Healthy gut – healthy chicks

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NUTRITION · HEALTH · SUSTAINABLE LIVING

Baromfi agarat

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Agenda

- Gut Health – Why
- What are the main challenges in today's modern Poultry Production?
- Main causes for Gut Integrity loss and major consequences.
- Eubiosis/Disbiosis and main challenges. Nutrition and Gut integrity. Bacterial enteritis.
- ABF programs and bacterial enteritis.
- BCO lameness.
- Drinking water management.
- Mycotoxin effects on Gut health.
- Final conclusions.

Gut Health – Why ?

- The gastrointestinal (GI) tract has the most extensive exposed surface in the body and is constantly exposed to a wide variety of potentially harmful substances.

- The GI tract acts as a selective barrier (physical, chemical, immunological, and microbiological components)

→ Any challenge leads to Gut Homeostasis changes!

What are the main challenges in today's modern Poultry Production?

- A common mistake when intestinal health is discussed is to only focus on the control of intestinal disease.

- Generally, the attention is placed on coccidia or specific enterobacteria like Clostridium perfringens, E. coli, or *Salmonella* spp. Main issues found? ABF free concerns?

- **However, these are, in reality, most of the times the consequences, not the causes of the problem!**

- Most of the times, the real problem is an excess of nutrients in the hindgut which causes the proliferation of these microbes with the consequence disruption of gut microbiome-host equilibrium causing the metabolic, pathogenic or sterile inflammation.
-
- The excess of nutrients in the hindgut may be due to either high nutrient levels in the diet or suboptimal digestion. **Eventually also lost of Gut Integrity by any external factor!**

Main causes for Gut Integrity loss?

- Genetic selection for growth has increased daily feed intake significantly.
- Anti-nutritional compounds such as non-starch polysaccharides (NSPs) and mycotoxins in the feed could lead to bad digestibility, resulting in more undigested protein in the lumen on which pathogenic bacteria can be fed.
- NSPs present in the feed increase viscosity in the gut, decreasing the passage rate of digesta. This leads to decreased absorption of digesta and increased incidence of wet litter.
- The presence of mycotoxins in the feed harm the intestinal barrier functioning and is one of the predisposing factors for secondary diseases and dysbacteriosis.

Consequences :

- Selection for maximum growth, high daily intake and lowest FCR = increase feed passage. → Digestibility disturbance and wet litter.
- Minor violations of the intestinal digestion and absorption capabilities increases number of nutrients in intestines available to potential harmful bacteria. → Gut inflammation and Gut integrity issues.
- All factors that cause an initial damage/ disbalance under this high pressure may lead to → Bacterial enteritis and/or NE.

Possible reasons why eubiosis turns into dysbiosis

- **Feed**

✓ Substantial dietary changes

✓ Low-quality feed components

✓ Inadequate feed hygiene

✓(Water quality/quantity!)

- **stress**

✓ Transportation

✓ **Overcrowding**

✓ Climate – Cold stress/heat stress

✓ Disease – increased number of pathogens

✓antibiotic overuse

✓ Vaccination

feeding the animal, we also feed the microflora

-Influences digestive secretions and peristalsis

-Damage the beneficial Gut microflora

Nutrition - Non bacterial factors

- - **NSP's** – indigestible, water soluble (wheat, rye, oats and barley).
- - **High dietary concentrations of animal protein** (fishmeal?)
- - **high concentrations of poorly digestible proteins**-substrates for bacteria growth
- - **Feed containing some large-sized and many small-sized particles** (Branton et al., 1987; Engberg et al., 2002)
- - **Animal fat increases C. perfringens counts compared with vegetable oil** (Knarreborg et al ., 2002)

Gut health and Integrity “Stress”!?

- **Digestive health** is a main concern in the **poultry** industry as it has a high **impact** on production and mortality rates caused by **gut** diseases.
- Traditionally, sub-therapeutic doses (!) of antibiotics have been used as a strategy to control pathogen load, prevent diseases, and enhance growth performance.
- Bacterial enteritis is an important disease in **poultry**, causing loss of performance by **intestinal** inflammation and villus shortening, which **affect** performance.
- **Bacterial enteritis is omnipresent**
- The efficiency of feed digestion and absorption is directly proportional to the healthy surface of the intestine.

ABF programs and bacterial enteritis

- Many poultry companies have years of experience working with the ABF systems, some of them still have difficulties controlling diverse health challenges.

- Due to antimicrobial resistance, preventive use of antimicrobial growth promoters is now banned in most countries. This has led to increased problems with necrotic and bacterial enteritis.

- Anticoccidials and cox-vaccines, however, will not protect the animals against bacterial enteritis. **Necrotic enteritis is induced by *Clostridium perfringens*, whereas bacterial enteritis is omnipresent in poultry production.**

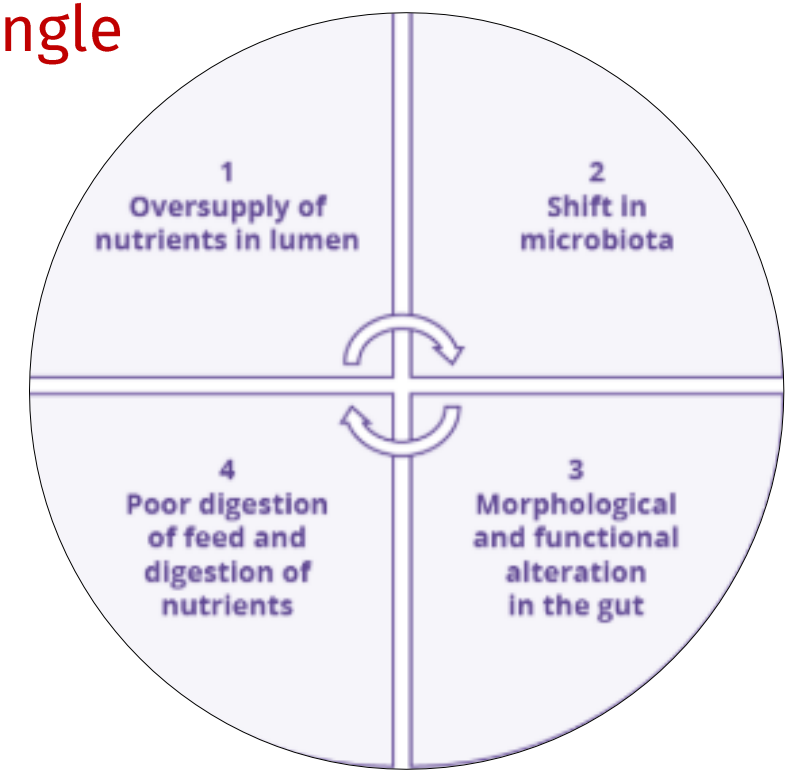
- **Other anticoccidial additive alternatives should be considered and evaluated!**

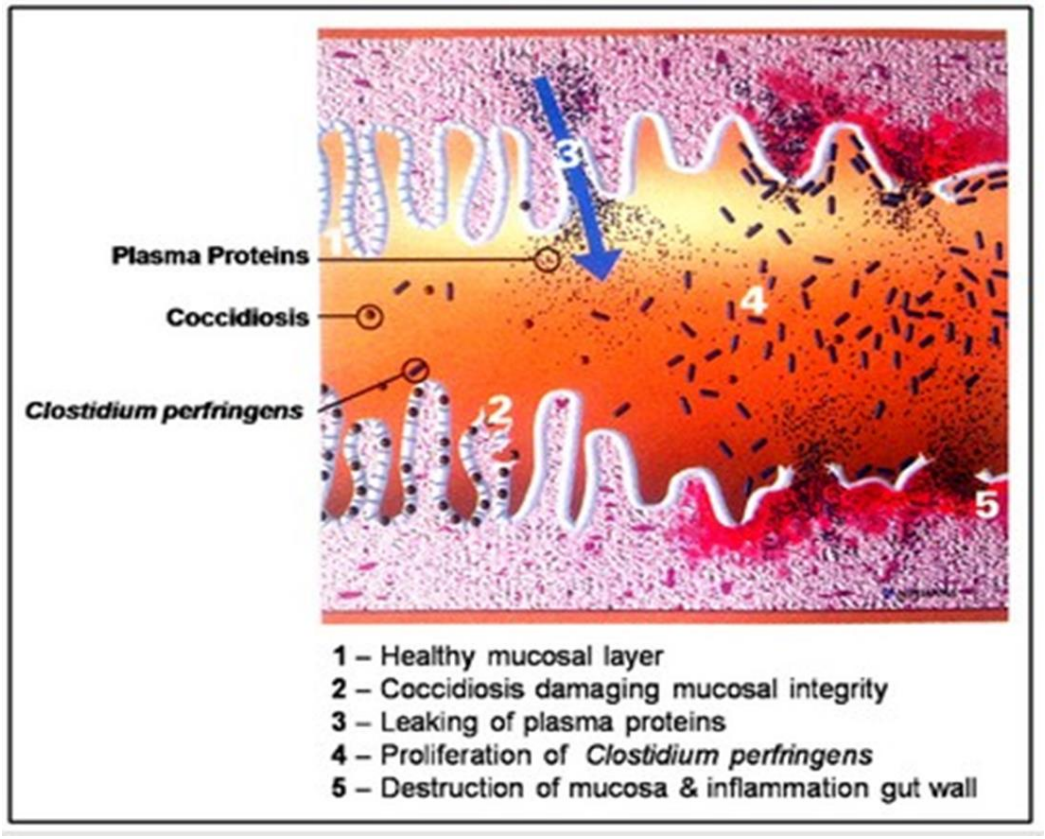
AB reduction : main reasons

- Abuse and misuse on AB application.
- AB use for Metaphylaxis / Prophylaxis !?
- AB resistances.
- Treatment failure.
- Legislation applied to control its use.
- Bacteria mutation leading to harmful and very pathogenic new strains !
- No other tools to fight pathogenic infections

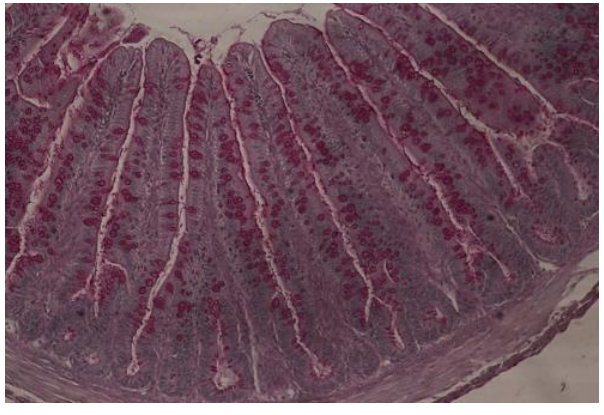
Bacterial enteritis

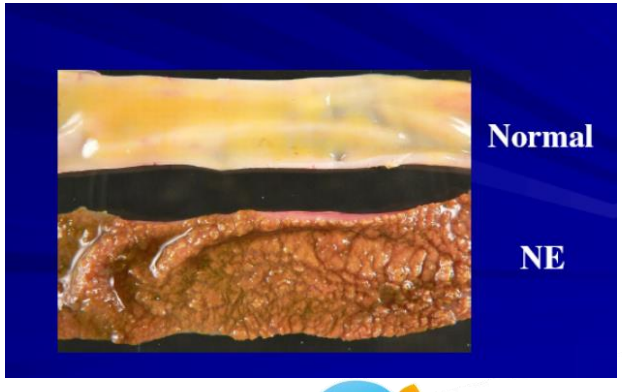
Bacterial enteritis is an inflammatory response in the gut induced by a general bacterial challenge, not one single bacterial species.
Bacterial enteritis is a vicious circle, starting with an oversupply of nutrients in the lumen, leading to a shift in microbiota, inducing morphological and functional alterations, resulting in poor digestion of feed and absorption of nutrients, leading again to oversupply of nutrients in the lumen.





1 – Healthy mucosal layer
2 – Coccidiosis damaging mucosal integrity
3 – Leaking of plasma proteins
4 – Proliferation of *Clostidium perfringens*
5 – Destruction of mucosa & inflammation gut wall

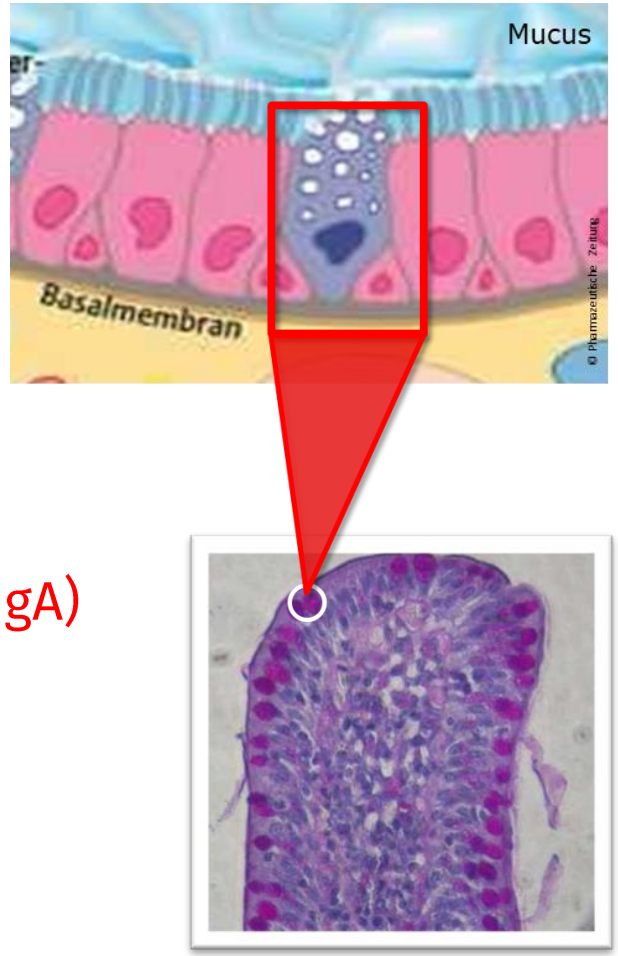




Necrotic enteritis

courtesy Dr Rob Porter, Poultry Health Scho

Mucus layer



- One of first line of non-immune defences
- Composed of glycoproteins secreted by goblet cells
- Functions (Forstner and Forstner, 1994):
  - Lubrication of intestinal surfaces
  - Trapping and neutralizing bacteria (bacteriocidal, bacteriostatic and sIgA)
  - Detoxification of heavy metal binding
  - Interactions with the intestinal immune system
  - Acting as a diffusion barrier for nutrients
  - Protecting the underlying epithelial cells

- **Any aggression to this important layer might result in Gut Integrity loss!**

Feed structure and composition influence on GIT

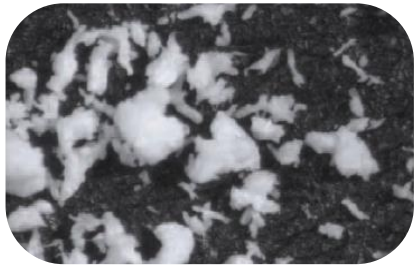
Sugar beet pulp

Oat hulls

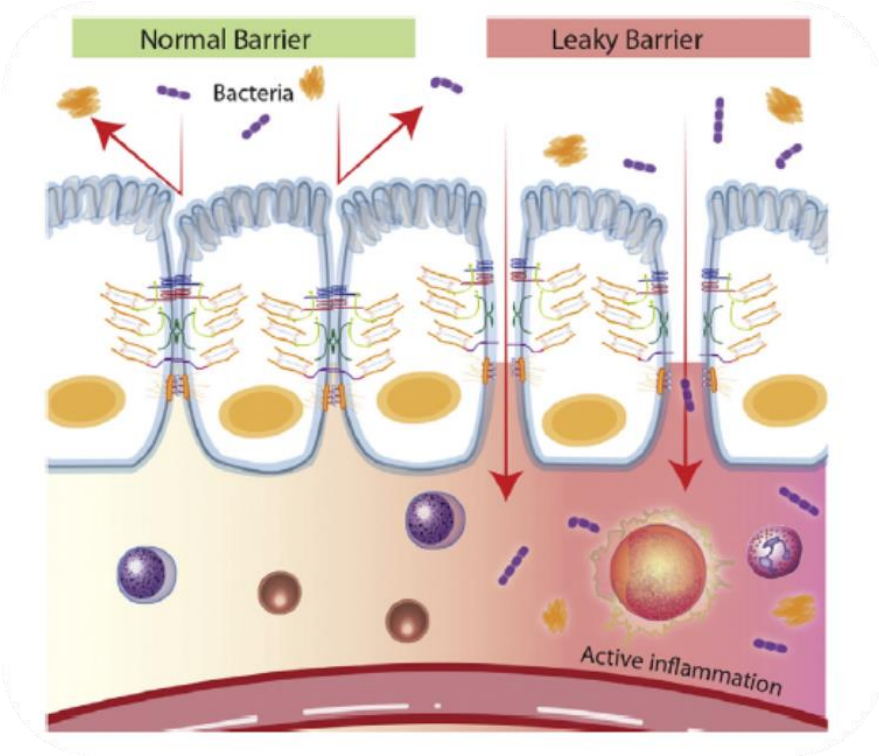
Soybean hulls

Sunflower hulls

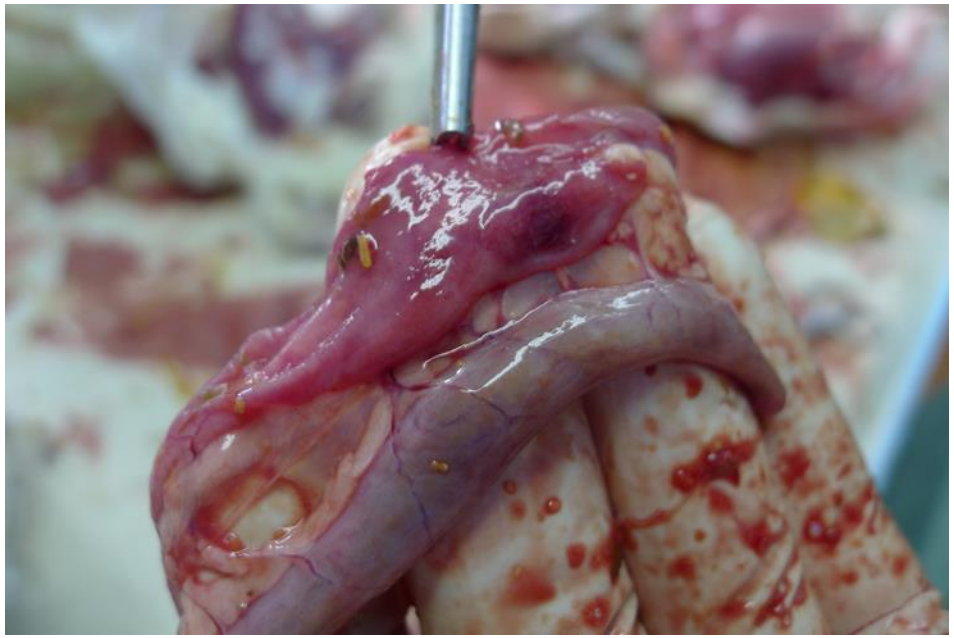
Pea hulls



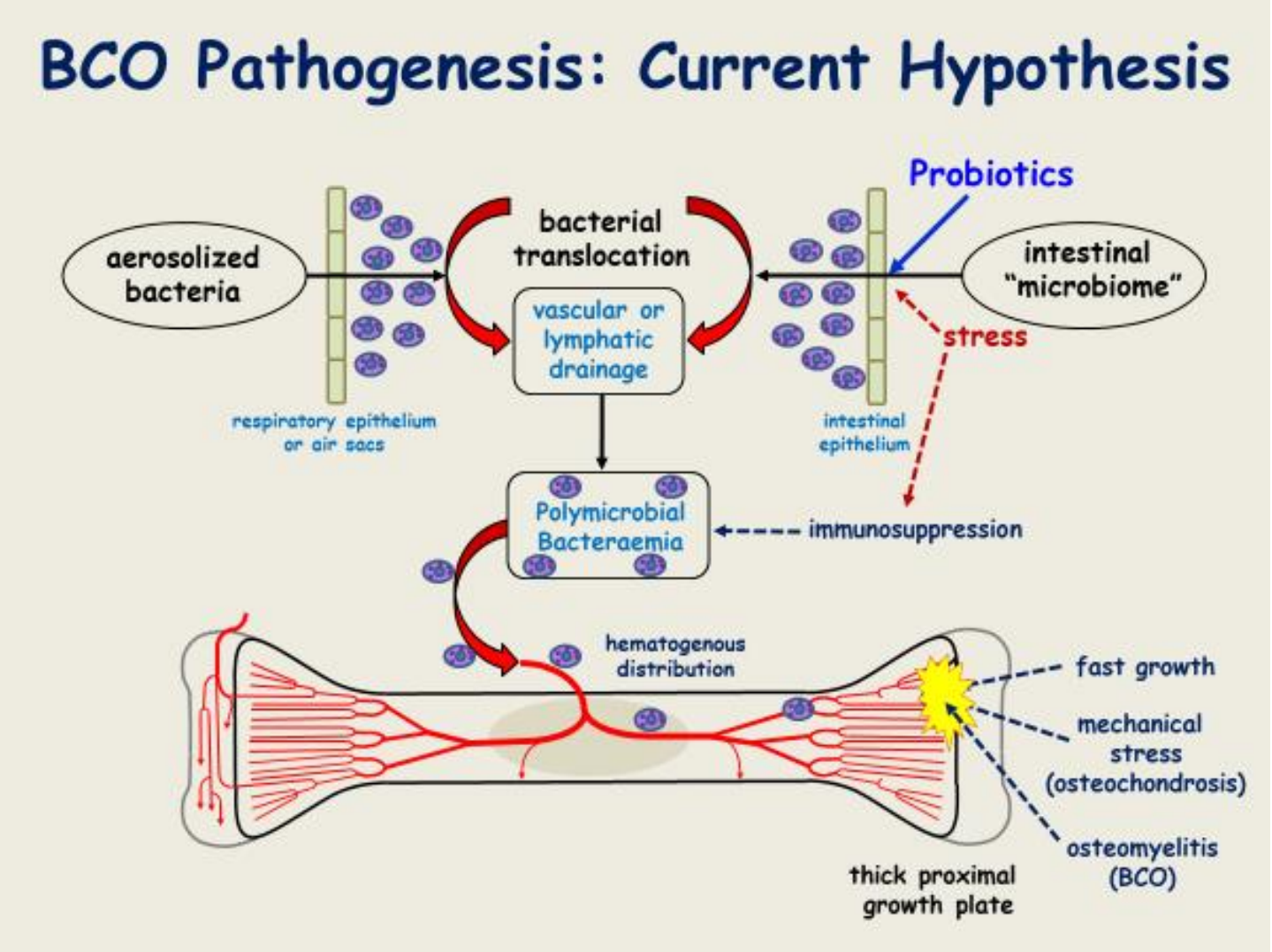
Microcrystalline cellulose

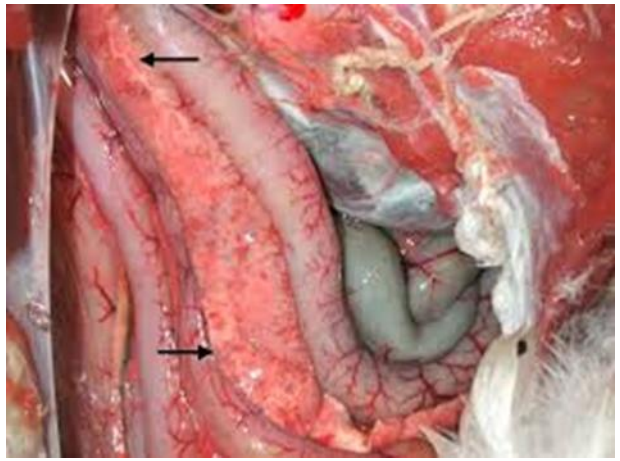


- Fibres from different sources are different in shapes, forms, structure and physicochemical characteristics
- Dietary fibre affects GIT development in different ways, depending not only on the type of the fibre used, but also on its particle size
- Probably cellulose inclusion has the least effect on GIT because of its lack of physical structure



BCO – Bacterial Chondronecrosis and Osteomielitis. Gut protection loss!





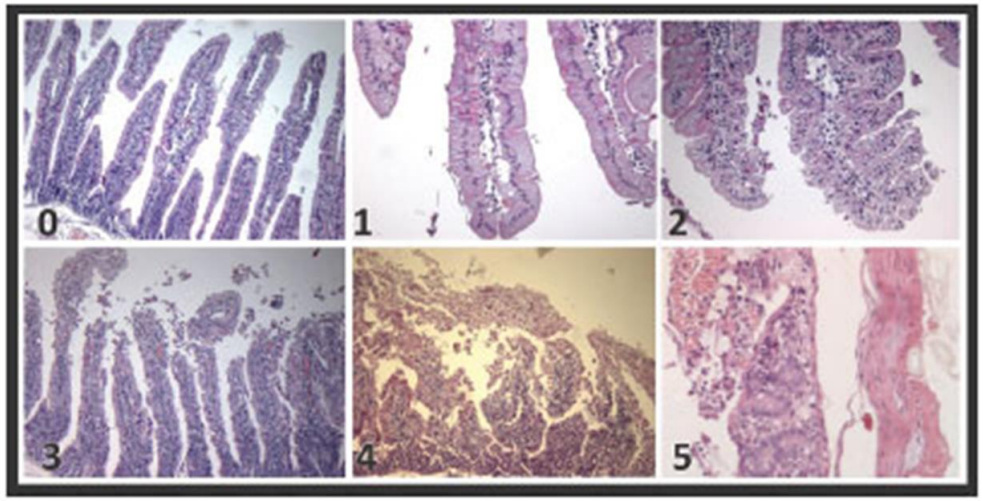
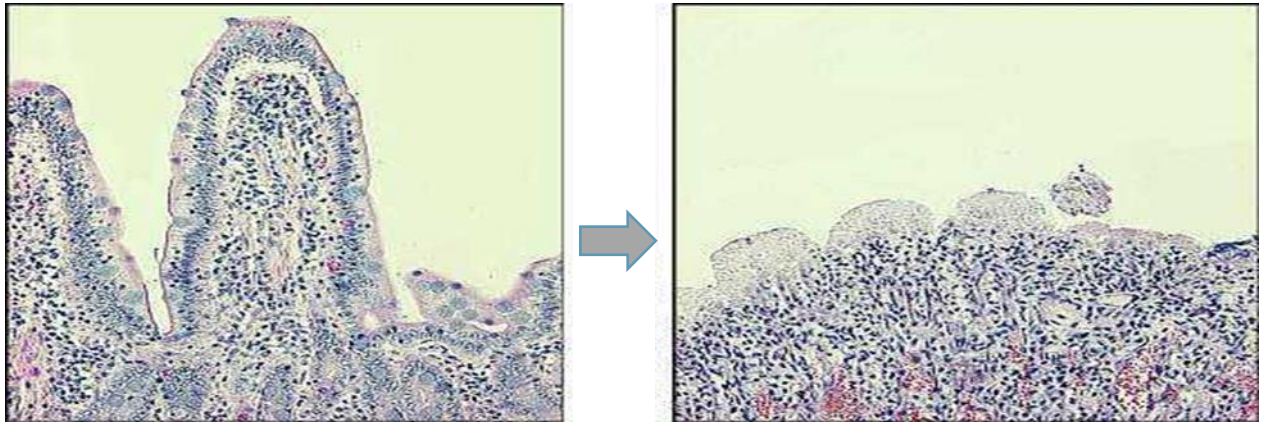


FIGURE 1 - Histopathology lesions intensity (Grade 0 to 5) classification.



Be aware of “more drinking” consequences!

- The most consumed “nutrient” in poultry production.

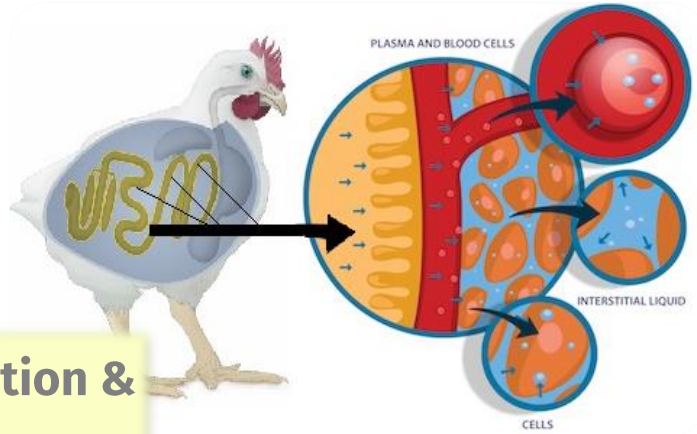
- **Higher water intake**

More water uptake by GIT

More microorganism/chemical uptake by GIT

More pathogenic bacteria uptake by GIT

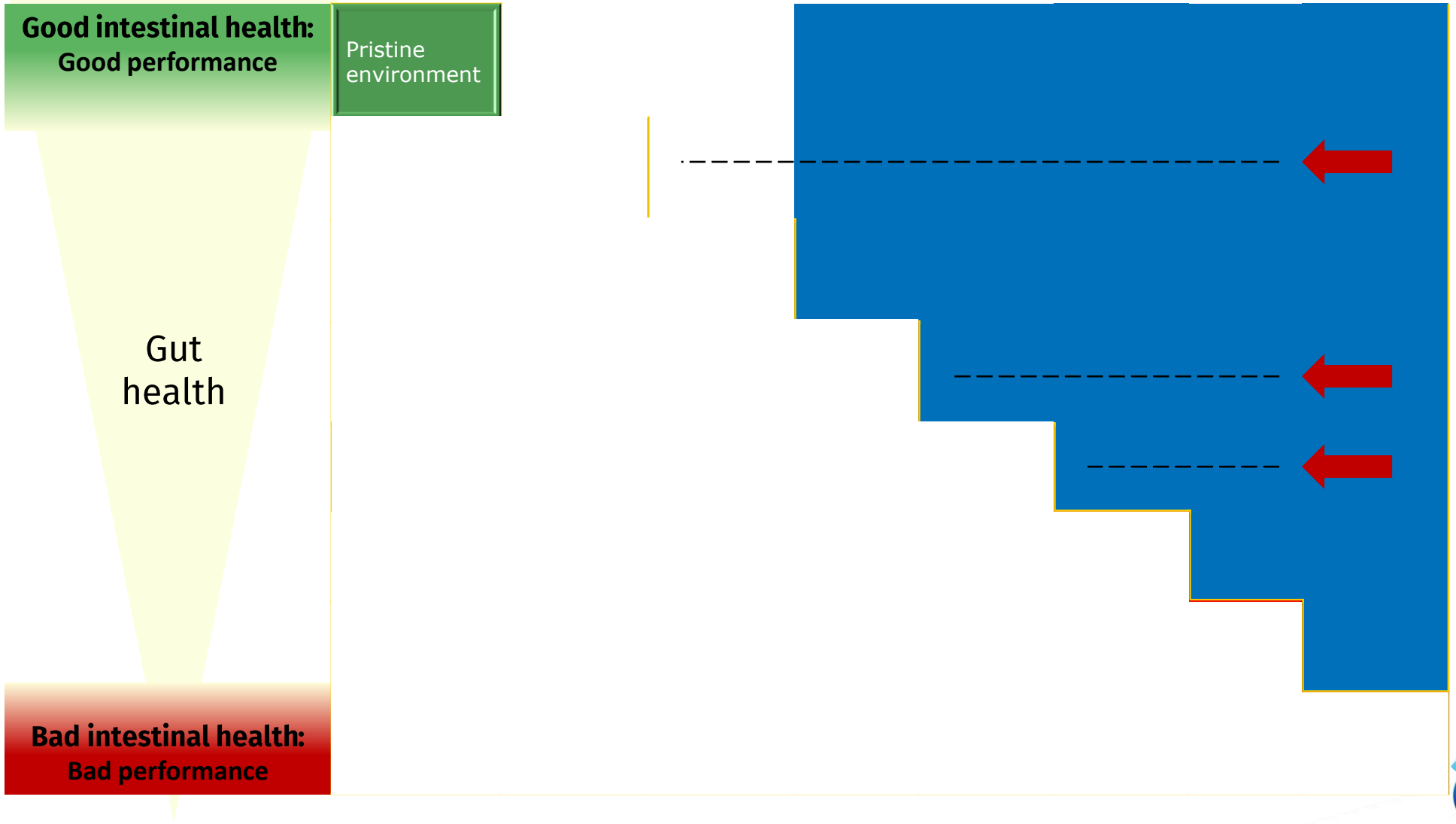
If the gut is not fully prepared for such condition



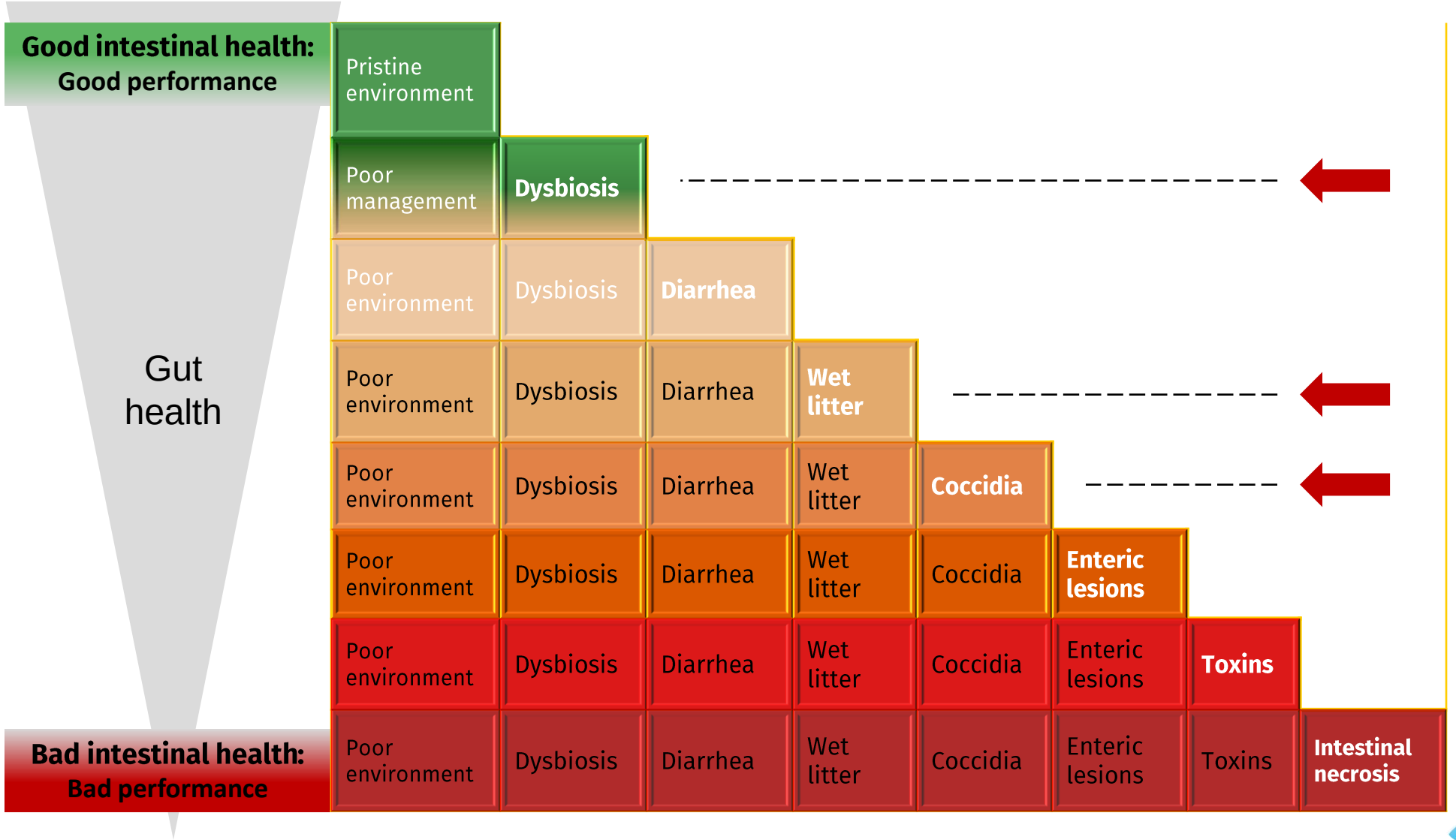
High possibility of infection & disease

Wet litter

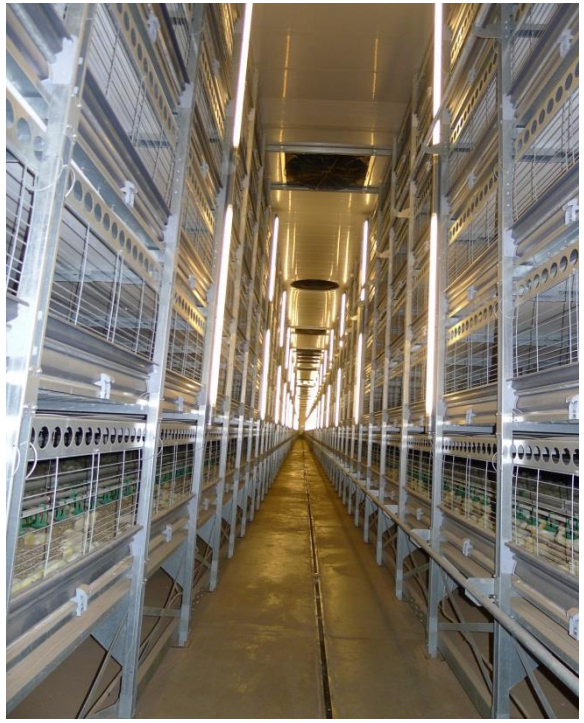
Progression pyramid of dysbiosis



Progression pyramid of dysbiosis



Eubiosis *vs.* Dysbiosis



Mycotoxins effects reminder – don't underestimate their sub-clinical influence!!!

- Mycotoxines are immunosuppressive. They affect immune response!
  - Reduction of IgG and IgM (Oswald y Comera, 1998).

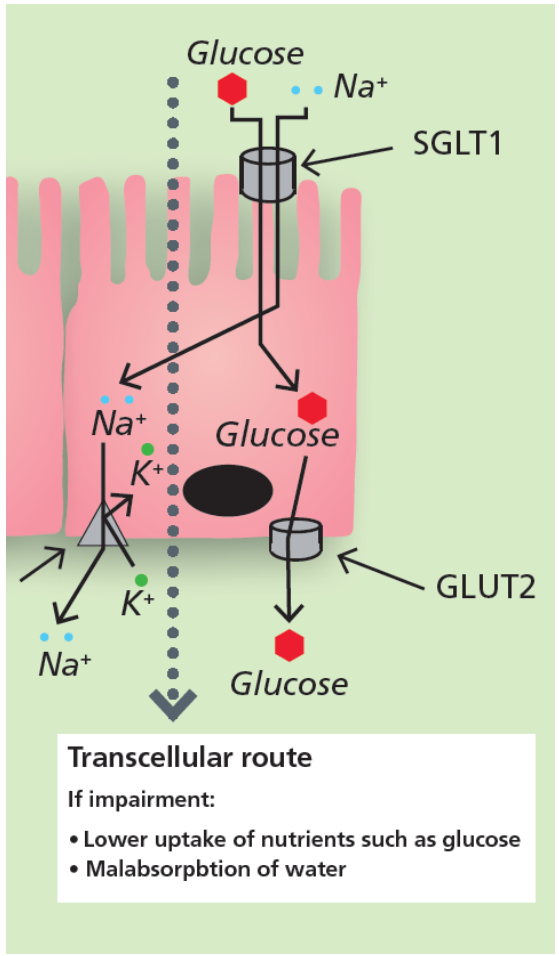
- Mycotoxins such as T-2 toxin can cause caustic injury to the mucosa, destroying cells on the tips of villi, (H*emorrhage, necrosis, and inflammation of the intestinal epithelium*) (Kolf-Clauw et al., 2013) inducing NE.

- Deoxnivalenol predisposes for the development of Necrotic enteritis in broilers
- reducing intestinal epithelial integrity
- removing tight junction proteins

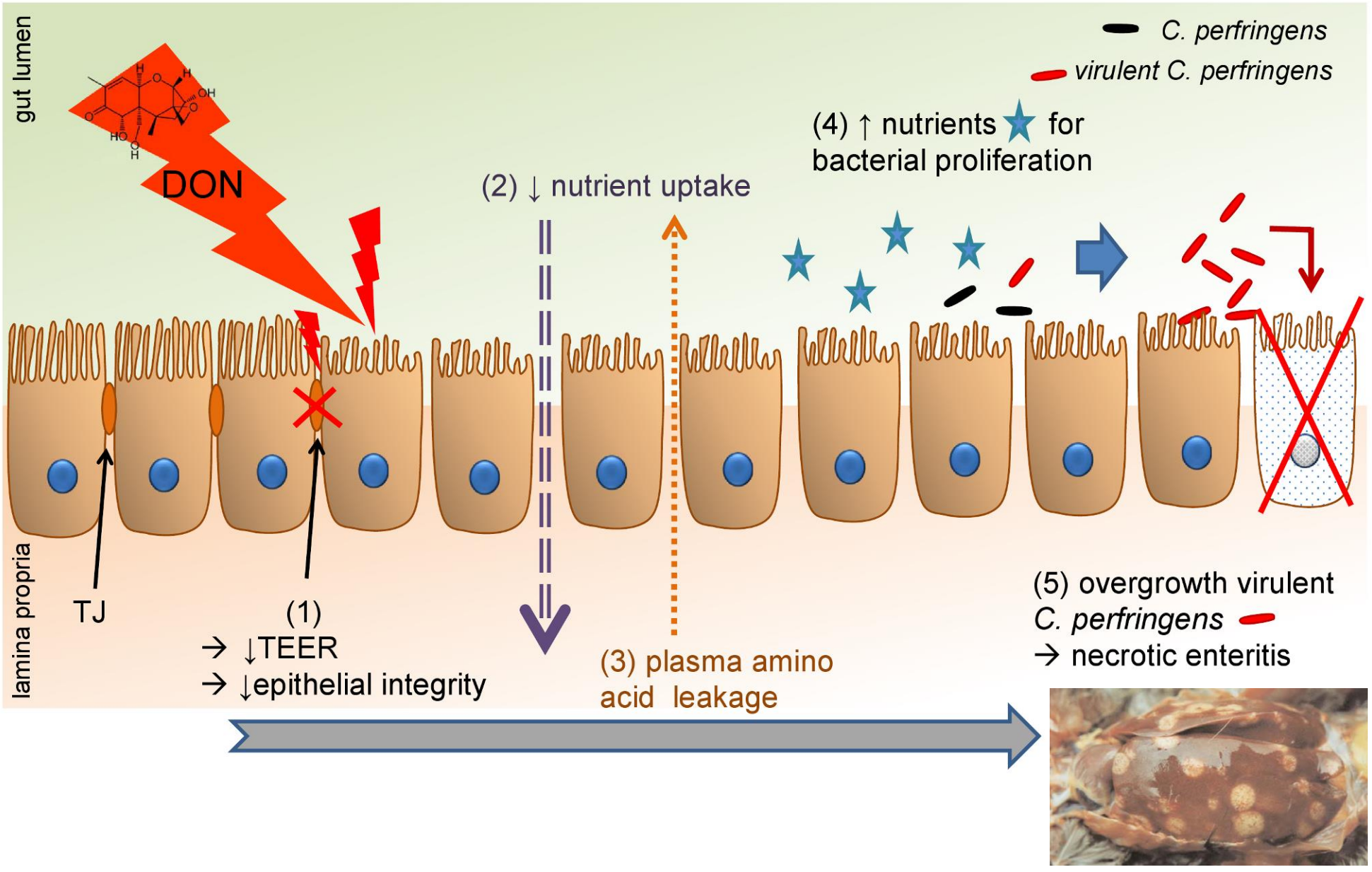
- *OTA causes hypotrophy of the bursa of Fabricius. It's also nephrotoxic!*

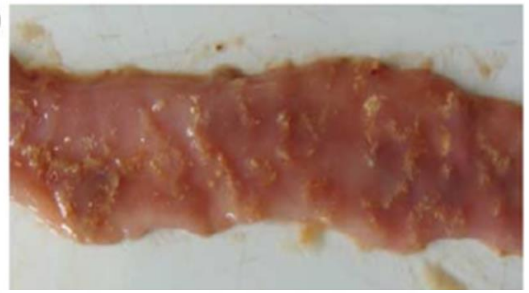
- ***Mycotoxins can be transferred vertically!!!***
- ***There are no safe levels for its presence!!***
- ***Most mycotoxins are not adsorbed!***
- ***Most situations they act indirectly with other systems.***

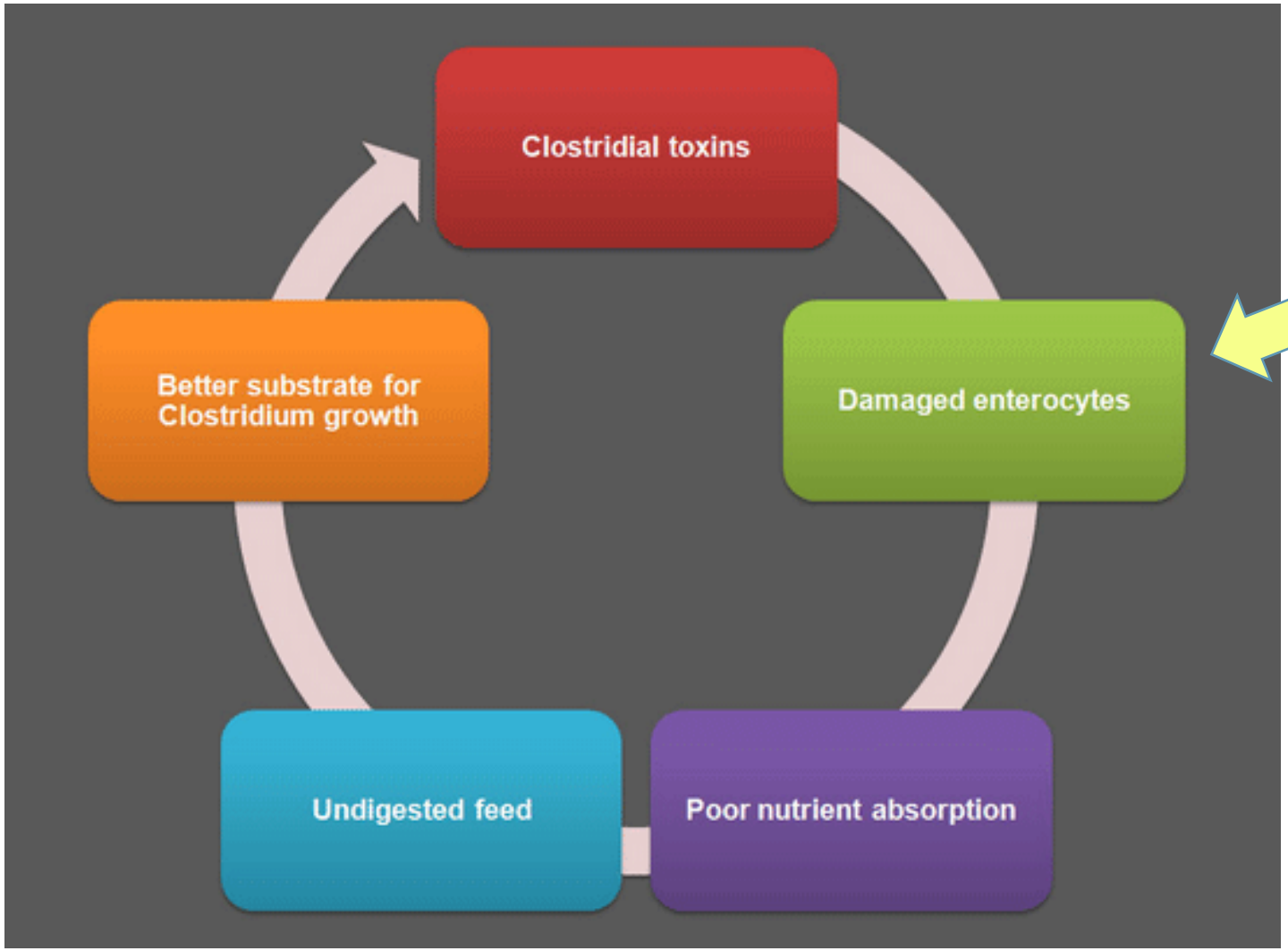
DON reduces nutrient assimilation via SGLT-1



- DON interferes with intestinal absorption of nutrients such as glucose and amino acids.
- Low concentration of DON inhibits SGLT-1
- SGLT-1 is responsible for glucose uptake
- SGLT-1 is also responsible for water resorption –> possible reason for DON to produce Diarrhea.






Clostridial toxins
Damaged enterocytes
Poor nutrient absorption
Undigested feed
Better substrate for Clostridium growth

Mycotoxins

My own field experience overview

- In these days We find more often multifactorial cases.
- What causes what? Too many consequences!!
- Observation at all levels: bird's behaviour, farmer observations, our own careful bird and farm observation, pos-mortem exams, previous product applications.

- Too many variables and concomitant factors!
- Cause-Consequence dilema! What is cause, what is consequence?

- Diagnosis vs solution!
- If we fail to plan (diagnosis/solution), We plan to fail!

So, What to do and prioritize?

- Differential diagnosis! Recognize predisposing factors, prioritize what's causing disbalance/ GIT integrity loss!!
- Anticipate the establishement of a species-specific beneficial microflora.
- Gut Integrity enhancement! Mucin layer is the first phisical barrier in the GUT! Gut protection!
- Optimal supply of digestible amino acids and minerals-growth of inner organs, muscles, skeleton and performance.
- Avoid damage to GIT by mycotoxins. (DON-T2)
- Additives to enhance gut health are gaining ground to support host defense, gut barrier management and integrity and recovery of the intestine or control the microbial ecosystem directly.

- **Feed additive strategies** :

Probiotics,
Acidifiers,
Phytogenics,
Mycotoxin deactivators

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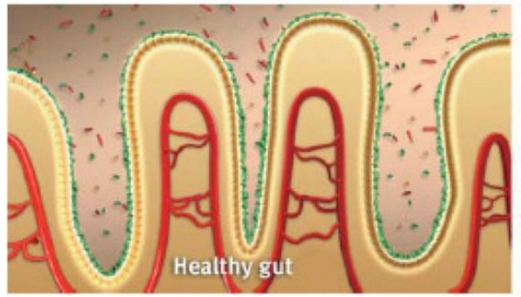
Conclusions



- The GI tract has the most extensive exposed surface in the body, so a wide variety of factors associated with **diet and infectious disease agents can negatively affect the delicate balance in the gut**.

- Strategies to enhance bird's health like **infectious disease prevention programs and using non antibiotic alternatives will maximize production efficacy and sustainability!**

Thanks

Questions?

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