex." Diseases of Poultry 10th ed.: 1016.

[35] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Deficiency Vitamin D." Diseases of Poultry 10th ed.: 52.

[36] 2006. Avian Disease Manual 6th ed. "Stapylococcosis." American Association of Avian Pathologists: 117-119.

[37] Calnek, W., Barnes, H., Beard, C. et al. 1997. Diseases of Poultry 10th ed.: 225.

[38] 2006. Avian Disease Manual 6th ed. "Mycoplasmosis." American Association of Avian Pathologists: 98-100.

[39] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Viral Arthritis." Diseases of Poultry 10th ed.: 711-719.

[40] Rose, M.E. 1979. "The Immune System in Birds." Journal of the Royal Society of Medicine, Volume 72: 701-705.

[41] Calnek, W., Barnes, H., Beard, C. et al. 1997. "Dyschondroplasia." Diseases of Poultry 10th ed.: 918.

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

© 2010 Elanco Animal Health. All rights reserved.

Contents — Intestinal Integrity (I2)

Cellular Sloughing (CS) 19

Excessive Bile (BL) 23

Excessive Intestinal Fluid (WC) 24

Excessive Intestinal Mucus (MC) 25

Feed Passage (FP) 26

Gizzard Erosion (GIZ) 28

Gross *Eimeria acervulina* (gAC) 30-31

Gross *Eimeria brunetti* (gBR) 32

Gross *Eimeria maxima* (gMX) 33-34

Microscopic *Eimeria maxima* (mMX) 35

Gross *Eimeria mitis* (gMI) 36

Gross *Eimeria necatrix* (gNX) 37

Gross *Eimeria tenella* (gTN) 38

Hyperemia (HY) 39-40

Intestinal Hemorrhage (IH) 42-43

Intestinal Integrity-Broilers (I^2) 44

Intestinal Tone (IT) 45

Mouth Lesions (ML) 47

Necrotic Enteritis (NE) 48

Proventriculitis (PRV) 51

Roundworms (RW) 54

Tapeworms (TW) 59

Thick Intestines (TK) 61

Thin Intestines (TH) 62

Contents **Intestinal Integrity**

Respiratory Index **Other Lesions**

Q 2010 Elanco Animal Health. All rights reserved.

Contents — Respiratory Index (RI)

Airsacculitis (ARS) 4-5

Ammonia Burns in Cornea (AB) 7

Ascites (AC) 8-9

Aspergillosis (AP) 10-11

Swollen Head (SH) 56

Tracheitis (TRA) 66-67

Contents | Intestinal Integrity

Respiratory Index | Other Lesions

Q 2010 Elanco Animal Health. All rights reserved.



Contents — Other Lesions

Alphitobius diaperinus—Darkling Beetle score (BTL)..... 6

Burned Feet (BF) 12

Bursa Measurement (BSM) 13-14

Bursal Atrophy (BUR) 15

Bursal Damage (BDM) 16-17

Cardiovascular (CDV) 18

Color (CLR) 20

Crop Mycosis (CM) 21

Cull Bird (CL) 22

Femoral Head Necrosis (FH) 27

Gross Examination for Coccidial Infections 29

Inflammatory Process (IP) 41

Litter Eater (LE) 46

Osteomyelitis (OM) 49

Pale Legs (PL) 50

Retained Yolk (RY) 52

Rickets (RKT) 53

Scratches (SC) 55

Swollen Hock (HK) 57-58

Tenosynovitis (TN) 60

Thymus (THY) 63

Tibial Dyschondroplasia (TDS) 64

Time in Box/Transportation (BOX) 65

Contents | Intestinal Integrity | Respiratory Index | Other Lesions

Q 2010 Elanco Animal Health. All rights reserved.