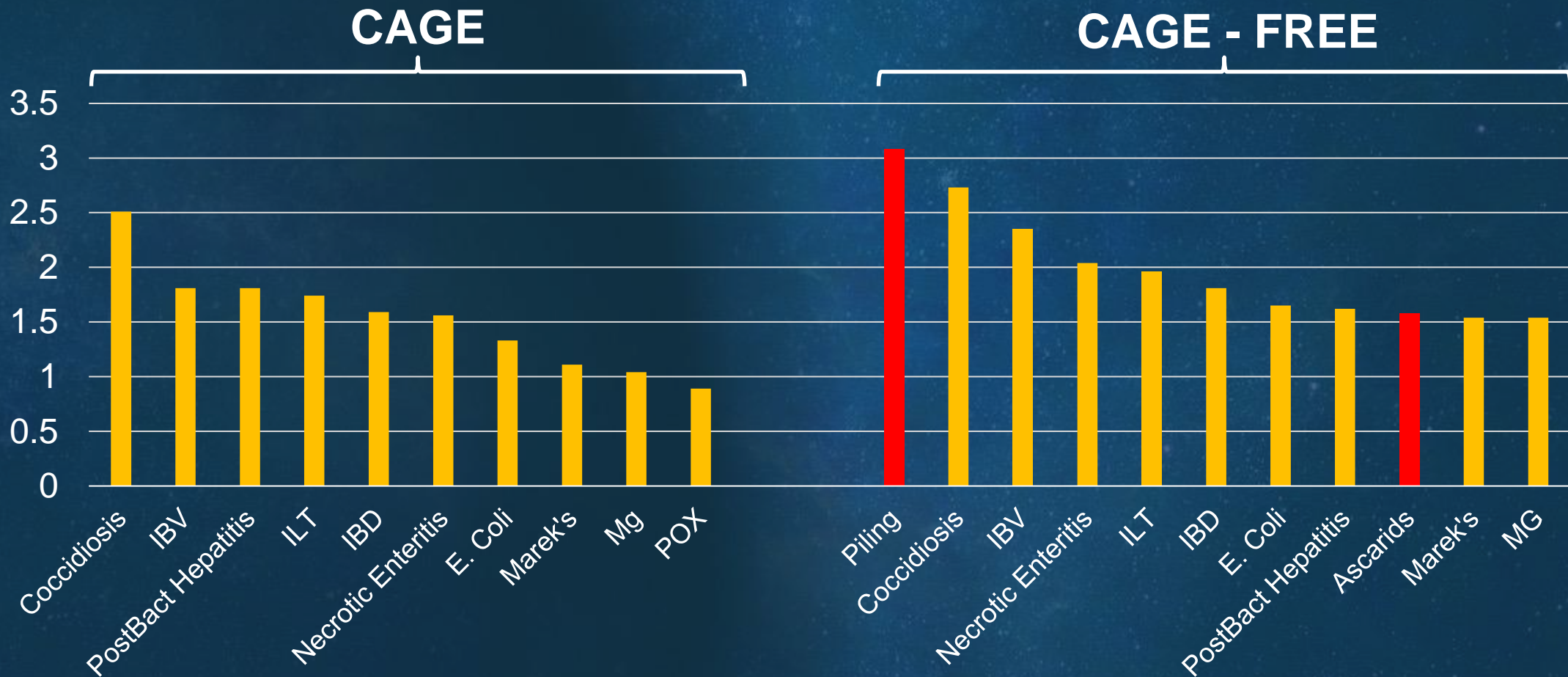
A large, realistic brown egg is the central focus, set against a dark space background with a glowing nebula on the left. Several circular cutouts of varying sizes are scattered around the egg, each containing a different image related to poultry: a brown hen, a white hen, a brown rooster, and a cracked egg. The overall theme is poultry health and management.

Health program updates in the cage free management guide

Fernando Carrasquer Puyal
DVM CEAV
Global Technical Services
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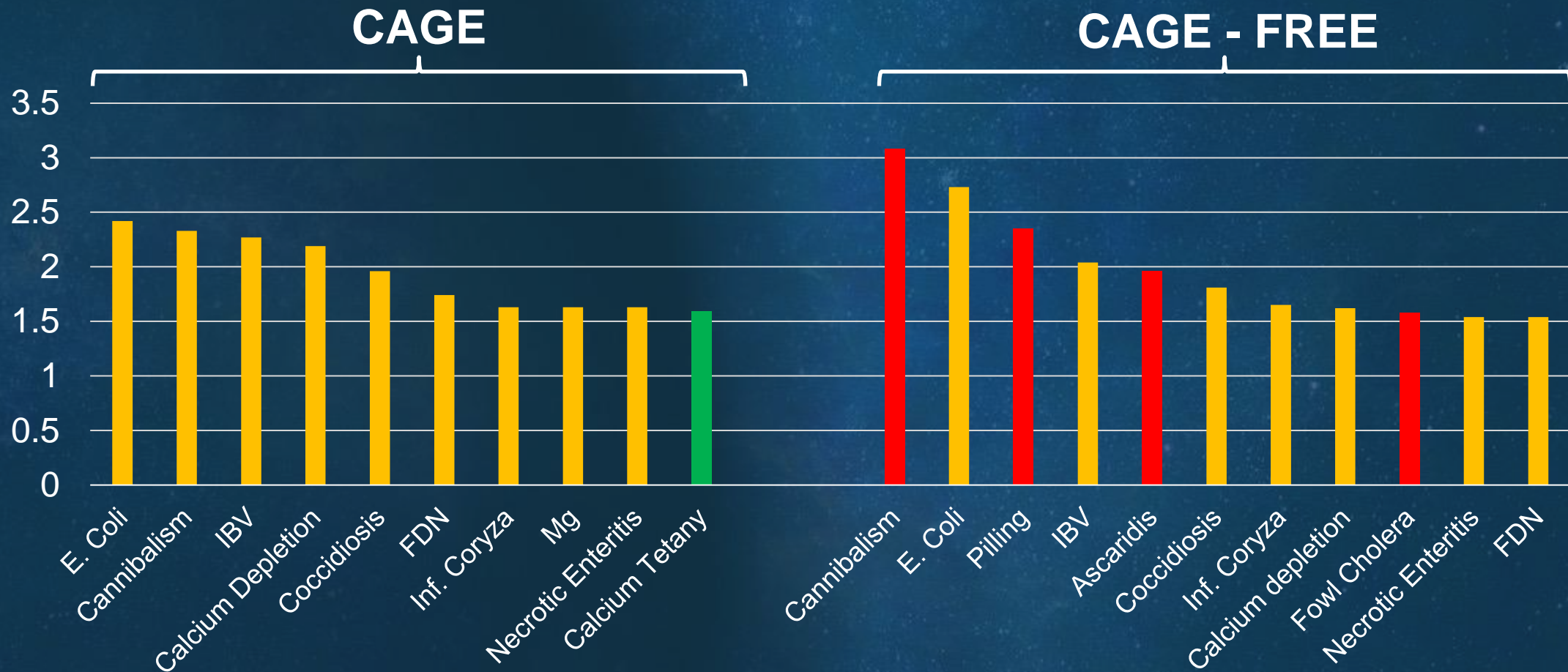
What is different about the health of cage-free birds?

2020 AVEP pullet disease Survey



What is different about the health of cage-free birds?

2020 AVEP layer disease Survey



What will you find in the health and biosecurity chapter?

Biosecurity

- ▶ We keep thinking that biosecurity comes first (also in cage free).
- ▶ 5 full pages for basic biosecurity rules

HEALTH & BIOSECURITY

BIOSECURITY PROGRAM

A biosecurity program is a set of measures taken to prevent and control the introduction and spread of disease on a farm. Biosecurity programs are designed to prevent the introduction and spread of disease on a farm. Biosecurity programs are designed to prevent the introduction and spread of disease on a farm.

BIOSECURITY TYPES

Conceptual Biosecurity

This is the biosecurity related to the farm design and location of the farm and its surroundings.

Structural Biosecurity

This is the biosecurity related to the physical structures used at the farm to prevent the introduction or spread of disease.

Operational Biosecurity

This is the biosecurity related to how work on the farm should be done to prevent the introduction or spread of disease.

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HEALTH & BIOSECURITY

BIOSECURITY PROGRAM – STEP 1

ISOLATION

This includes all measures taken to prevent the introduction of pathogens by visitors or material entering the farm.

Some basic rules:

- Only allowed visitors with a clear purpose should be permitted. All visitors should be considered as a risk for the flock.
- A signpost should be available for visitors. All visitors must fill in their names, date of visit, purpose of visit, last visited farm and which flock number.
- Visitor clothing must be available for staff and visitors.

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HEALTH & BIOSECURITY

BIOSECURITY PROGRAM – STEP 2

PEST CONTROL

This includes all measures taken to prevent the introduction and spread of pathogens by vermin (eg, rodents and birds) and insects.

Active measures:

- Check the flock health status will be severely impacted if the absence of biosecurity of any animals.
- Keep the perimeter around the house free of grass and other organic material.
- Remove any spilled feed.

BIOSECURITY PROGRAM – STEP 3

STAFF TRAINING

This includes all measures taken to ensure workers to do their job properly and observe biosecurity regulations.

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HEALTH & BIOSECURITY

BIOSECURITY PROGRAM – STEP 4

FEED & WATER

This includes all measures taken to avoid the introduction and spread of pathogens by water and feed.

Water:

- Quality of raw materials and hygiene measures at the farm are vital to produce pathogen free feed.
- It is very important to exclude other birds from entering feed trucks and avoid spillage as well as contamination after feed distribution.

BIOSECURITY PROGRAM – STEP 5

WASTE DISPOSAL

This includes all measures to prevent the introduction of pathogens during waste removal.

Waste:

- Waste should be removed and disposed of at least 3 km away from the site. Make sure that no other farms dispose of their manure within a 3 km radius of your farm.
- Only permit transport of dead birds to external facilities.
- Never have personal contact with people handling dead birds.

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HEALTH & BIOSECURITY

BIOSECURITY PROGRAM – STEP 6

CLEANING & DISINFESTATION PROTOCOL

This includes all measures to prevent the introduction of vertically transmitted pathogens.

Chemical disinfectant	Myxomatosis	Avian Flu	Salmonella	Respiratory Syncytial Virus	Parvovirus	Chlamydia	Chloramphenicol
Alcohol	++	++	++	++	++	++	Effectively reduced by organic material, soap and hot water. Ineffective.
Alkaline	++	++	++	++	++	++	Corrosive, irritative.
Organic acids	++	++	++	++	++	++	pH dependent, inactivated by soap, organic material, soap and hot water.
Chlorine Compounds	++	++	++	++	++	++	Resistant to sunlight and soap, corrosive, irritative.
Quaternary Ammonium Compounds	++	++	++	++	++	++	Ineffective.
Quaternary Ammonium Compounds	++	++	++	++	++	++	Inactivated by organic material, soap and hot water.

BIOSECURITY PROGRAM – STEP 7

PULLET REPLACEMENT

This includes all measures to prevent the introduction of vertically transmitted pathogens.

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HEALTH & BIOSECURITY

VACCINATION PROGRAMS

Specific recommendations for individual farms are not possible, but the sample vaccination program table 32 is intended as a very general guideline for vaccination which are needed on most farms worldwide.

Table 32: Vaccination program

Weeks	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
MD/CD																	
IBV																	
ND																	
CD																	
IBD																	
AI																	
MD/CD																	
IBV																	
ND																	
CD																	
IBD																	
AI																	
MD/CD																	
IBV																	
ND																	
CD																	
IBD																	
AI																	

MD - Marek's disease
CD - Chlamydia
IBV - Infectious bronchitis virus
ND - Newcastle disease
CD - Chlamydia
IBD - Infectious bursal disease
AI - Avian influenza
MD/CD - Marek's disease and Chlamydia
IBV - Infectious bronchitis virus
ND - Newcastle disease
CD - Chlamydia
IBD - Infectious bursal disease
AI - Avian influenza

HEALTH & BIOSECURITY

ADMINISTERING VACCINES IN PRACTICE

Administering the vaccine in practice is just as important as the vaccine program design. All the involved is simply following a procedure that is clearly defined by the vaccine manufacturer, however, mistakes are still often made. To avoid errors, check and audit these procedures regularly. Proper vaccination is essential for a good health status.

Transport and Storage

- Only accept vaccine in good condition.
- Place in the cold chain at all times.
- Never freeze vaccine.
- Never expose to sunlight.
- Store vaccine correctly and check it regularly.

Reconstitution

- Follow manufacturer's instructions carefully when administering.
- Avoid contact with disinfectants during the reconstitution process.
- Use the vaccine immediately after.

Administering

- Use the appropriate technique to administer each vaccine.
- Vaccinate only healthy chicks.
- Do not dilute or "top" the vaccine.
- Avoid contact with disinfectant when administering vaccine.
- Avoid using medication and antibiotics for three days preceding and one week after live vaccine vaccination.

Mass Administration

Drinking Water

- Most common vaccine.
- Assure the absence of chlorine or other disinfectant in the drinking water.
- A previous water pre-treatment can assure that all birds are thirsty.
- Use dye in the drinking water for monitoring.
- Assure that water is consumed within 2 hours.

Individual Administration

Eye Drop

- Used for respiratory disease vaccines.
- Use dye in order to assess the efficiency of the application.
- Trained and committed crew and a well-organized program of work is essential.
- Trained and committed crew along with well-organized program of work is essential.

Injection

- Used for inactivated vaccines and certain live vaccines.
- Injection can be subcutaneous or intramuscular depending on the vaccine.
- Equipment should be correctly maintained.
- Trained and committed crew along with well-organized program of work is essential.
- Check vaccine reaction 7 days after administration in the case of the vaccine. More than 90 % of chicks should be positive.

Vaccines

- We keep thinking that vaccines play a key role in birds health.
- 1 full page for basics on adapted vaccine programs.
- 1 full page for basics on vaccines administration.
- Half a page for basics on vaccine monitoring

HEALTH & BIOSECURITY

VACCINE MONITORING

Serological data obtained after the bulk of the vaccination program is completed, normally by 10 to 16 weeks of age is a good method for evaluating the immediate status of a flock of pullets prior to production. Such data also serve as an immune status baseline for determining whether a field infection has occurred when production drops are observed. It is recommended that the flock owner submit 25 good serum samples to a laboratory one or two weeks prior to the pullets being placed in the laying house to establish freedom from certain diseases such as *Marek's disease*, *Chlamydia*, *DNAI* and *Mycoplasma synoviae* (MS) prior to onset of production.

Table 33: Serological monitoring

Disease	ND	IB	AviPV	EDC	AE	MG	MS	ED
Technique	ELISA, HI	ELISA, HI	ELISA	ELISA	ELISA	ELISA, PMA	ELISA, PMA	ELISA
Week	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25, 45, 65, 85

COCCIDIA

Coccidiosis is a disease caused by protozoan species of the genus *Eimeria*. There are species-specific and those affecting parts of the intestine. The severity of the disease produced depends on the species and the degree of infection. In some cases, the birds will die, while in others the birds will be stressed in their growth and are likely to have complications with necrotic enteritis.

In long-lived birds, control is based on the establishment of immunity against each of the *Eimeria* species. Cross immunity is very poor and does not provide good protection. For the species, coccidiosis programmes can be used as long as they allow partial cycling of the protozoa. In this way, immunity is reduced but immunity can be developed if there is a challenge during rearing. Another option and more effective option is the use of vaccines. These are usually given in the first few days of life and must be repeated several times in the birds to produce a long-lasting and robust immunity. For this, not only the application but also the management of the birds in these early weeks must be well managed. This is different depending on the type of vaccine used (attenuated or non-attenuated).



Internal parasites

- Internal parasite control is key in cage-free production as the birds are in contact with the litter.
- 1 full page for basics on worm's control.
- Half a page for basics on coccidia control.

HEALTH & BIOSECURITY

VACCINE MONITORING

Serological data obtained after the bulk of the vaccination program is completed, normally by 15 or 16 weeks of age is a good method for evaluating the immune status of a flock of pullets prior to production. Such data also serves as an immune status baseline for determining whether a field infection has occurred when production drops

are observed. It is recommended that the flock owner submits 25 good serum samples to a laboratory one or two weeks prior to the pullets being placed in the laying house to establish freedom from certain diseases such as *Mycoplasma gallisepticum* (MG) and *Mycoplasma synoviae* (MS) prior to onset of production.

Serological data can give valuable information on the immune that levels for a number of disease-causing agents. Working with a poultry laboratory to set up a profiling system will make better evaluations of vaccination programs and flock conditions possible.

Table 33: Serological monitoring

Disease	ND	IB	AmpV	EDS	AE	MG	MS	IBD
Technique	ELISA, HI	ELISA, HI	ELISA	ELISA	ELISA	ELISA, PRA	ELISA, PRA	ELISA
Week	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25, 45, 65, 85	15, 25	1, 15, 25, 45, 65, 85	1, 15, 25, 45, 65, 85	1

COCCIDIA

Coccidiosis is a disease caused by protozoan species of the genus *Eimeria*. They are species-specific and those affecting hens replicate in different parts of the intestine. The severity of the disease produced depends on the species and the degree of infestation. In some cases, the bird will die, while in others the bird will be stunted in their growth and are likely to have complications with necrotic enteritis.

In long-lived birds, control is based on the establishment of immunity against each of the *Eimeria* species. Cross immunity is very poor and does not provide good protection. For this purpose, coccidiostat programmes can be used as long as they allow partial cycling of the protozoa. In this way, lesions are reduced but immunity can be developed if there is a challenge during rearing. Another simpler and more effective option is the use

of vaccines. These are usually given in the first few days of life and must be cycled several times in the birds to produce a long-lasting and robust immunity. For this, not only their application but also the management of the birds in these early weeks must be well managed. This is different depending on the type of vaccine used (attenuated or non-attenuated).

Lesion location in the gut for main *Eimeria* species in chickens



HEALTH & BIOSECURITY

INTERNAL PARASITES

Internal parasites are a common finding in birds in free-range systems but may also be present when birds do not have access to outdoor parts.

They cause a reduction in nutrient absorption by the birds. Depending on the level of infestation this can lead to a deterioration in bird body condition, decrease in production, egg quality and even promote cannibalism and mortality.

They usually cycle outside the birds' gut which may be direct or have another intermediate host. Different species also colonize different parts of the intestine or other parts of the birds' body.

Since it is very difficult to avoid contact with these parasites, especially in free-range, a population control programme should be applied to avoid heavy infestations that cause damage to the birds.

In those parasites that have cycles with an intermediate host, it is important to cut the cycle by controlling the population of these hosts.

Rotation of outdoor flocks as well as proper drainage and maintenance are necessary to avoid areas with high egg loads.

Worm programmes should include treatments to reduce the parasite egg load during the service period.

It is necessary to monitor the presence of parasites either by faecal egg counts or by post-mortem examinations.

Flocks should be treated with deworming drugs repeatedly to keep parasite populations from growing out of control and minimize the damage caused.

The main parasites found in laying hens

Hair worm (Capillaria)



These nematodes (worms) parasitize the small intestine. They are small in size: males usually measure 7-13 mm while females are 10-18 mm, so they are difficult to visualize. Some species have the earthworm as an intermediate host.

Round worm (Ascaridia galli)



This is the most common infestation. These nematodes (worms) parasitize the small intestine although occasionally they can reach other organs. Occasionally found in eggs. Adults are large, thick, yellowish-white worms. Males 5-7 cm long and female 8-12 cm, so they can be easily observed during autopsies or in feces. They have a direct cycle, but insect can play a role in their spread as carriers.

Cecal worm (Heterakis gallinarum)



These nematodes (worms) are usually found in the cecum. They are tiny: males are about 7-10 mm long while females are about 10-13 mm. They have a direct cycle, but earthworms can act as carrier for them. They are not usually harmful in themselves but because play a critical role as *Histomonas meleagridis* carrier.

Tapeworm (Amoebiasis, Divalinec, Raillietina ...)



Various species of cestodes can parasitize long-living poultry. They do not normally cause damage except in the case of heavy infestations. They usually have cycles with intermediate hosts (ants, houseflies, beetles, snails, ...).

Key Points

- Health is vital to achieve the bird's full genetic potential. Act before diseases become a limiting factor for your birds performance!
- Implement a real biosecurity program, not a paper biosecurity program.
- Adapt the vaccine program to your epidemiological situation.
- Administer vaccines according to the manufacturers' instructions.
- No vaccine program will work if vaccines are administered incorrectly.
- Monitor flock serology to verify the effectiveness of your vaccination program.
- Internal parasite control should be considered to avoid damage produced by heavy infestation.

**But ... There is nothing in
the management guide
about behavioral
problems ?**

ONSET OF PRODUCTION (18 – 25 weeks)

STRESS MONITORING IN LAYERS

A simple and effective way to monitor the stress level of the birds is the use of alfalfa. The birds do not use it for feed but as an enrichment. When the consumption of

alfalfa is observed to increase dramatically, this should be taken as a clear message that the flock is being exposed to some form of stress. This gives producers time to check

which factors are affecting the birds and to apply corrective measures before severe pecking begins to occur.



Alfalfa eat



Alfalfa eat

FEEDING LAYERS DURING PRODUCTION

Flocks have a strong feed selection behaviour based on particle size. Coarser feed particles will be much more attractive than the finer particles to the hens and they will actively seek them out. In cage free systems, each hen has access to many feeding points where she can feed only on the coarsest fraction of the feed if this behaviour is allowed, the birds will eventually reject the fine fraction of the feed. This will greatly complicate the feeding of the birds and can be a leading cause for many production issues.



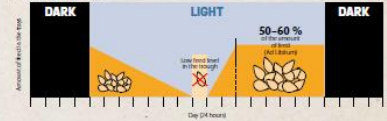
Normal hen



Low level

daily. The simplest way to do this is to force them to empty their beaks. To do this, feed distributions should be changed during the morning. During the afternoon the birds should be fed ad libitum, so no can should

Feed distribution to production



PRODUCTION PERIOD (25 – 100 weeks)

NEST MANAGEMENT

Nest boxes should be kept clean at night to prevent hens from sleeping inside them. The second cause for floor material to be soiled is called with hens and increase the percentage of floor eggs, vent closure can

be brought forward by the floor eggs, this should always be done while checking that the percent of floor eggs, vent was in case.

FEATHER COVERING

Feather covering is a key indicator of the birds' body condition. If hens see their bottoms, their thermal insulation capacity will remain severely impaired. This impacts directly on feed intake and maintenance on egg number. It therefore means an increase in the production level costs. Poor feathering can also be caused by stress, pecking or incorrect feeding.

Monitoring feathering can help signal potential problems caused by aggression, nutritional deficiencies or other problems.

FEATHER PECKING

Feather pecking can be considered as harm on part of hen social interaction if it is kept at a low level. However, if birds are subjected to stress or are unable to express their behaviour, feather pecking can become associated and develop into aggression and even cannibalism. Once treatment has been proven to be effective in preventing feather pecking, however, it is not permitted in some countries.

It is important to monitor the occurrence of stress affecting the birds. Not all causes of stress are equally disturbing to birds but they all work in an additive way.

- The following points should be avoided:
- Sudden increases in light intensity
 - High light intensity (5-10 lux)
 - Direct sunlight entering into the house
 - Nutrient deficient feed formulation
 - High on how well birds in the house
 - Birds not being required to empty water daily
 - High density due to over housing of birds or to poor distribution of birds in the house
 - Birds housed in a system for which they were not trained in housing



- 4-point feather score
1. Complete plumage
 2. Slightly, no visible gaps
 3. Noticeable gaps 0.5 cm
 4. Noticeable gaps greater than 1 cm

Behaviour – like issues

➤ Definitively YES. But it is not included in the health and biosecurity chapter.

➤ Information about piling, keel bone fracture, stress monitoring and others is provided in the different chapters dedicated to the production cycle.

PRODUCTION PERIOD (25 – 100 weeks)

KEEL BONE FRACTURES

Hens often suffer collisions against equipment when moving around the interior of the house. This can lead to keel bone fractures if the bone is hit and it is weak and brittle.

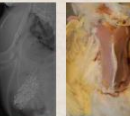
As a result, it will cause injuries in the birds that produce chronic pain, affect their immune response and reduce egg production. Unfortunately, this is reported to happen in a high percentage of cage-free flocks.

Some risk factors for collisions have been identified, such as:

- the absence of ramps between floors,
- the height and placement of perches and
- the top of aisles.

However, hens are clumsy birds and a number of them are likely to collide whatever the aviary

bone integrity and strength therefore seem to play a key role. Calcium physiology is always understood as a challenge in birds with a high production capacity. Therefore, a good rearing period and specifically good conditions before the egg production seems to be key to create a strong bone system and avoid keel bone fractures. Likewise, calcium management in the



Keel bone fracture

Keel bone fracture

feed and the occurrence of metabolic diseases as osteoporosis or osteomalacia should have a clear impact on this problem.

PILING

Piling is a behaviour of birds whereby individuals are crowded together in high densities in a certain place. One of the most common consequences is mortality. So something it can be the leading cause of mortality in some flocks. The cause of this behaviour is sometimes not easy to identify, but it is possible to distinguish at least three types of origins:

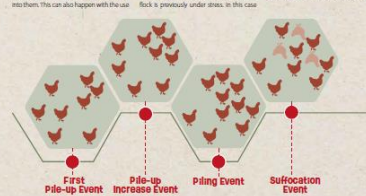
Health issues
This refers to piling where the origin of the crowding is the use of the nest by more hens than the maximum capacity. In fact, hens may prefer some nests to others and crowd into them. This can also happen with the use

of perches at the top of the aviary. These are easily identifiable as the uncrowded birds do not appear in the nests or in the same particular location.

Health issues
This refers to those whose origin is one of the birds that causes an episode of piling in the flock. Usually the number of involved birds is high and can be based on constant or agitated walls. Sometimes they are easy to identify when this event is very evident (production episode, loud sounds, disturbing voices...). At other times the initial event is more diffuse. This is especially true when the flock is previously under stress. In this case

subtle events will be sufficient to trigger an episode.

Health issues
This refers to piling occurring the same place repeatedly throughout the laying period and do not usually involve a large number of birds. One of the reasons for this behaviour is the location of the house, construction of the floor, changes in certain sections of the house or incoming sunlight have been identified in some cases. As with the previous groups, if the birds are under stress, they are more likely to occur. A key factor may be the quality of the lighting used (color and flicker)



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