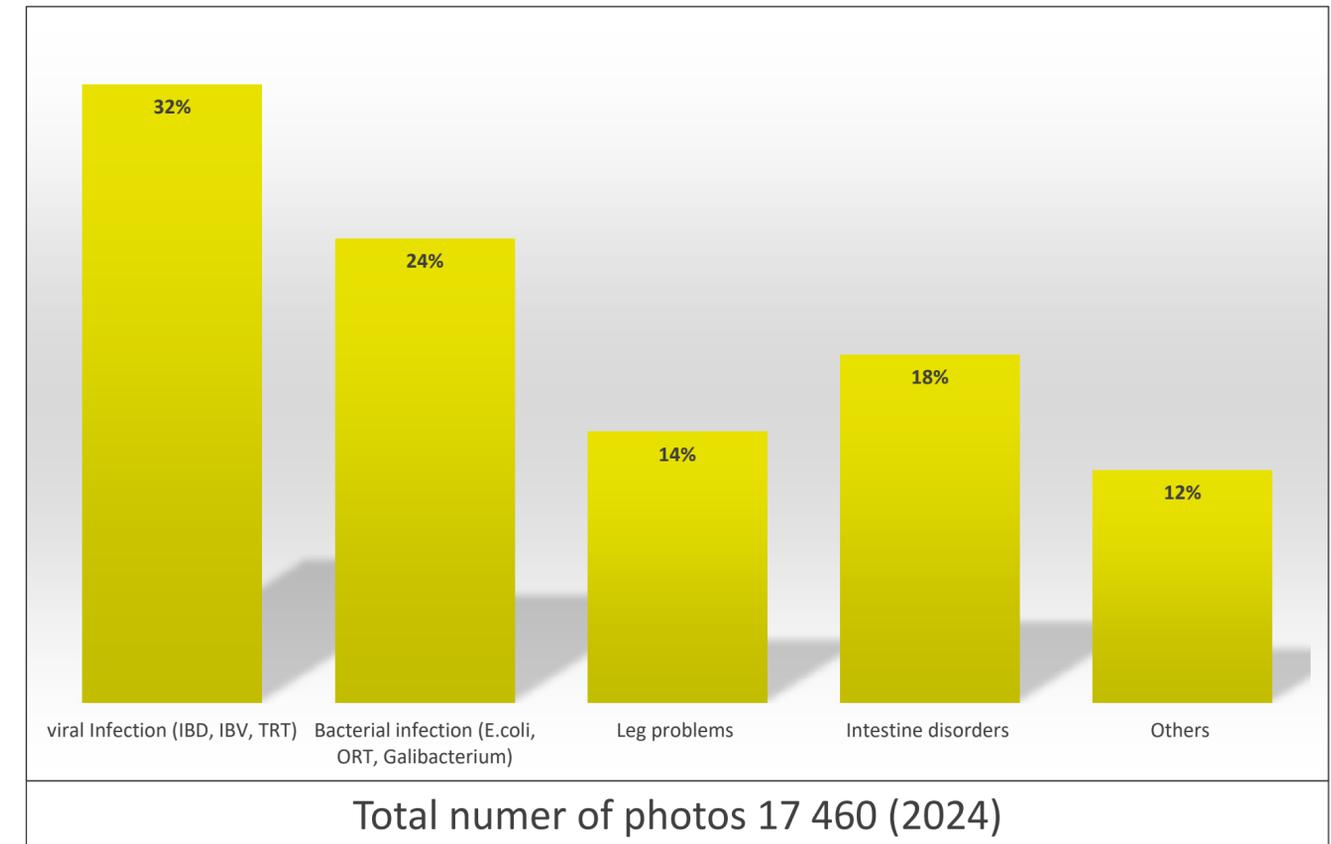
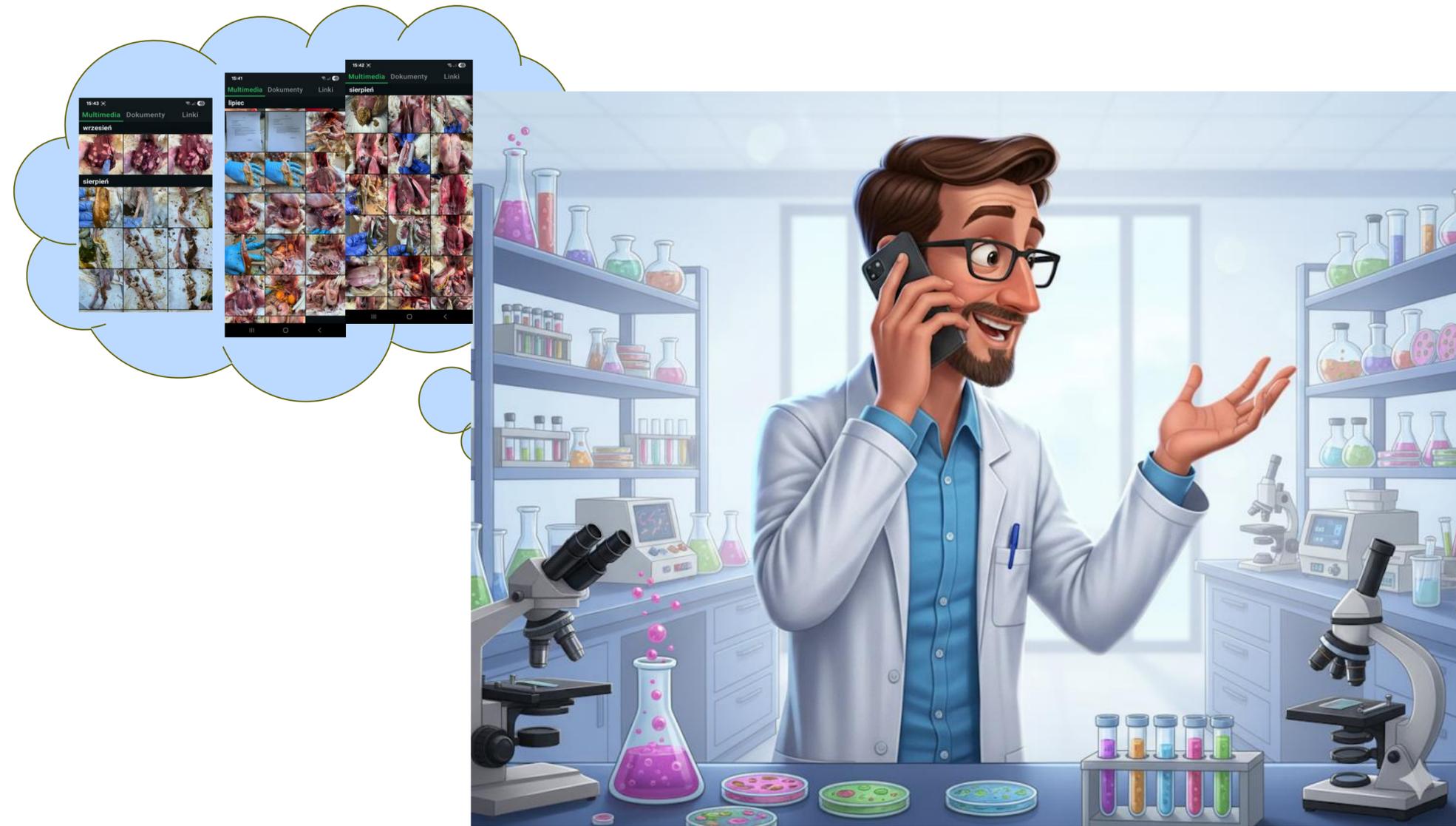


# Enteropathies in poultry - Challenges in poultry production -

PhD DVM Jaroslaw Wilczynski

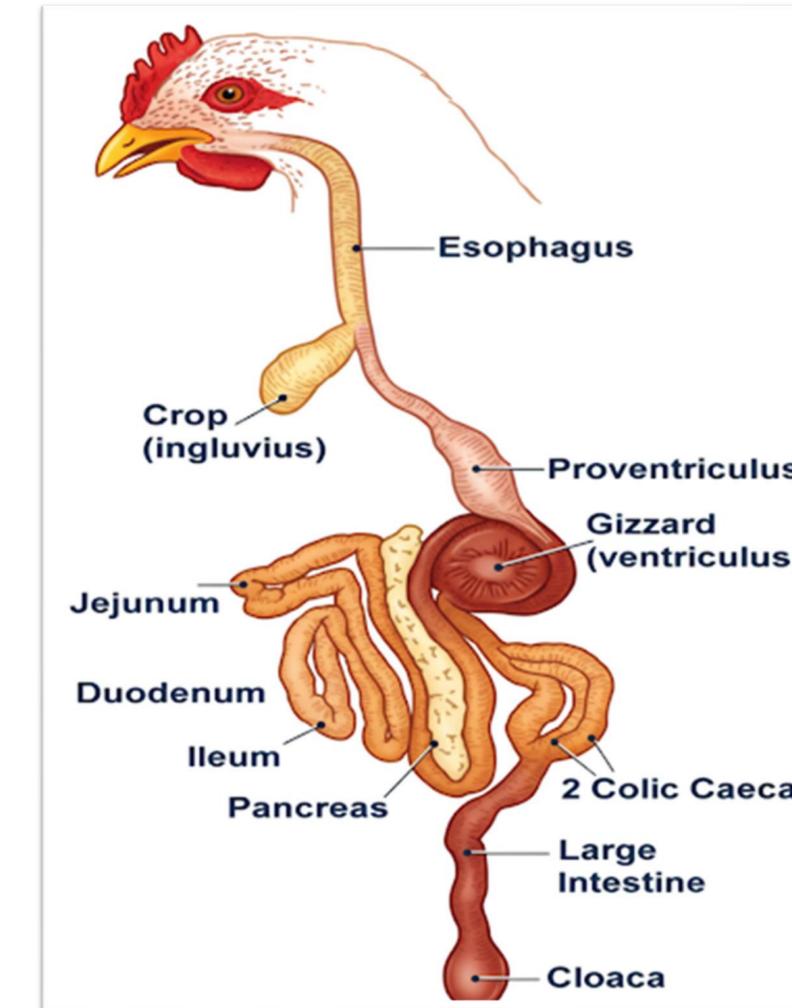
Laboratory Manager, Avi-Vet Servis, Poland

# What are the biggest field diagnostic problems?

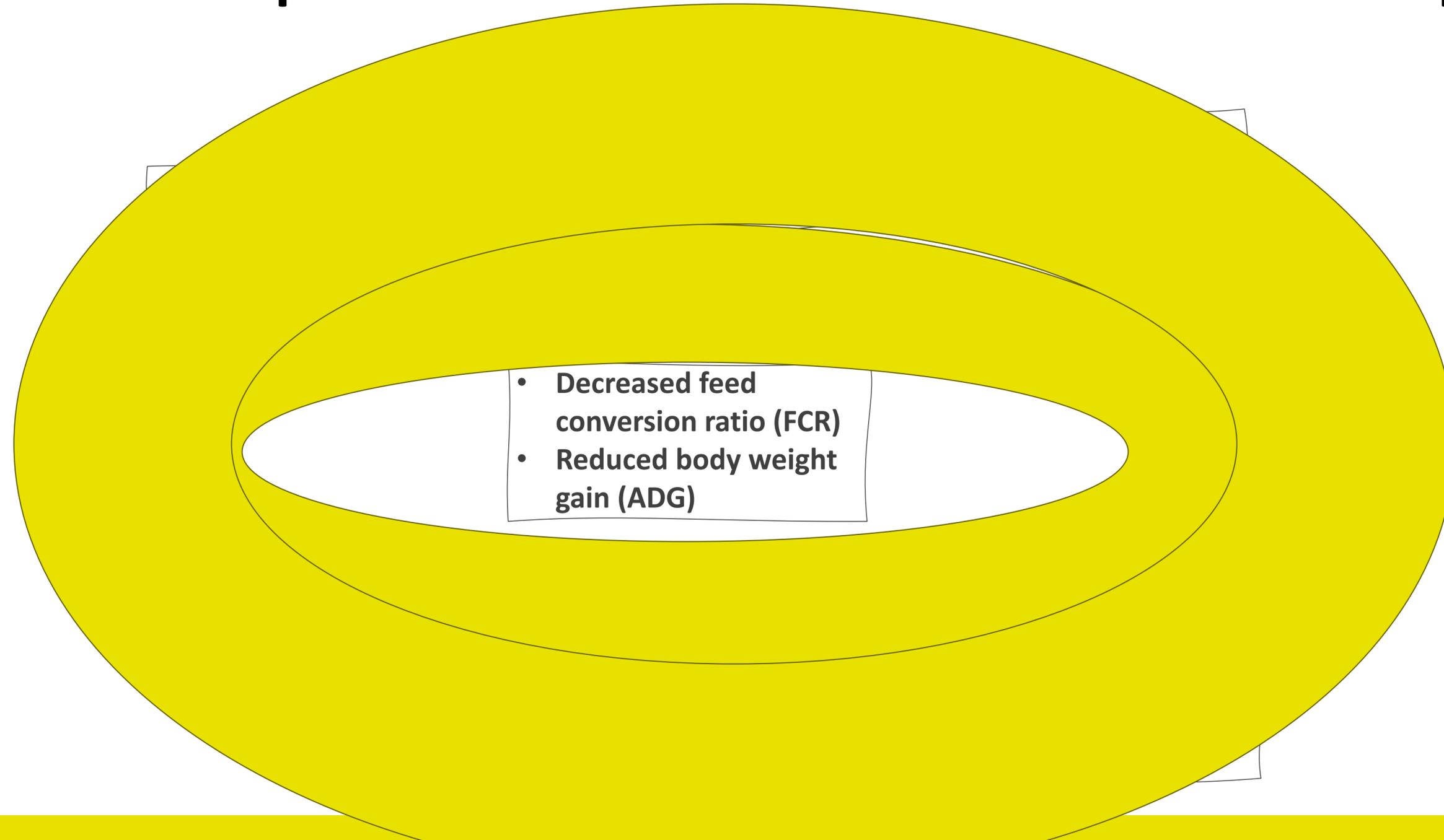


# Poultry digestive tract

- Super-fast metabolism
- The Proventriculus: The Chemical Machine
- Stomach Muscle: Biological Mill
- High cell turnover
- The pH of different sections of the digestive tract is different
- Very long intestinal villi
- GALT: The Hidden Brain of the Immune System
- Cecum „fermentation center“



# Economic impact: Measurable and hidden costs of enteropathy



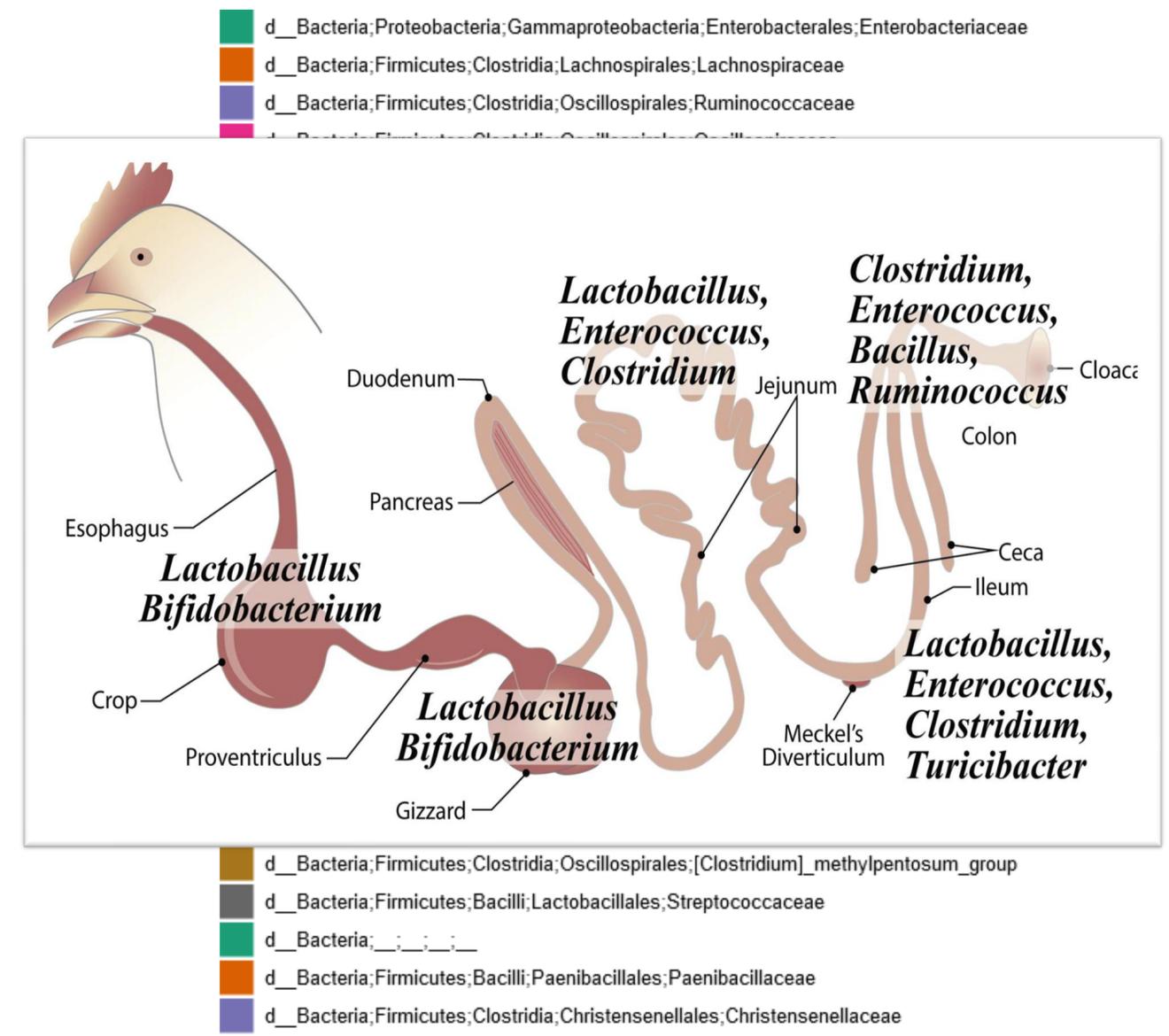
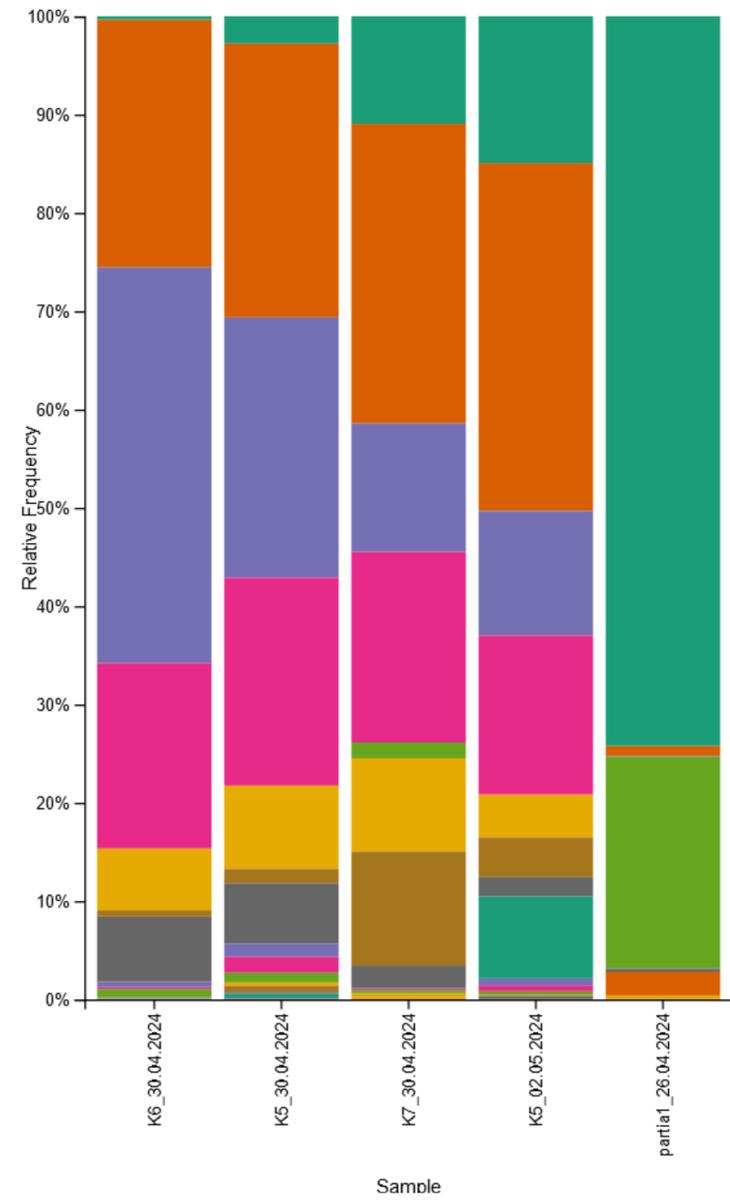
# Intestinal lumen - the external environment that is inside



- Constantly changing environment
- About 640 different species of microorganisms, especially in the richest part of the intestines, the caecum
- Three phyla dominate: Firmicutes (which include *Lactobacillus*), Bacteroidetes, and Proteobacteria
- The most important are the relationships and proportions between the microorganisms



# The effect of antibiotic administration on the intestinal microbiome

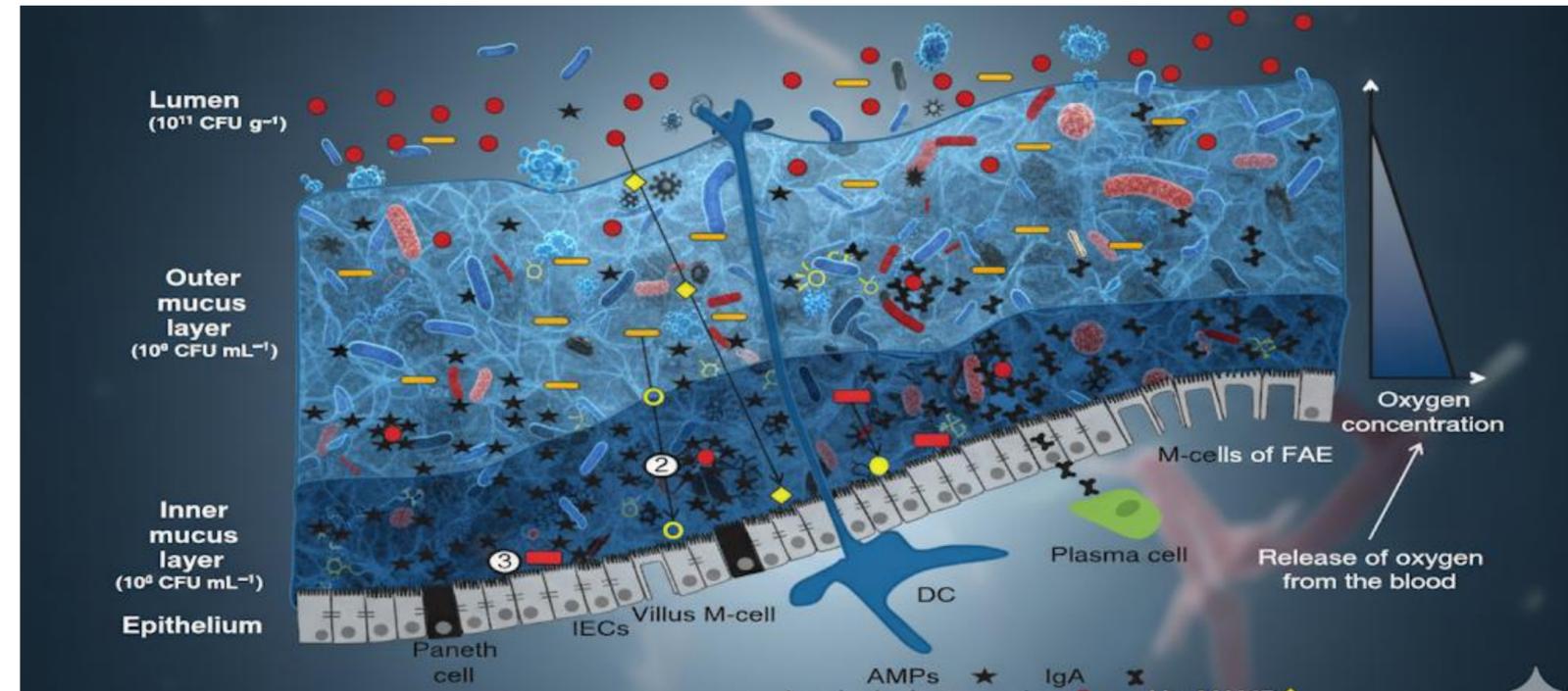


# What is intestinal integrity?

**Two key tasks: letting in what is good, blocking out what is bad**

The key elements of this barrier are:

- Epithelial cell layer:
- Tight junctions:
- Mucus layer:
- Healthy microflora (microbiome):
- Properly functioning immune system



# The mysterious X factor, the cause of all problems



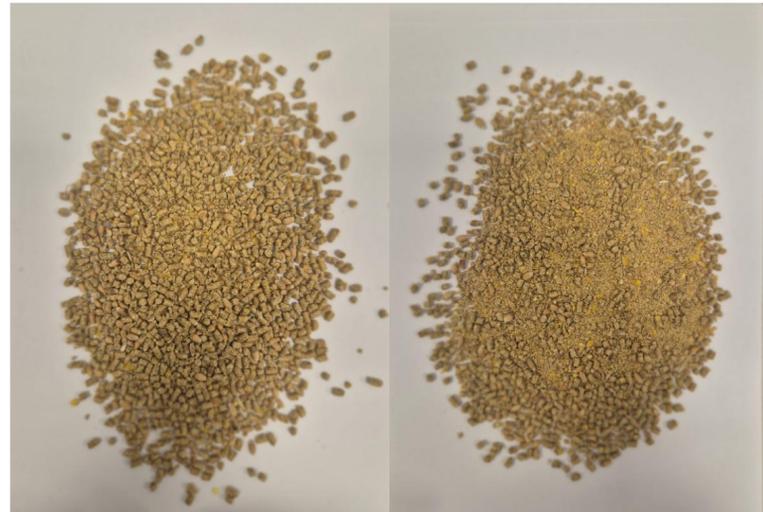
- Nutritional Factors and Feed Quality
- Environmental Factors and Management
- Infectious Agents (Pathogens)

**Every farm has its own X factor.  
The point of our work is to find it.**

# Feed problems



Quality of raw material



Feed homogeneity

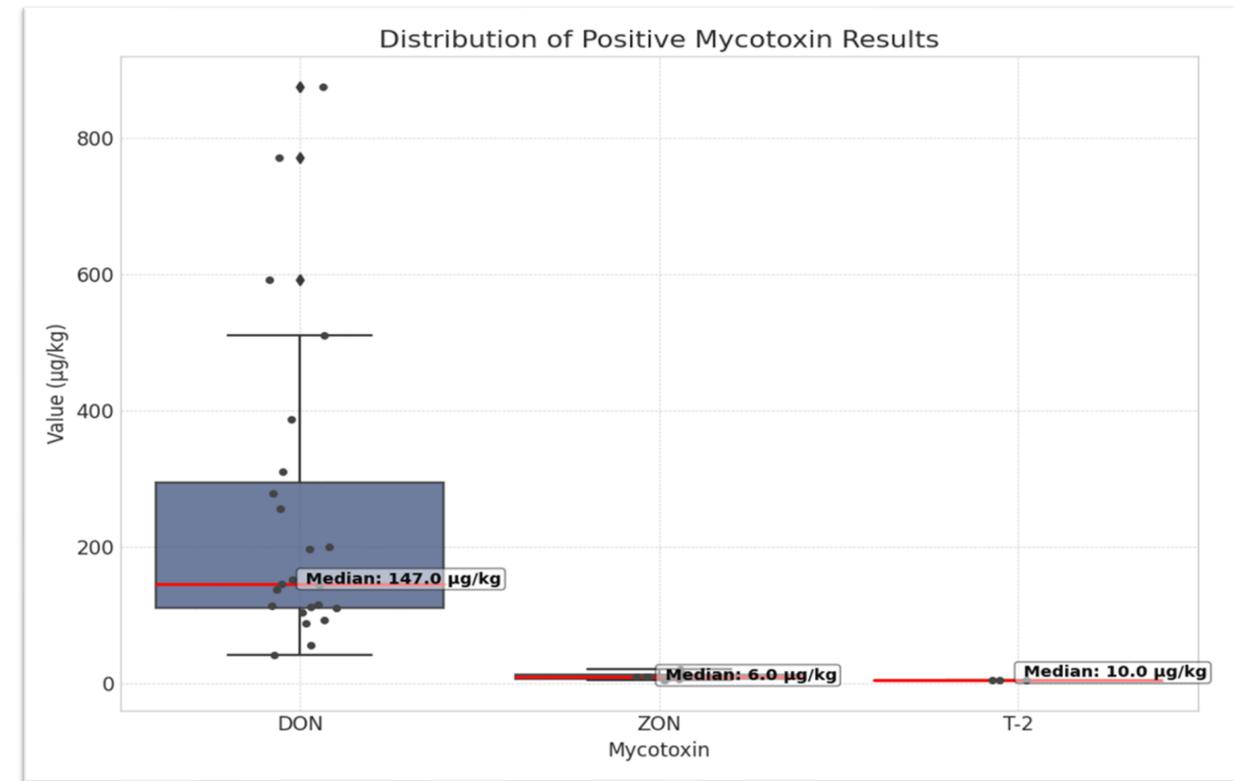
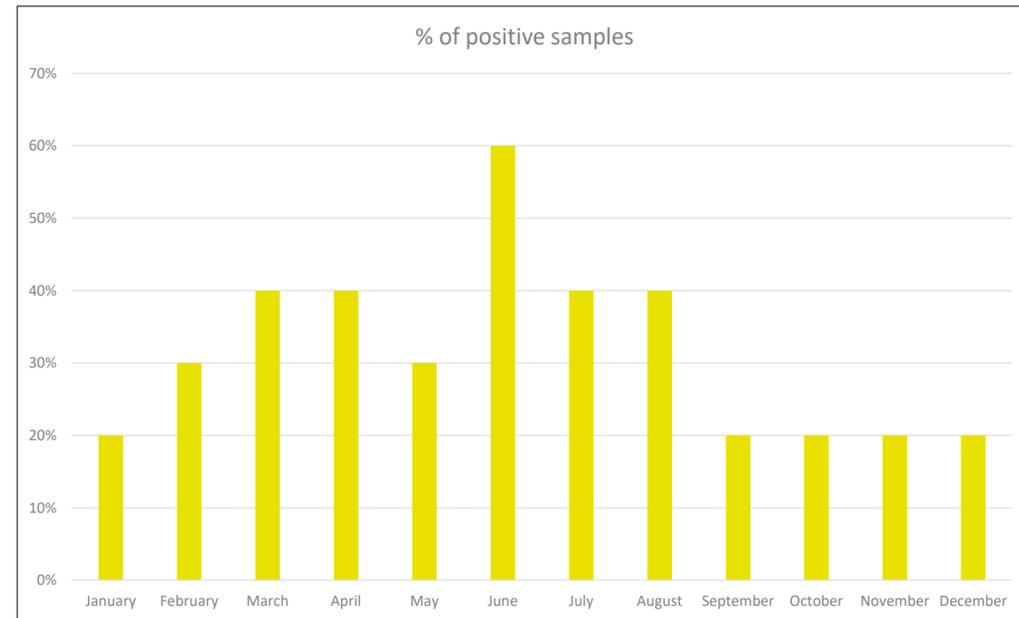
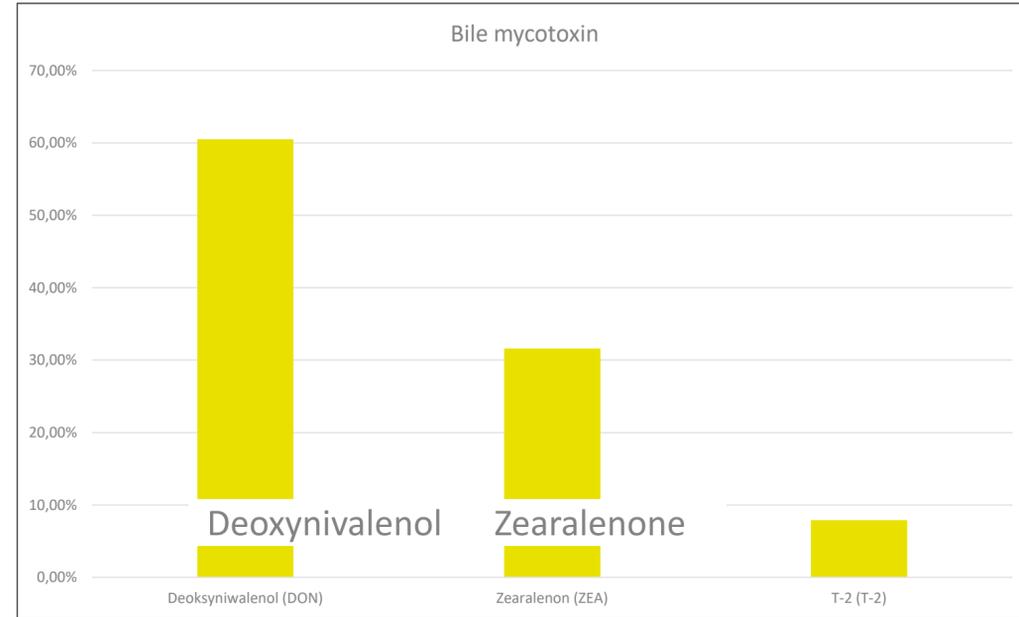


Mycotoxin

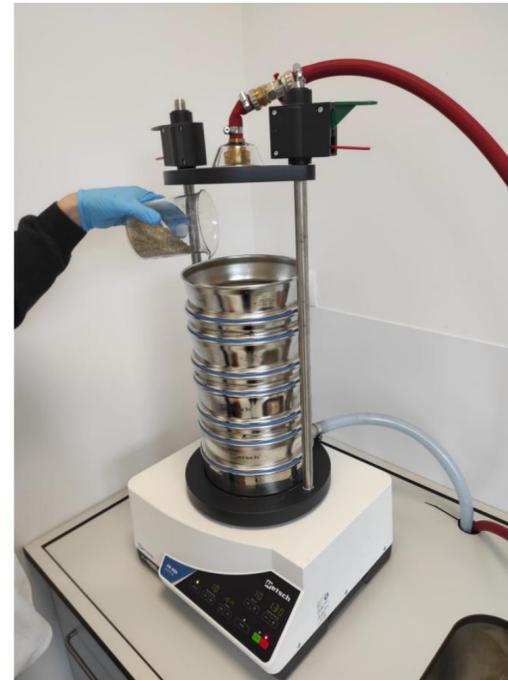


Production errors

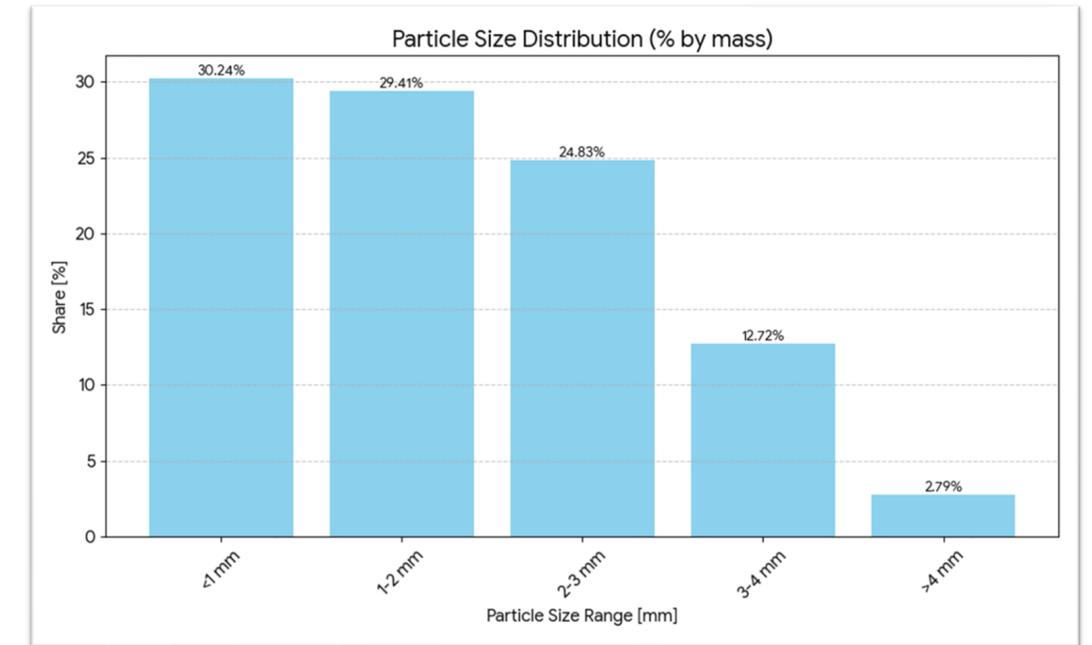
# Mycotoxin problems



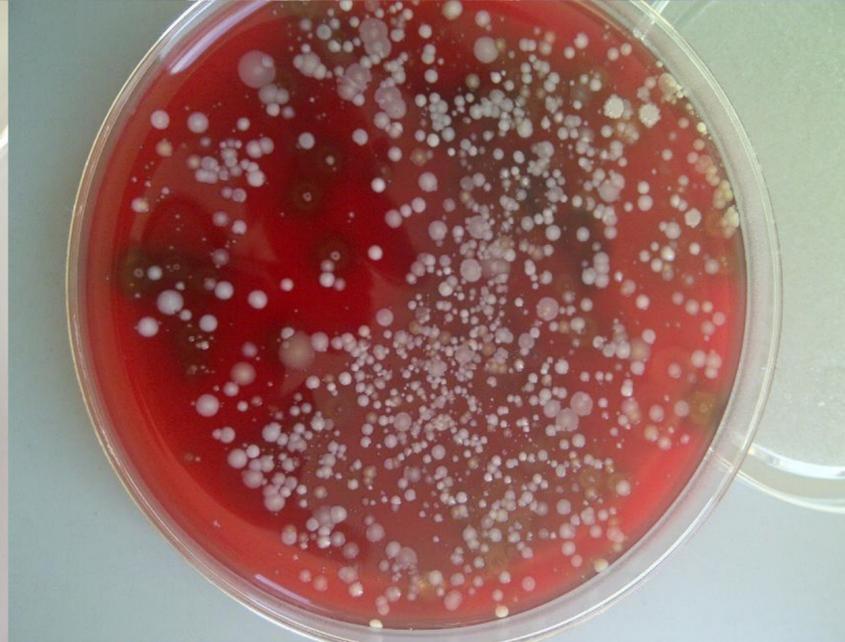
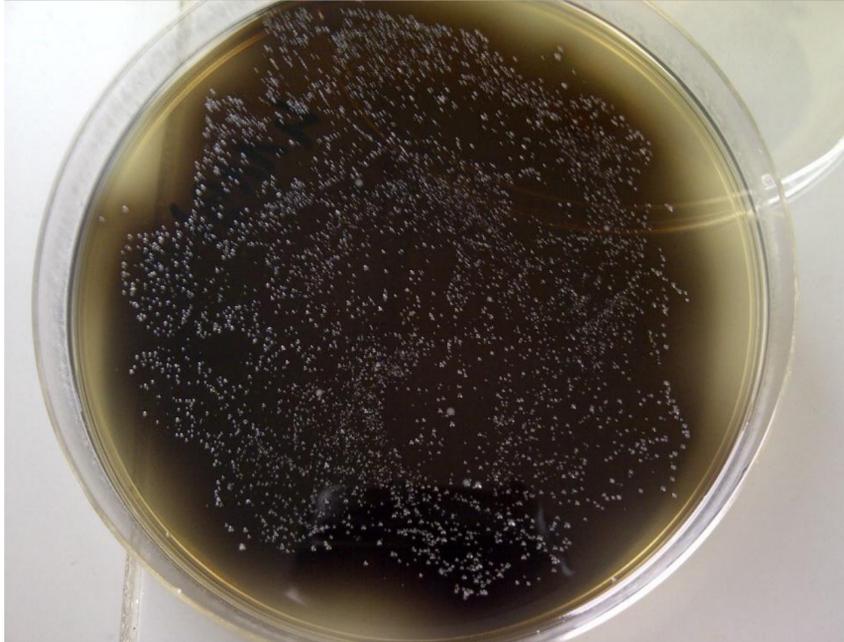
# Feed particle size - case study CB 21 days



Parameter	Dusty Feed	Coarse Fraction
Dry matter (%)	90.19	89.39
Crude Protein (%)	22.19	14.66
Crude Fibre (%)	7.1	4.7
Crude Ash (%)	15.3	11.2
Starch (%)	19.9	42.6
Sugar (%)	4	2.8
Phosphorus (mg/kg)	6485	4201

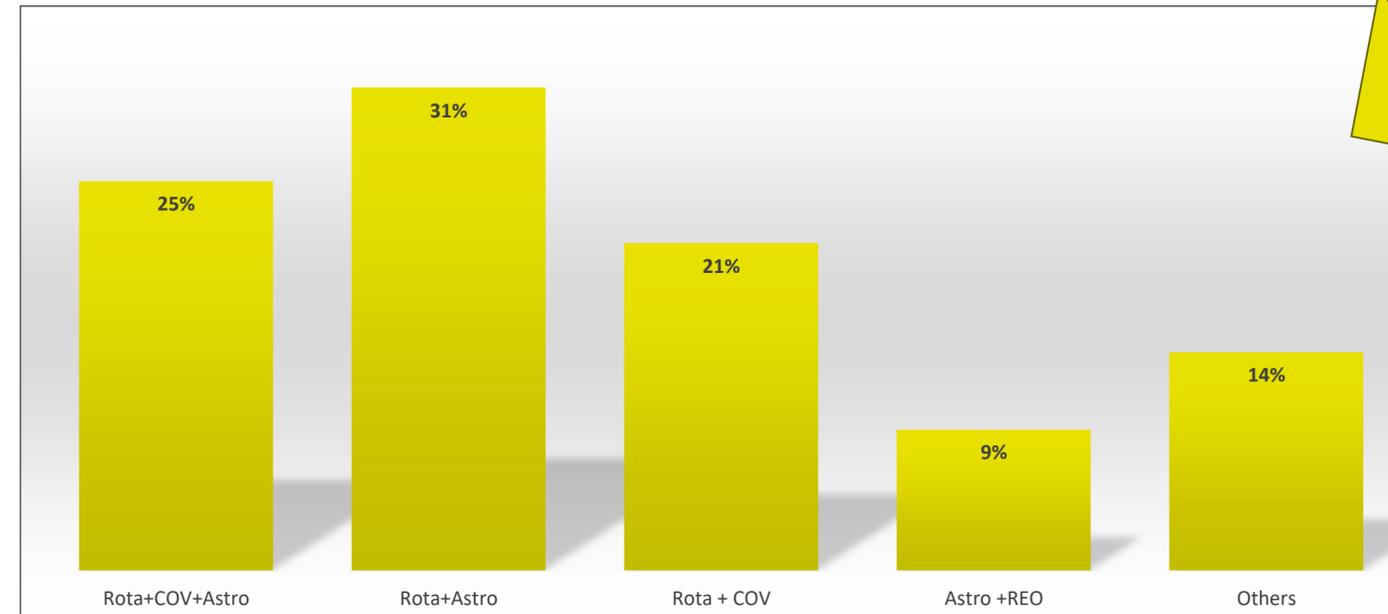
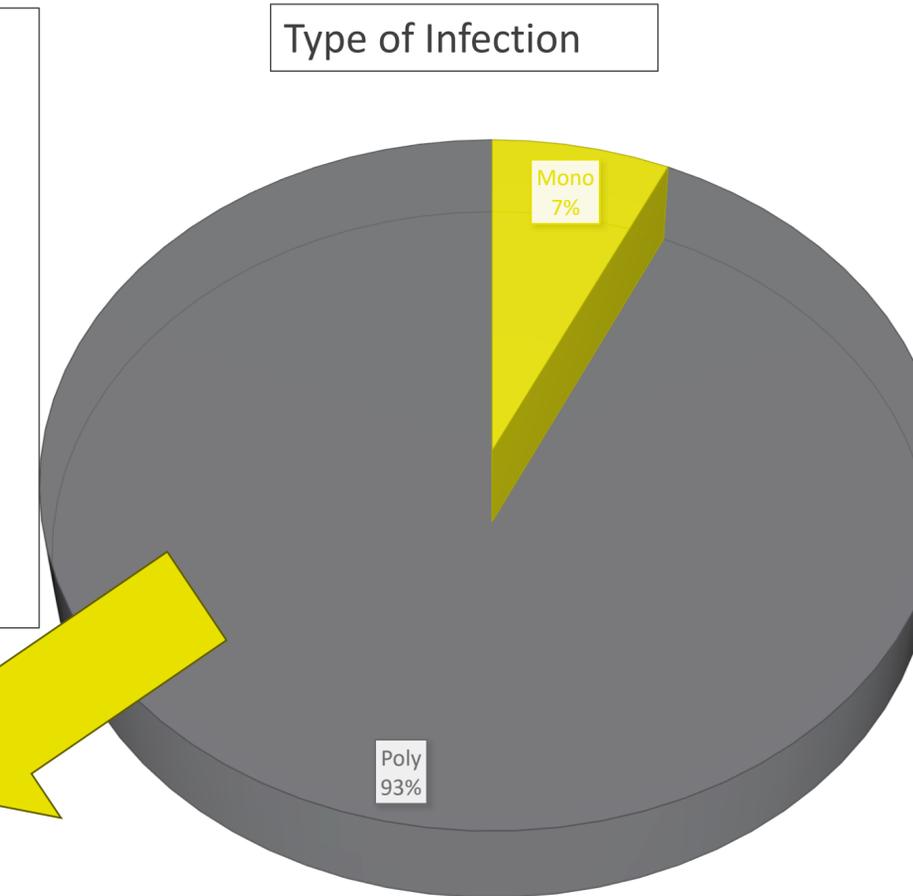


# Water system quality

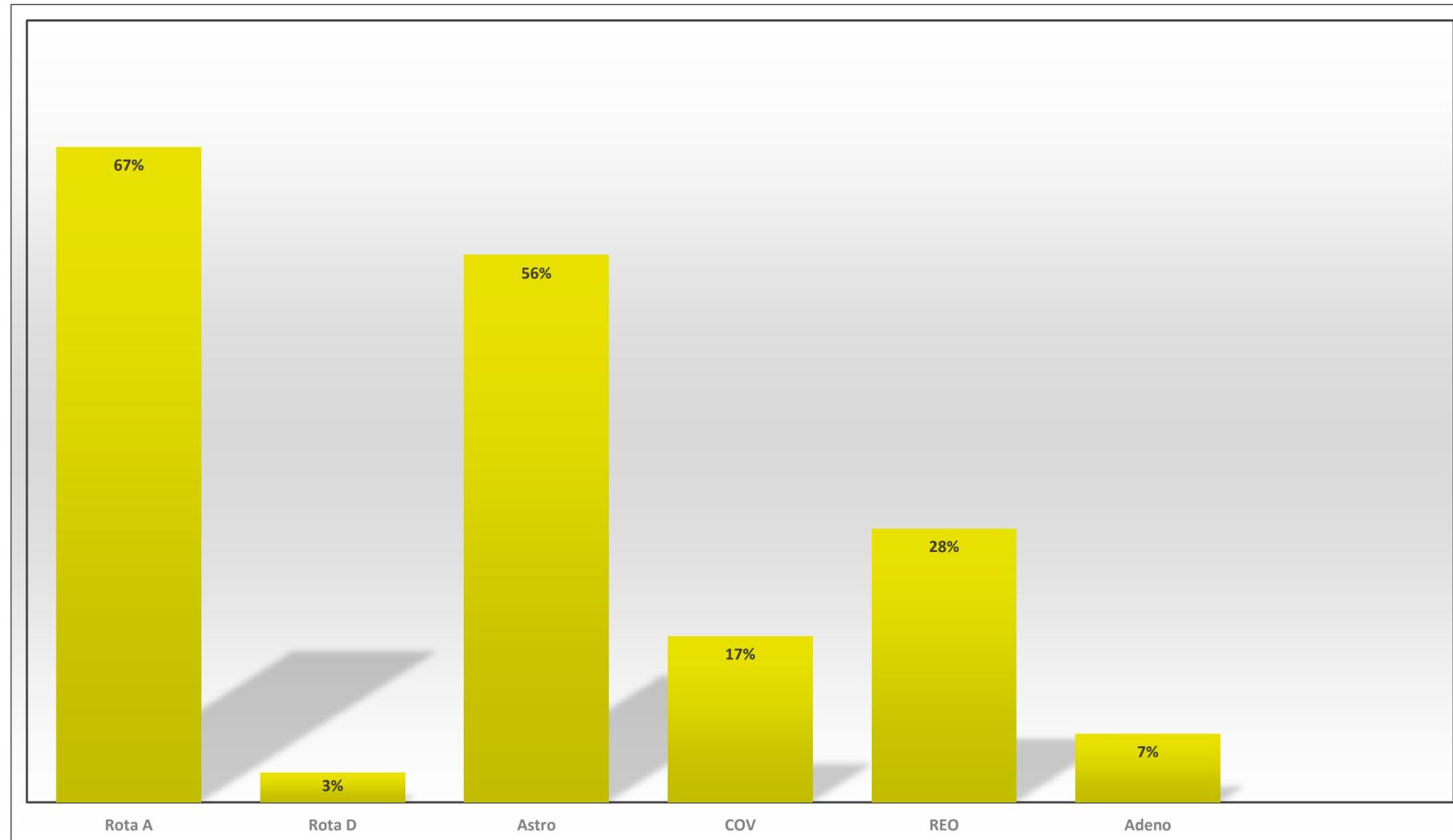


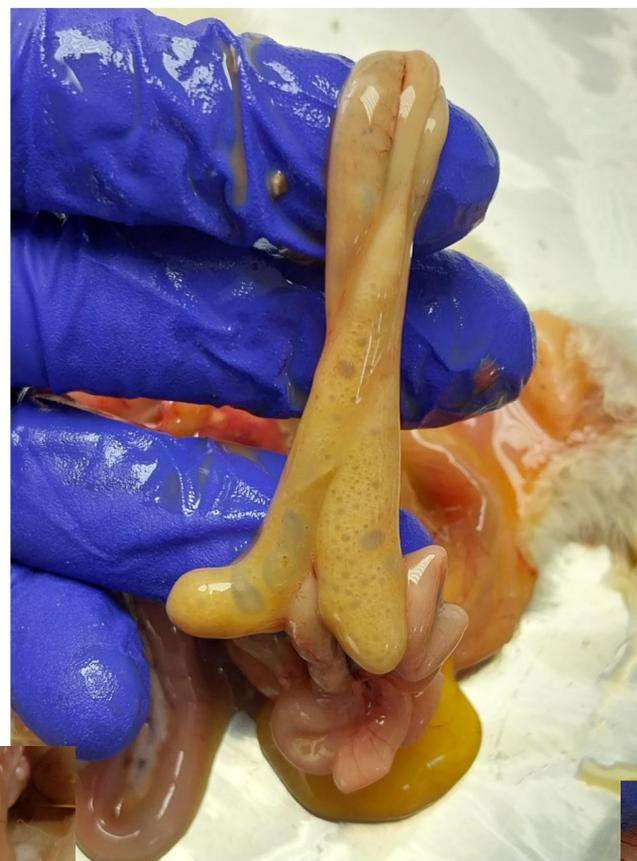
# Viral intestinal infections

- They work in a group, not alone
- The main symptom is "wet litter,,
- They are most dangerous for young birds
- They damage the intestinal epithelium and cause malabsorption syndrome
- They open the "gate" for bacteria
- They are extremely resistant in the environment - non-enveloped viruses



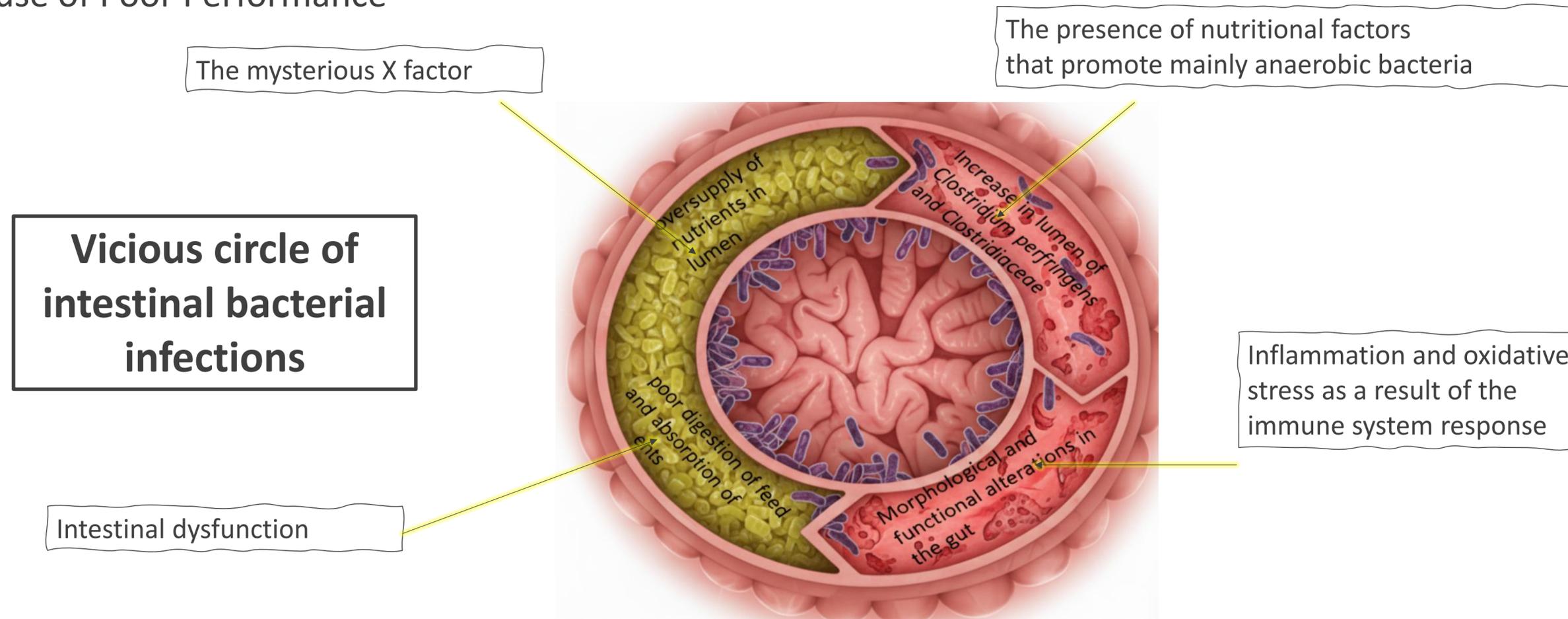
# Most common viral factors - 2024





# Intestinal bacterial infections

- Necrotizing Enterocolitis: The Silent Killer Activated by Stress
- Harmless to Chickens, Dangerous to Humans - *Salmonella*, *Campylobacter*
- Spirochaetosis: The Hidden Cause of Poor Performance
- Two faces of *E. coli*

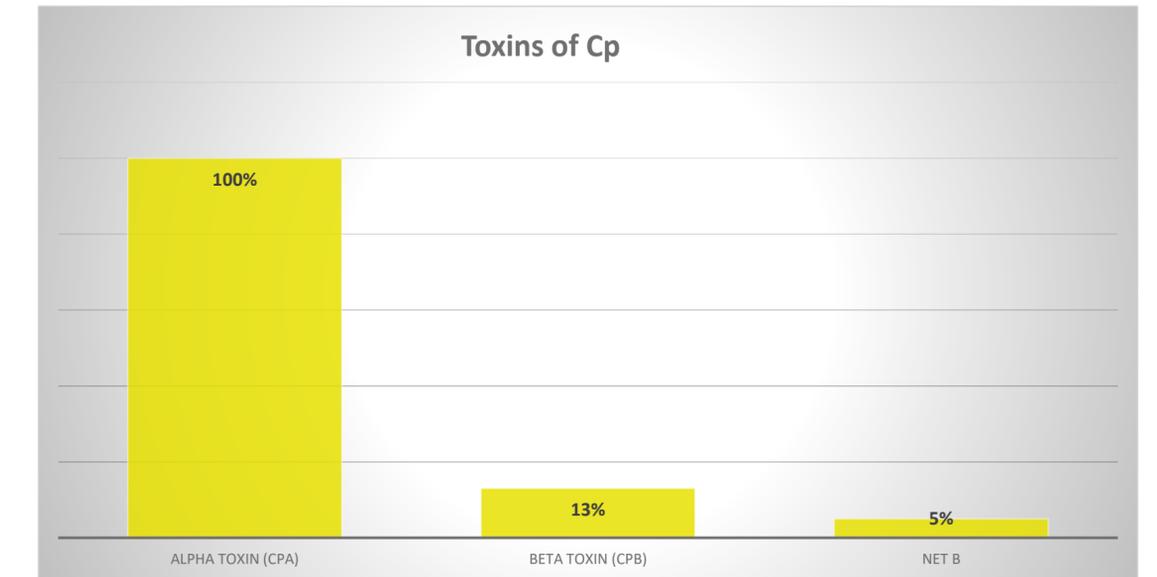
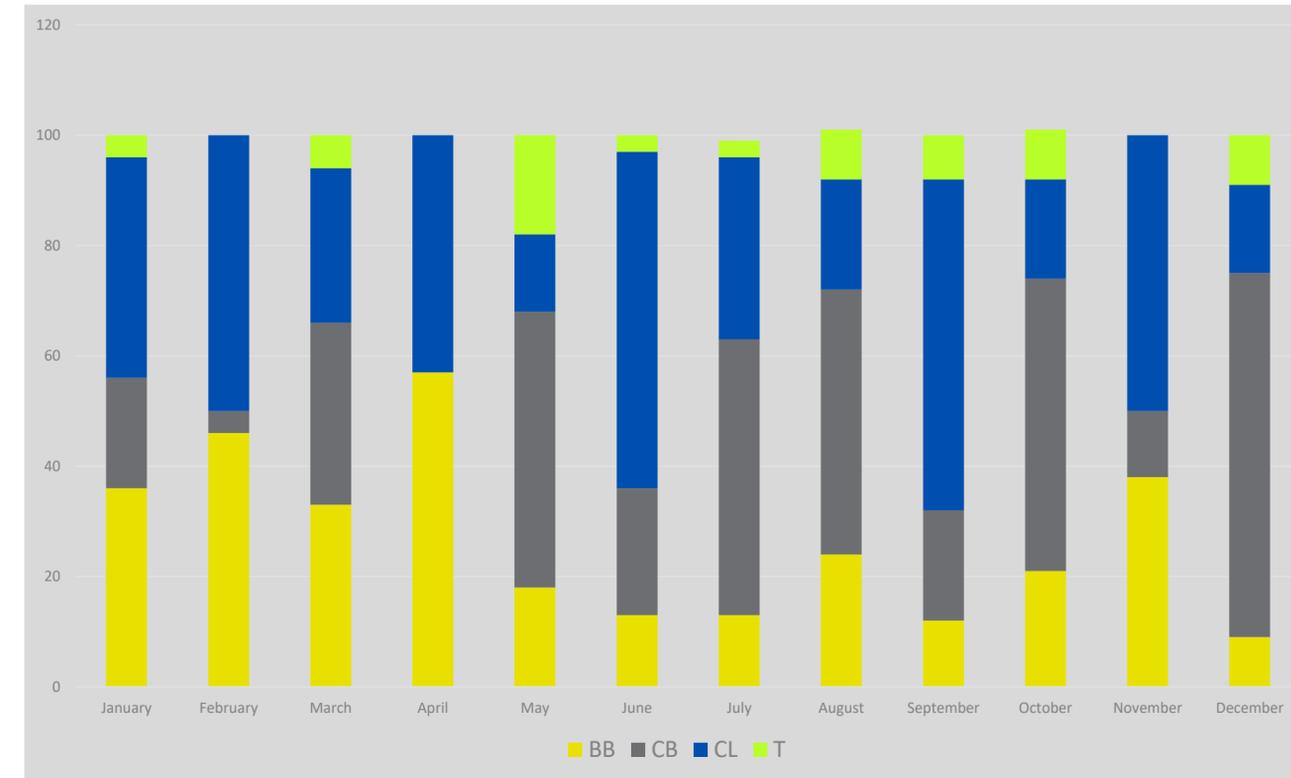
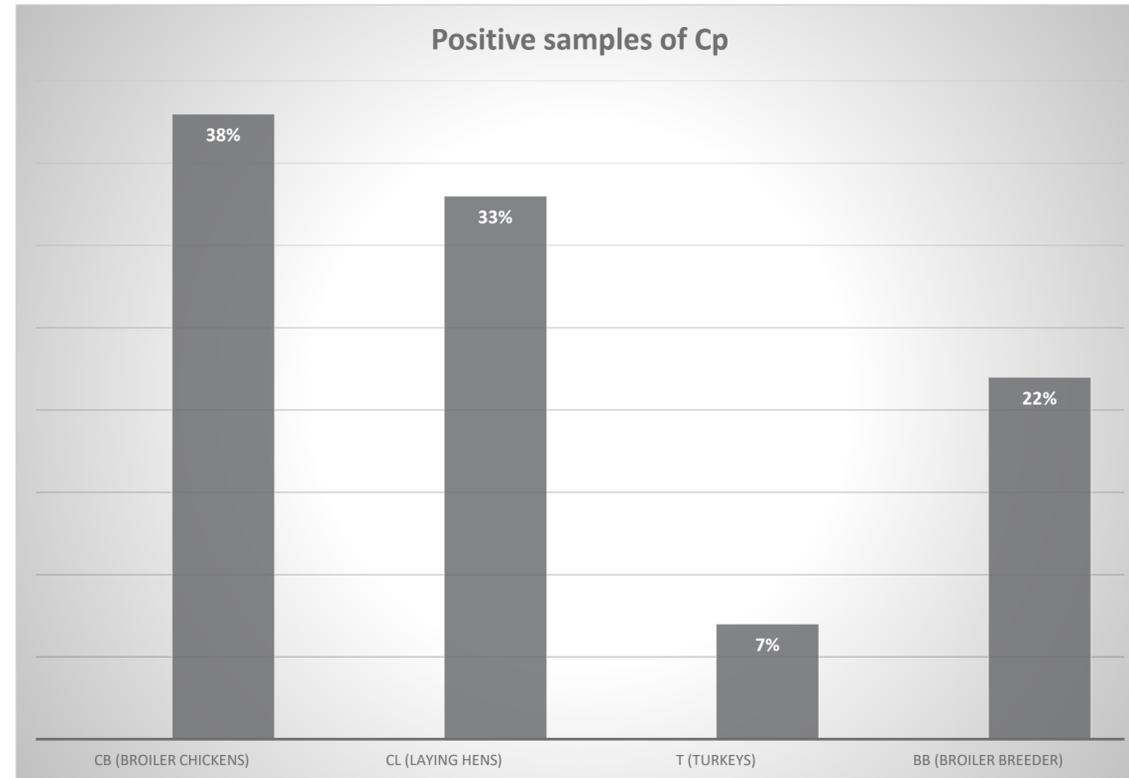


# Necrotic Enteritis (NE): The silent killer

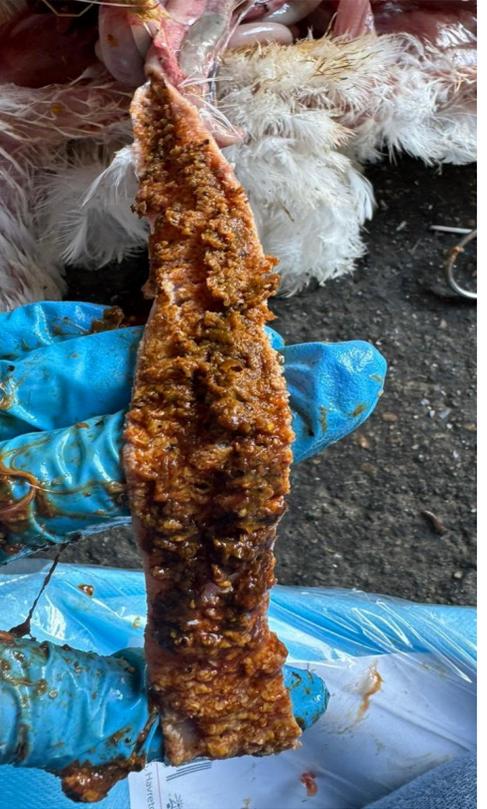
- Enterotoxaemic nature of infection
- NetB (Necrotic enteritis B-like toxin) and phospholipase C are the main tools of death
- A rich set of enzymes: collagenase, proteases, hemolysins, hyaluronidase, deoxyribonuclease and neuraminidase
- Permanent resident of the intestines
- Diet is key – the “protein monster.”
- Often acts in association with - coccidiosis, histomoniasis, roundworms



# Necrotic Enteritis (NE) – figures 2024



# Necrotic Enteritis (NE)



# Poultry colibacillosis

- Occurrence of potential APEC (pAPEC)
- Intestinal inflammation is practically non-existent, but it colonizes all tissues from the respiratory system to the skin
- Not all *E. coli* is "bad" - most are silent roommates
- It is the "armed" minority that is the problem
- Survival champion in environment (chicken house, feed, water)
- It acts like a "hyena" - it attacks the weakened



# APEC strains - VAGS – virulence associated genes of E. coli

Virulence factors encoded by genes located in pathogenic islands (PAIs) of chromosomes or plasmids.

*astA* - encodes heat stable EAST enterotoxin, which facilitates colonization of the intestines by APEC strains

*iucD* - encodes the siderophore aerobactin chelating iron ions in the environment

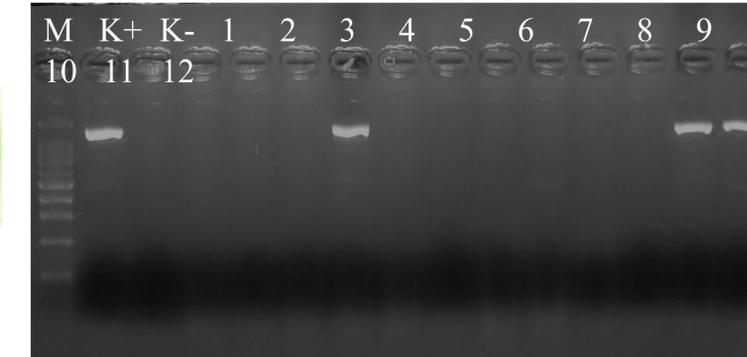
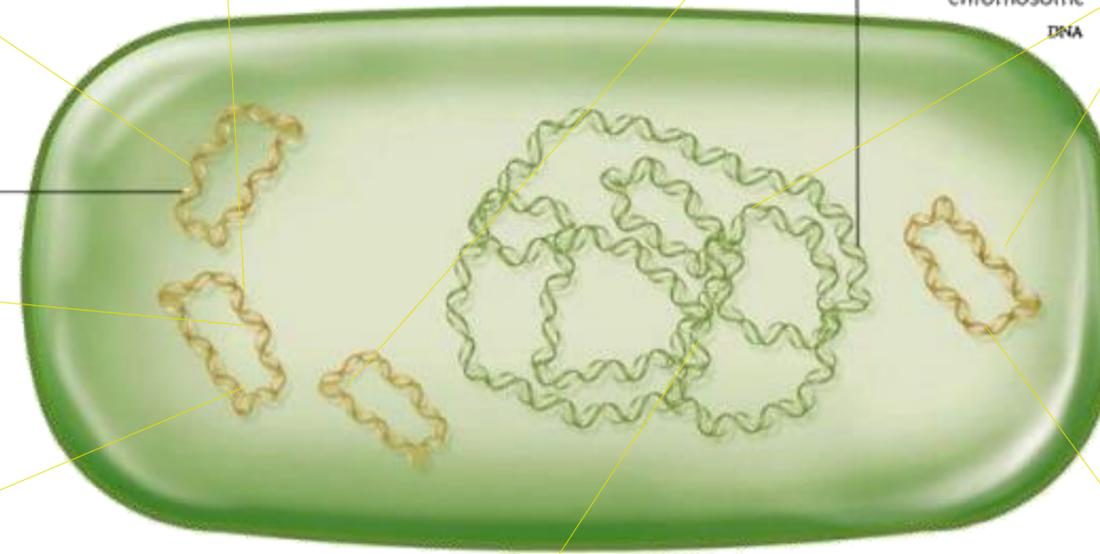
*irp2* - encodes the siderophore yersiniabactin absorbing iron ions from the environment

*iss* - encodes the Iss lipoprotein, a factor that enables bacteria to survive in the host's serum by inhibiting the complement system

*cvi/cva* - encodes bacterial colicins that are able to inhibit the growth of related organisms

Plasmid DNA

Bacterial chromosome DNA



*tsh* - encodes temperature sensitive hemagglutinin Tsh responsible for erythrocyte agglutination

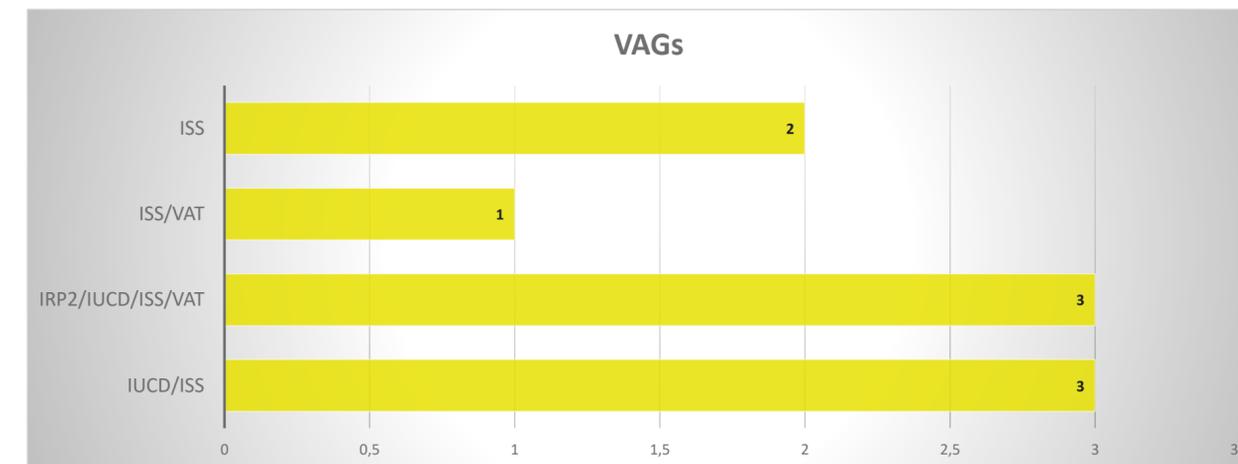
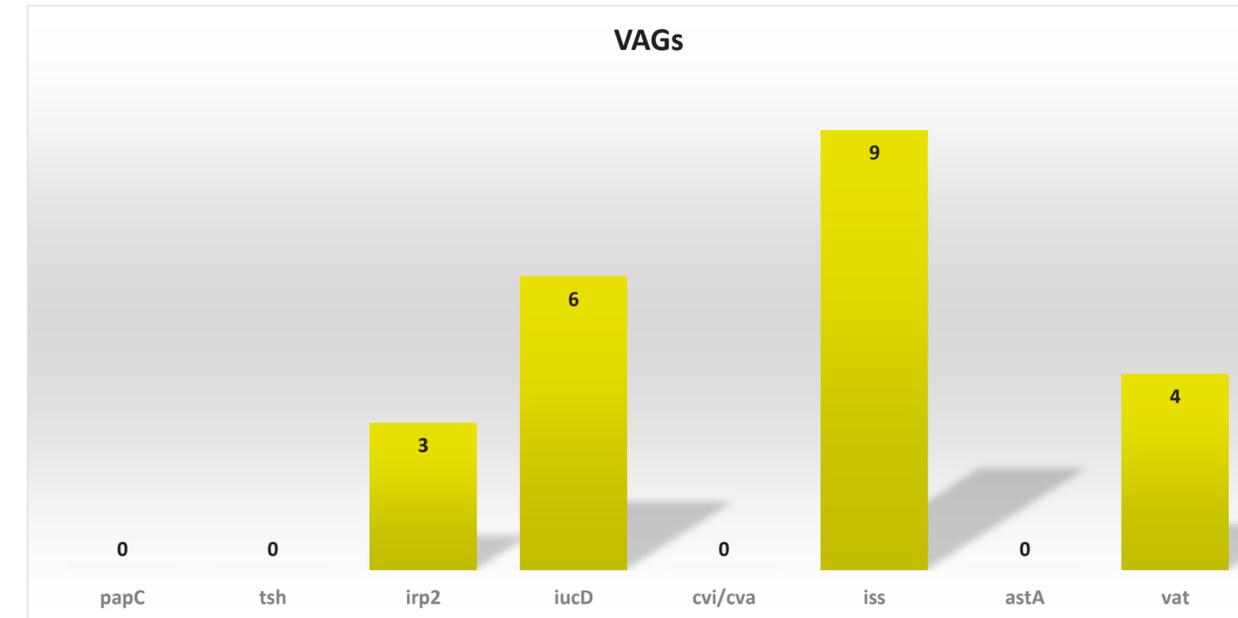
*papC* - encodes P fimbria adhesins enabling the binding of bacteria to host epithelial cells

*vat* - encodes a cytotoxin that causes changes in the epithelial tissue of the host

# Intestine as a potential source of APEC

- 10 chicken broiler farms
- Cloacal swabs from 5 birds from each farm from birds showing no symptoms of the disease
- Birds aged 18 to 24 days

Farm	No. of genes
1	2;8
2	2;8
3	4;8
4	0;8
5	2;8
6	4;8
7	2;8
8	1;8
9	1;8
10	4;8



# Pathological picture of colibacteriosis

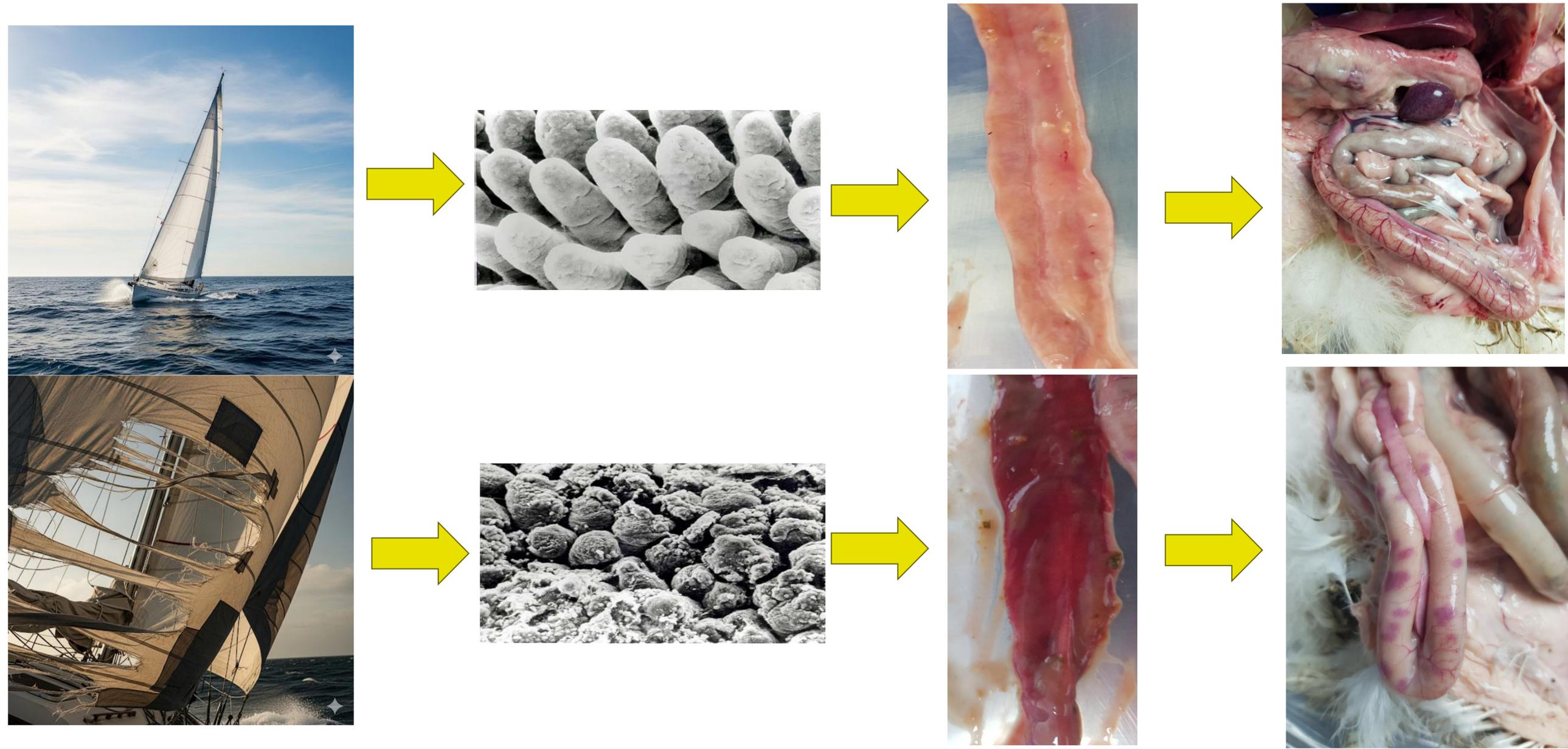


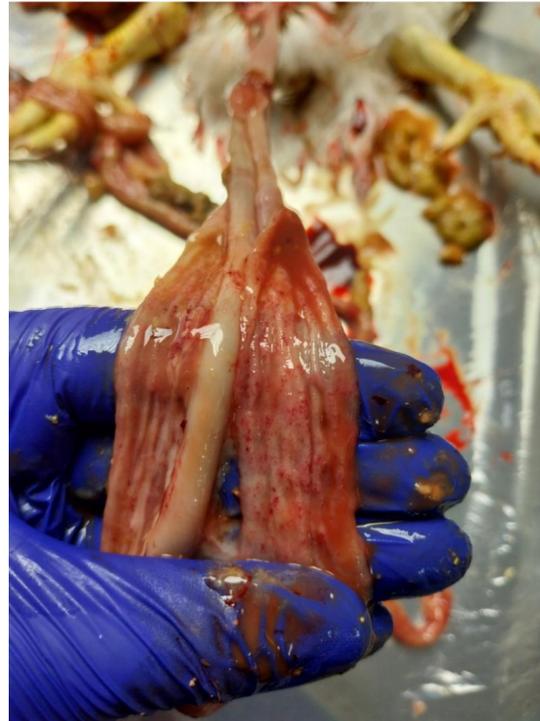
# Coccidiosis in chickens

- Coccidiosis is a disease of the entire flock
- New cycle every 4-7 days depending on species/strain
- The biggest challenge - eradication from the environment
- The most expensive subclinical form



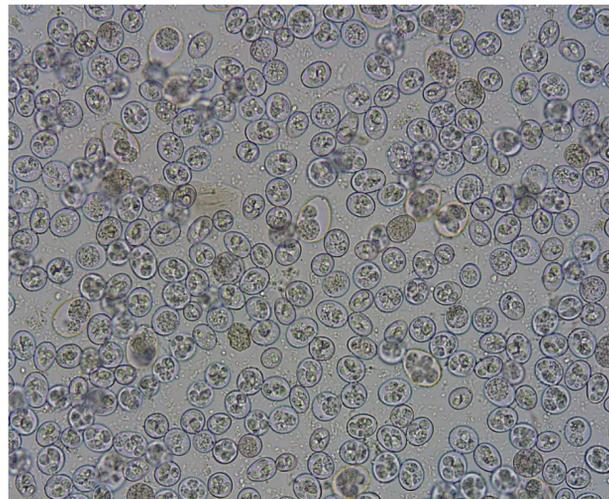
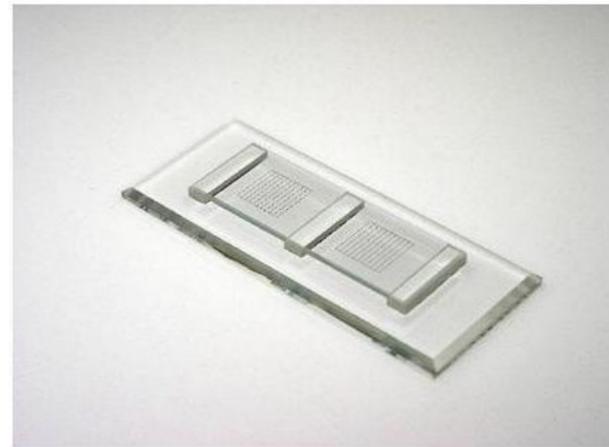
# Coccidiosis in chickens: Gateway to further infections

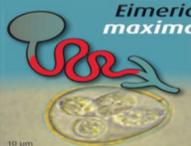
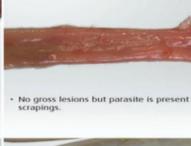
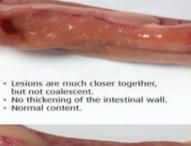
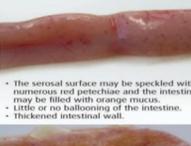
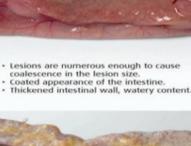
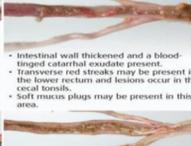




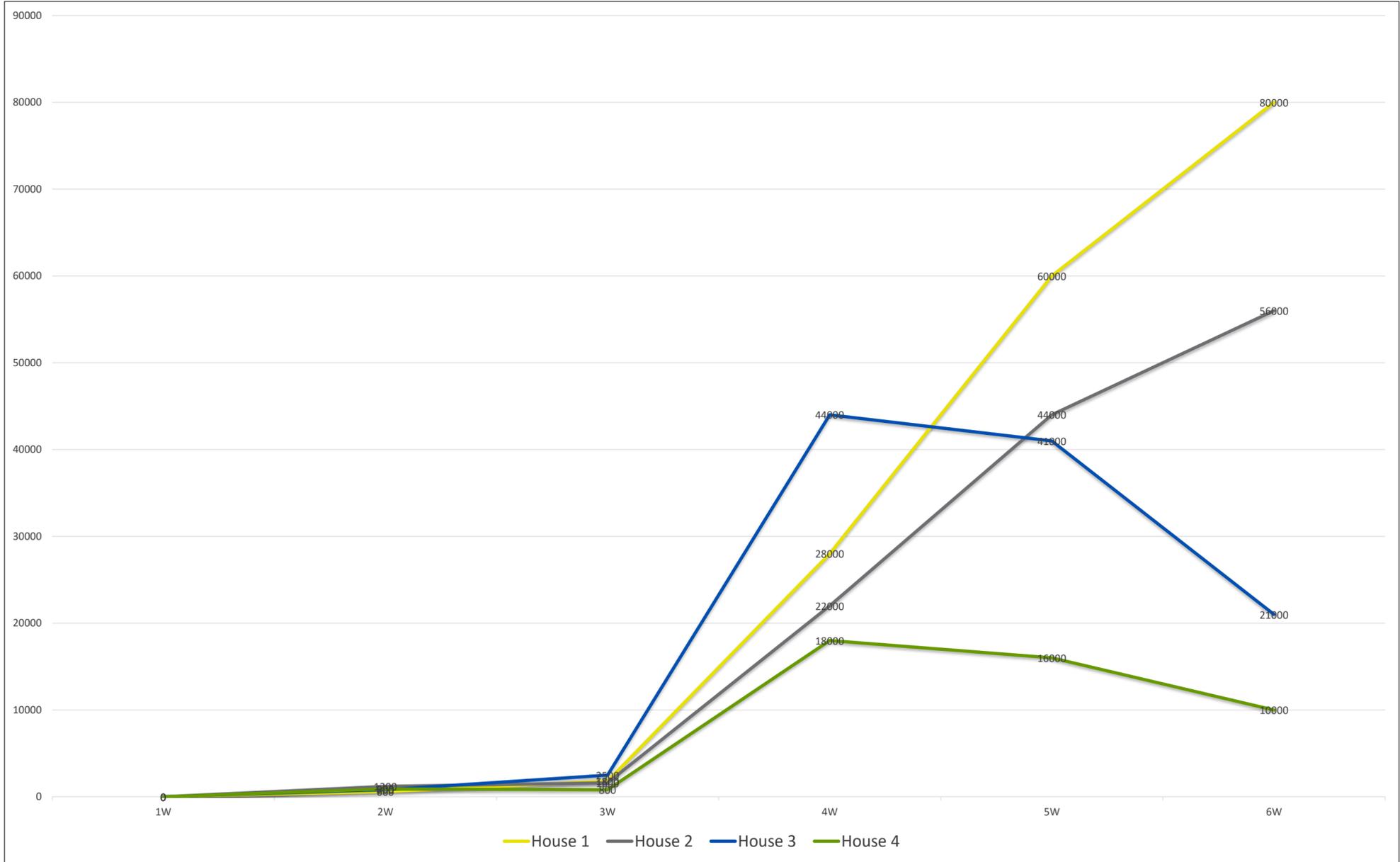
# Coccidiosis monitoring

- OPG determining the oocyst count
- „Scoring” Intestinal Change Index
- Determining the level of coccidiostats Feed control testing

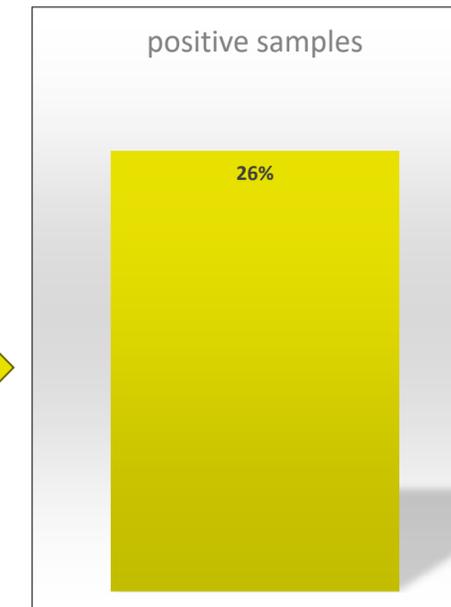
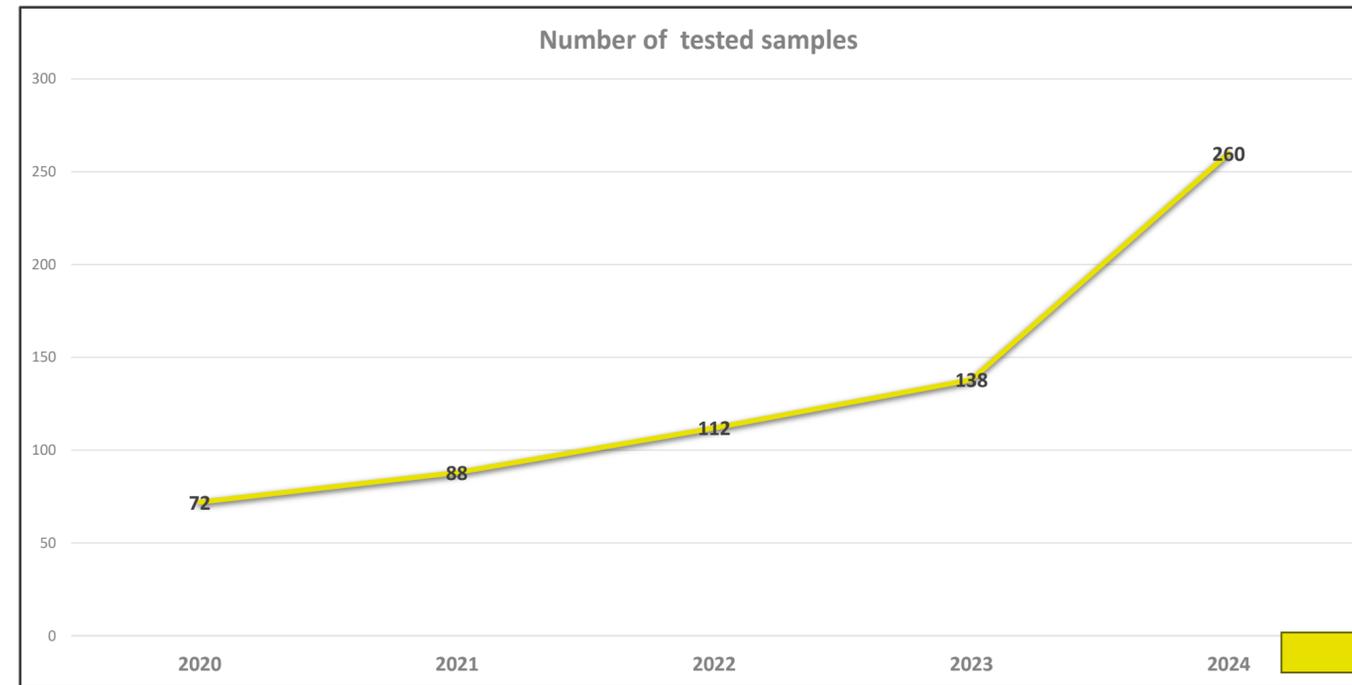


	<i>Eimeria acervulina</i>	<i>Eimeria maxima</i>	<i>Eimeria tenella</i>	<i>Eimeria brunetti</i>	<i>Eimeria necatrix</i>
<b>Score 1</b>	 <ul style="list-style-type: none"> <li>• Scattered white plaque-like lesions.</li> <li>• Can be seen on serosal or mucosal intestinal surfaces.</li> <li>• Maximum 5 lesions per square centimeter.</li> </ul>	 <ul style="list-style-type: none"> <li>• Small red petechiae may appear on the serosal side of the mid-intestine.</li> <li>• No ballooning or thickening of the intestine; small amounts of orange mucus may be present.</li> </ul>	 <ul style="list-style-type: none"> <li>• Very few scattered petechiae on cecal wall.</li> <li>• No thickening of the cecal wall.</li> <li>• Normal cecal contents.</li> </ul>	 <ul style="list-style-type: none"> <li>• No gross lesions but parasite is present in scrapings.</li> </ul>	 <ul style="list-style-type: none"> <li>• Small scattered petechiae and white spots are easily seen from the serosal side.</li> <li>• Little, if any, damage is apparent on the mucosal surface.</li> </ul>
<b>Score 2</b>	 <ul style="list-style-type: none"> <li>• Lesions are much closer together, but not coalescent.</li> <li>• No thickening of the intestinal wall.</li> <li>• Normal content.</li> </ul>	 <ul style="list-style-type: none"> <li>• The serosal surface may be speckled with numerous red petechiae and the intestine may be filled with orange mucus.</li> <li>• Little or no ballooning of the intestine.</li> <li>• Thickened intestinal wall.</li> </ul>	 <ul style="list-style-type: none"> <li>• Numerous petechiae. Noticeable blood in the cecal contents.</li> <li>• Somewhat thickened cecal wall.</li> <li>• Normal cecal contents.</li> </ul>	 <ul style="list-style-type: none"> <li>• Intestinal wall may appear greyish.</li> <li>• The lower portion may be thickened.</li> <li>• Salmon colored flecks, sloughed from the intestine are present.</li> </ul>	 <ul style="list-style-type: none"> <li>• Numerous petechiae and white spots are visible on the serosal surface.</li> <li>• Slight ballooning confined to the mid gut area may be present.</li> </ul>
<b>Score 3</b>	 <ul style="list-style-type: none"> <li>• Lesions are numerous enough to cause coalescence in the lesion size.</li> <li>• Coated appearance of the intestine.</li> <li>• Thickened intestinal wall, watery content.</li> </ul>	 <ul style="list-style-type: none"> <li>• Intestinal wall is ballooned and thickened. Roughened mucosal surface.</li> <li>• Intestinal contents are filled with pinpoint blood clots and mucus.</li> </ul>	 <ul style="list-style-type: none"> <li>• Large amount of blood or cecal cores are present. Cecal walls are greatly thickened.</li> <li>• Little, if any, faecal contents present in caeca.</li> </ul>	 <ul style="list-style-type: none"> <li>• Intestinal wall thickened and a blood-tinged catarrhal exudate present.</li> <li>• Transverse red streaks may be present in the lower rectum and lesions occur in the caecal toruli.</li> <li>• Soft mucus plugs may be present in this area.</li> </ul>	 <ul style="list-style-type: none"> <li>• Extensive hemorrhages into lumen of intestine.</li> <li>• The serosal surface is covered with red petechiae and/or white plaques.</li> <li>• The serosa is rough and thickened with many pinpoint hemorrhages.</li> <li>• No normal intestinal contents.</li> <li>• Ballooning extends over lower half of the small intestine.</li> </ul>
<b>Score 4</b>	 <ul style="list-style-type: none"> <li>• Coalescing of the lesions is complete and no distinctive lesions may appear in the duodenum.</li> <li>• Thickened &amp; roughened intestinal wall.</li> </ul>	 <ul style="list-style-type: none"> <li>• Numerous petechiae.</li> <li>• Bloody intestinal contents.</li> </ul>	 <ul style="list-style-type: none"> <li>• Severe bleeding &amp; thickened cecal wall. Unopened caeca is distended with blood at the distal end. The caeca might be contracted and shortened.</li> </ul>	 <ul style="list-style-type: none"> <li>• Extensive coagulation necrosis of the mucosal surface of the lower intestine may be present.</li> <li>• In some birds a dry necrotic membrane may line the intestine and caseous cores may plug the caeca.</li> <li>• Lesions may extend into middle/upper intestine.</li> </ul>	 <ul style="list-style-type: none"> <li>• Extensive hemorrhage giving the intestine a dark color.</li> <li>• Intestinal content consists of red or brown mucus.</li> <li>• Ballooning may extend throughout much of the length of the intestine.</li> </ul>

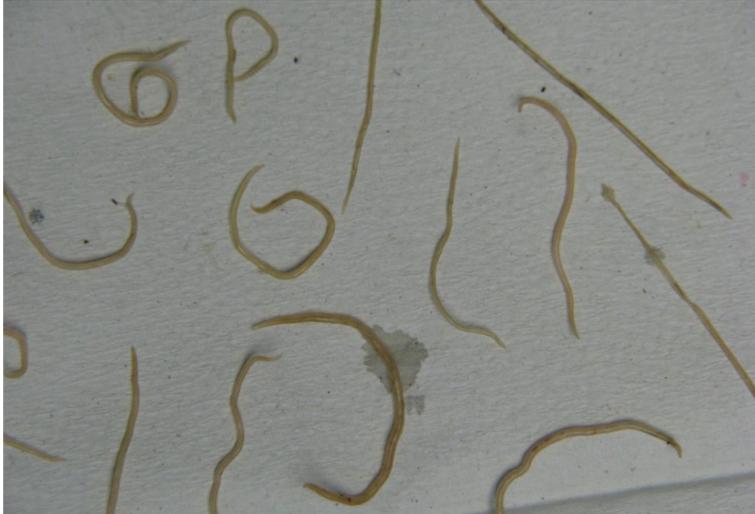
# OPG results



# Histomonas meleagridis infection



# Parasitosis of chickens



# Integrated control and prevention strategies in the post-antibiotic era

## To Do

- Biosecurity: The Foundation of Herd Health
- Monitoring – Knowledge is Power
- Nutrition Management and Alternative Feed Additives
- Prevention Instead of Cure

## Future

- Modern Vaccination Programs
- Microbiome Analysis and Modulation
- New Generations of Additives and Toxin Management Strategies



# What feed additives to use?



- Pre- & probiotics
- Phytotherapeutics - herbs and etheric oils
- Enzymes
- Beta-glucans
- Bacteriophages
- Antimicrobial peptides
- Toll-like receptor agonists
- Organic Acids

**Numbers don't lie -  
Only data speaks for itself**

- Assess where your weak point is - feed, hygiene, biosecurity
- Check all data of products and tools
- Set up your own field trial using scoring system
- Analyze production and financial results

# Here are the essential messages to take home

- Diagnose your flocks and measure what is affecting gut health
- Use objective and repeatable methods of performance monitoring (OPG, scoring, etc.)
- Collect data and analyze
- Find your weaknesses - assess what support you need

Find your own X factor



THANK  
YOU!

