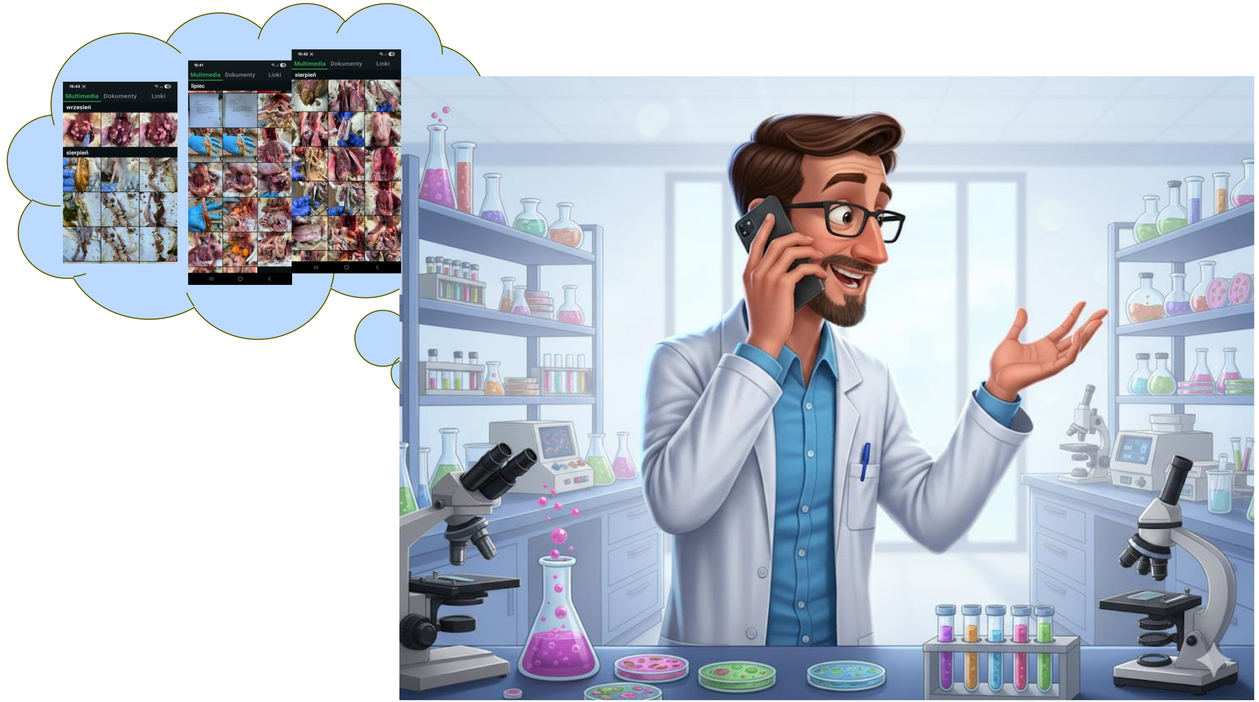
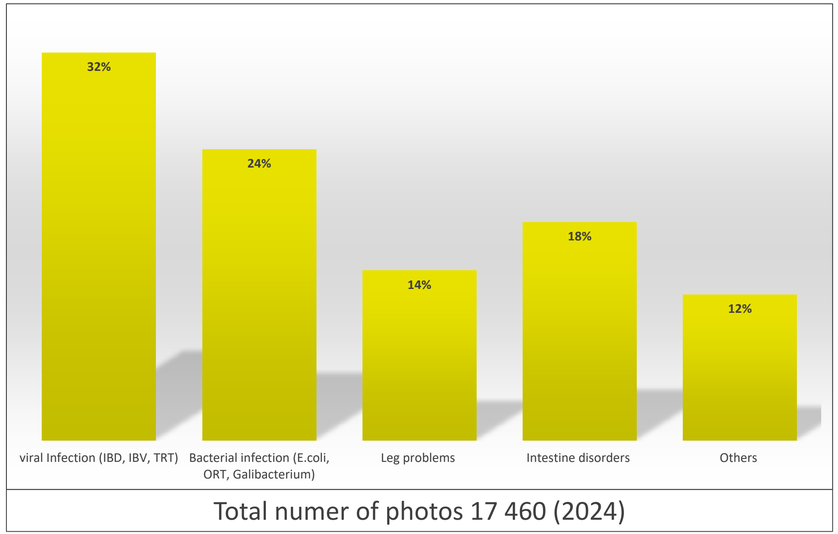
Enteropathies in poultry
- Challenges in poultry production -

PhD DVM Jaroslaw Wilczynski

Laboratory Manager, Avi-Vet Servis, Poland

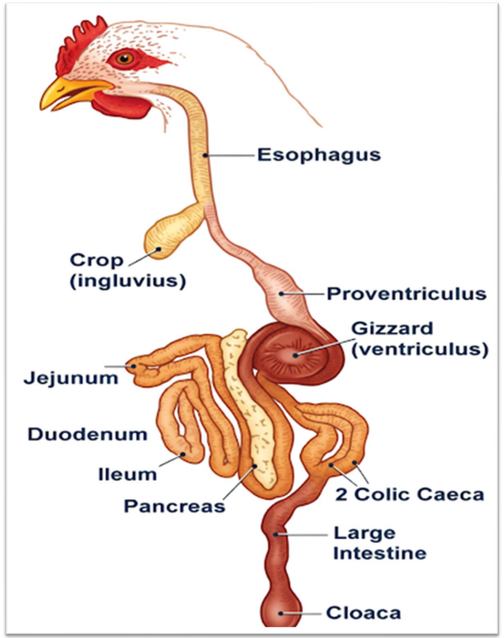
What are the biggest field diagnostic problems?





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”



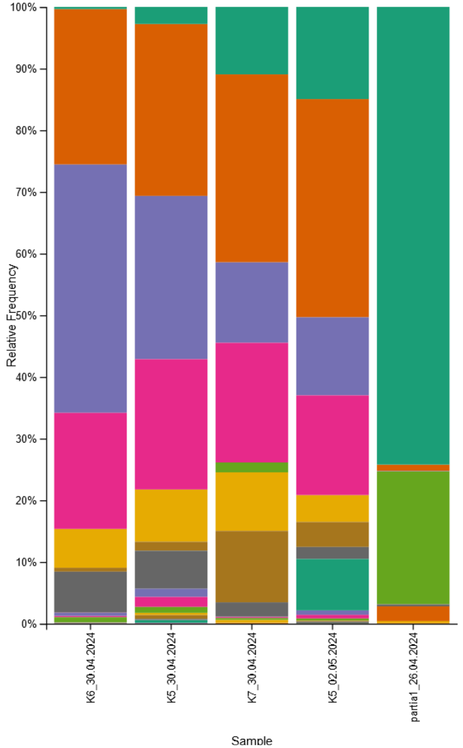
Economic impact: Measurable and hidden costs of enteropathy

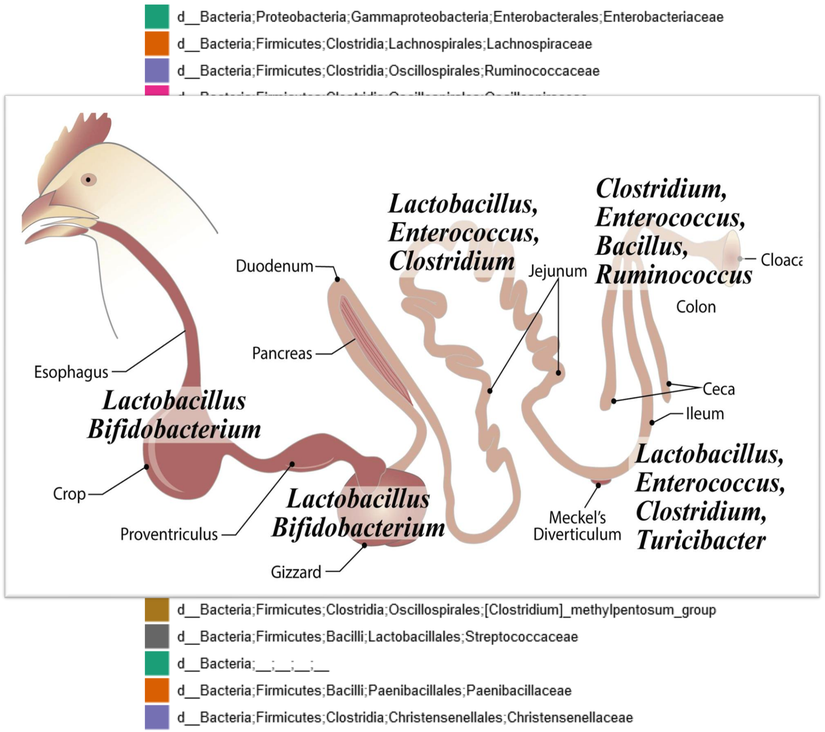
- Decreased feed conversion ratio (FCR)
- Reduced body weight gain (ADG)

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



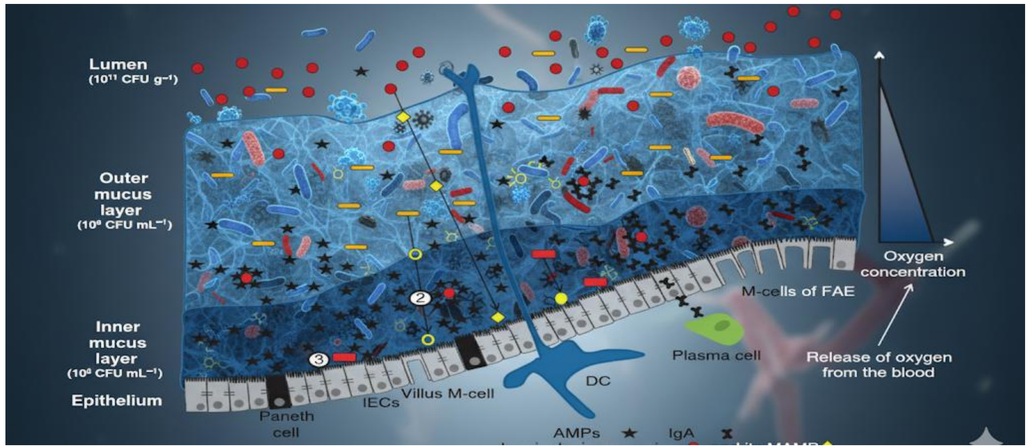


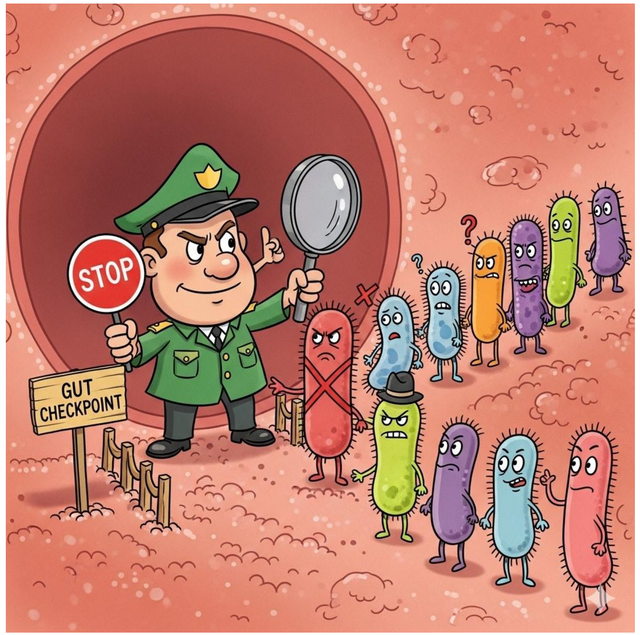
What is intestinal integrity?

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





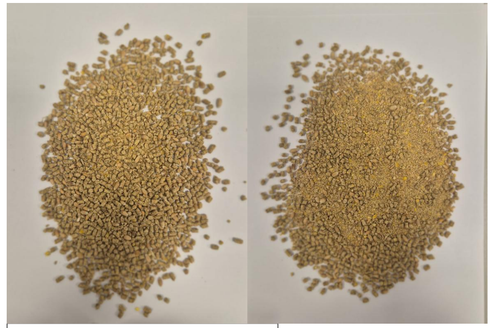
The mysterious X factor, the cause of all problems

- 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

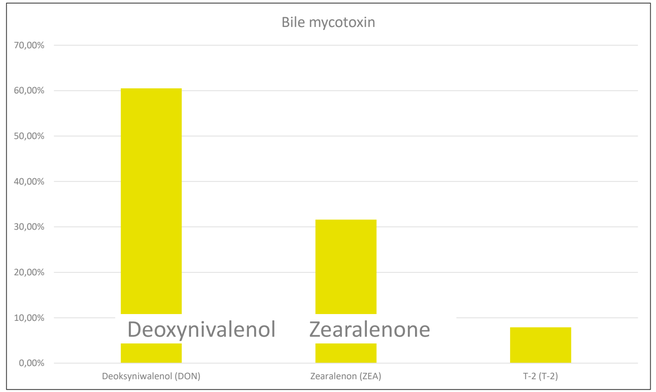


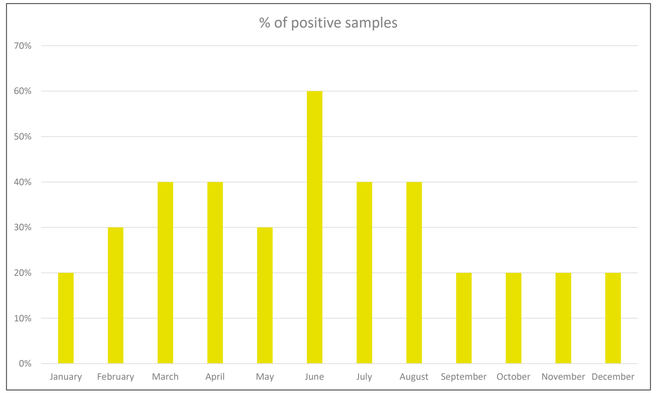
Feed homogenity

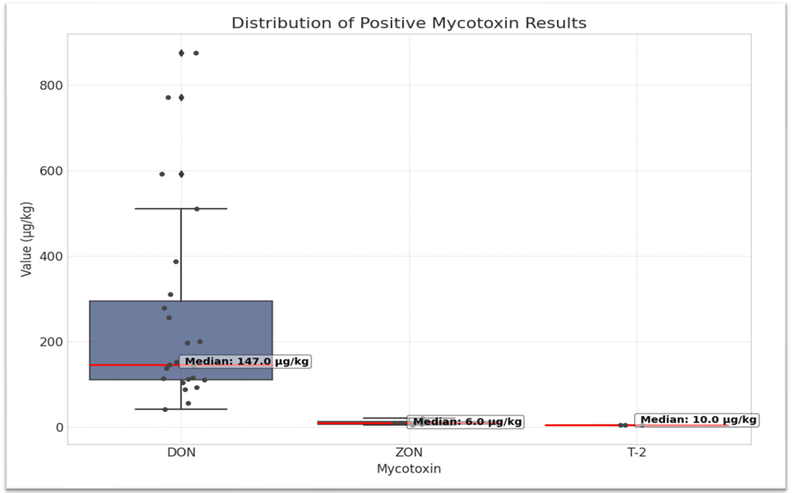
Mycotoxin

Production errors

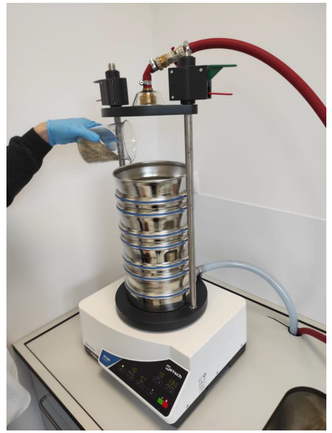
Mycotoxin problems



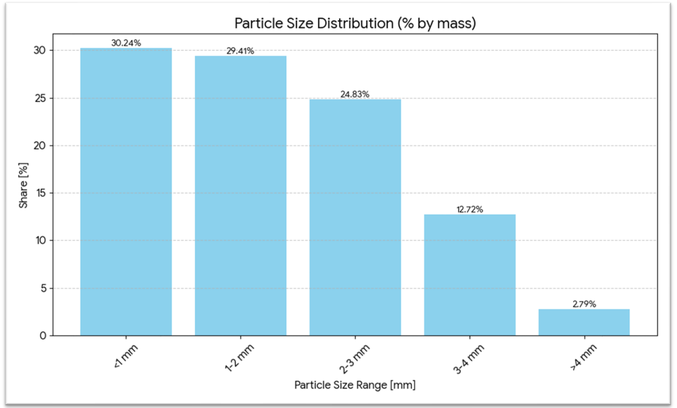




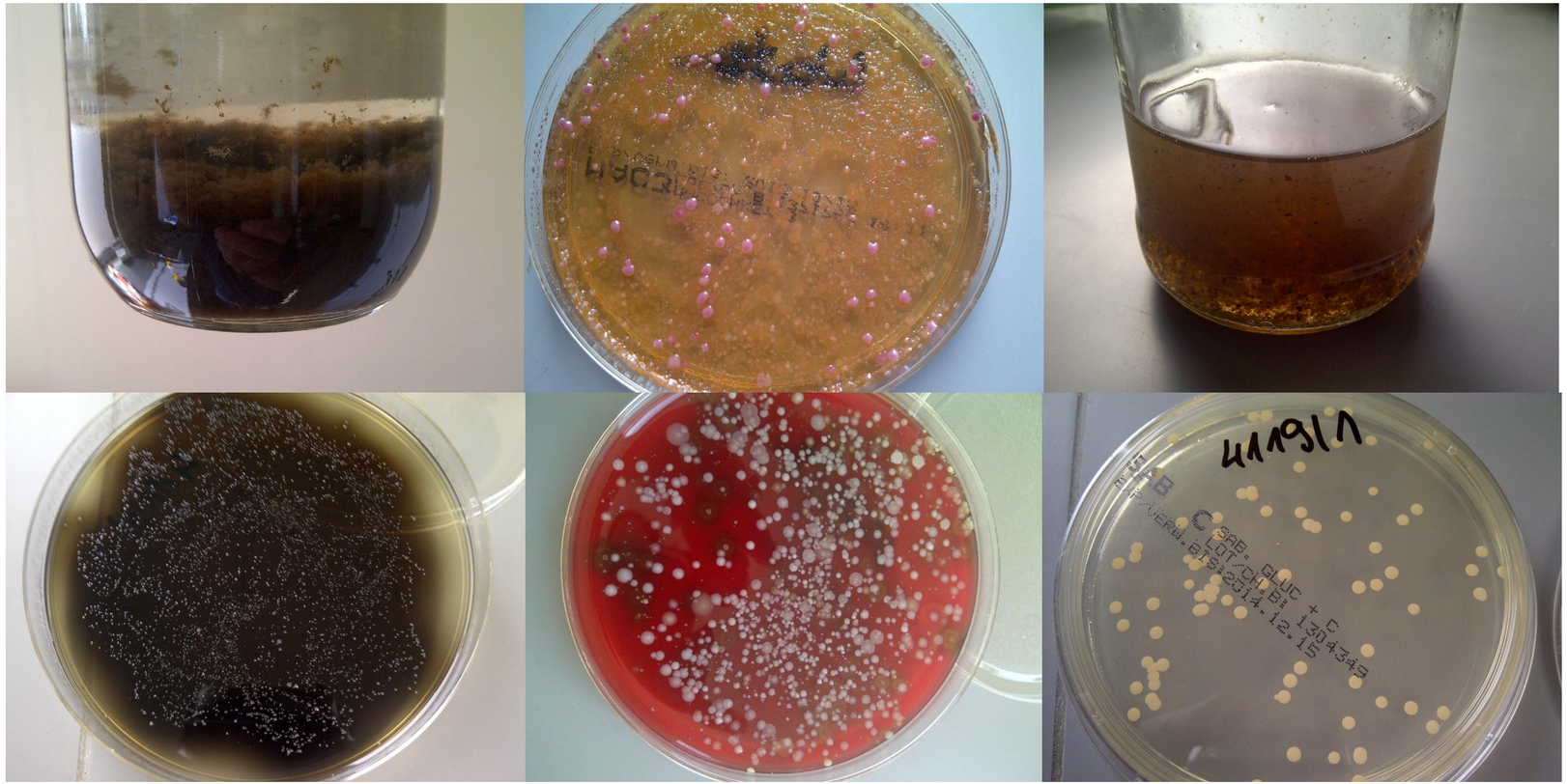
Feed particle size - case study CB 21 days



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

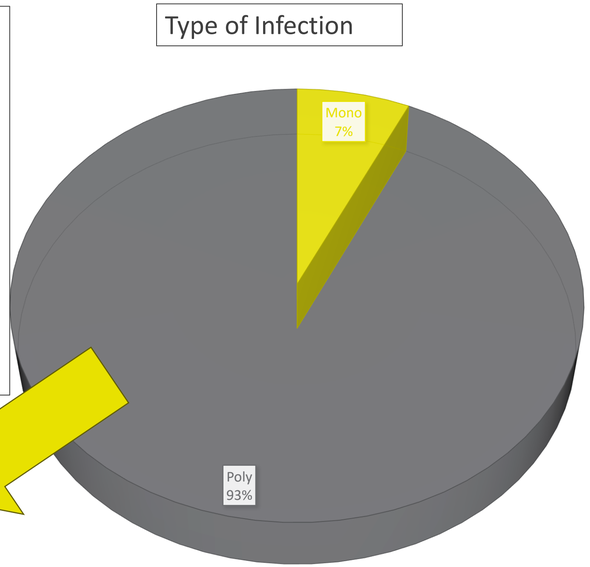


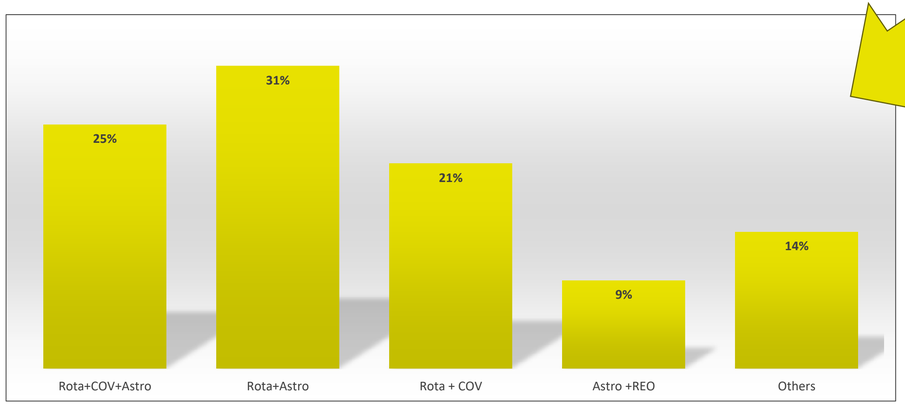
Water system quality



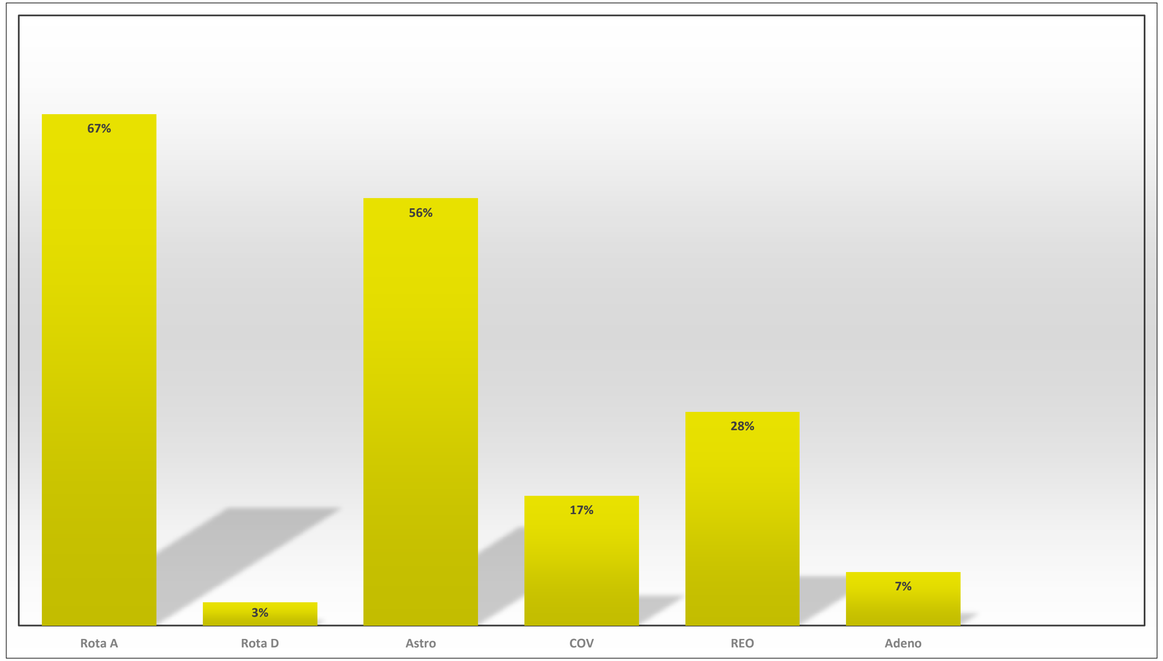
Viral intestinal infections

- 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

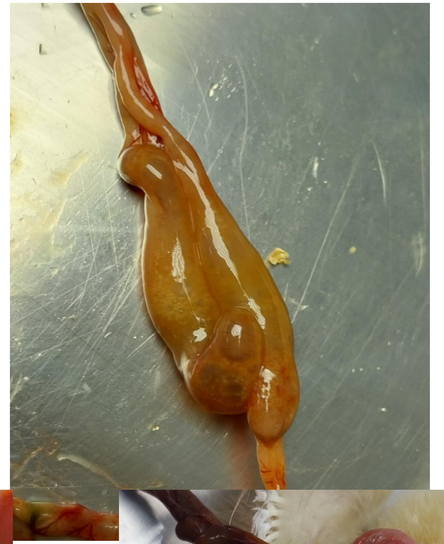




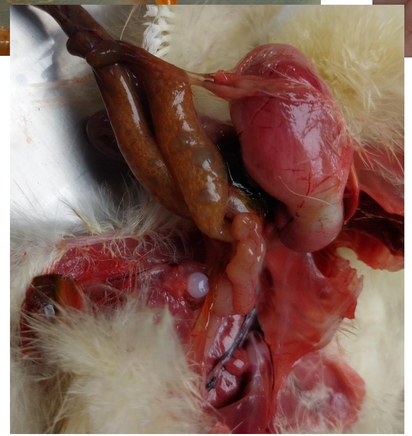
Most common viral factors - 2024





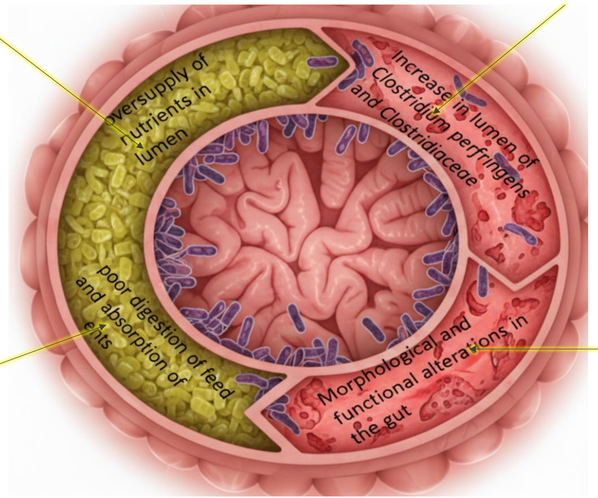




Intestrinal bacterial infections

- 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*

Vicious circle of intestinal bacterial infections



The mysterious X factor

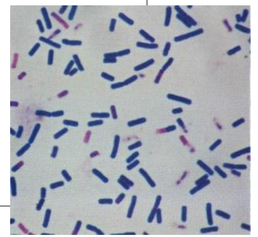
The presence of nutritional factors that promote mainly anaerobic bacteria

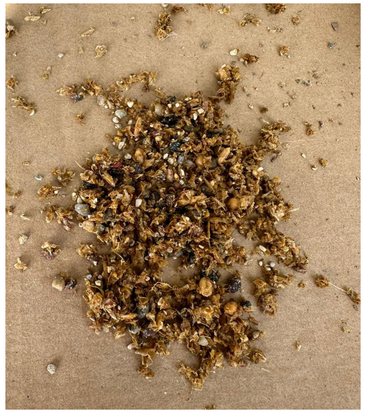
Inflammation and oxidative stress as a result of the immune system response

Intestinal dysfunction

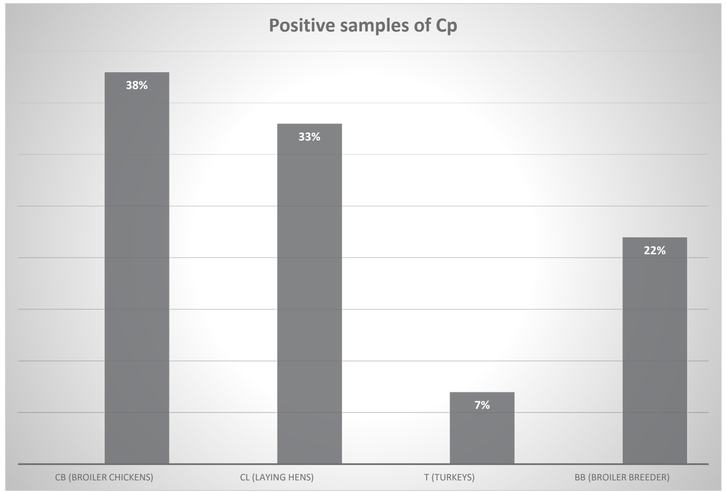
Necrotic Enteritis (NE): The silent killer

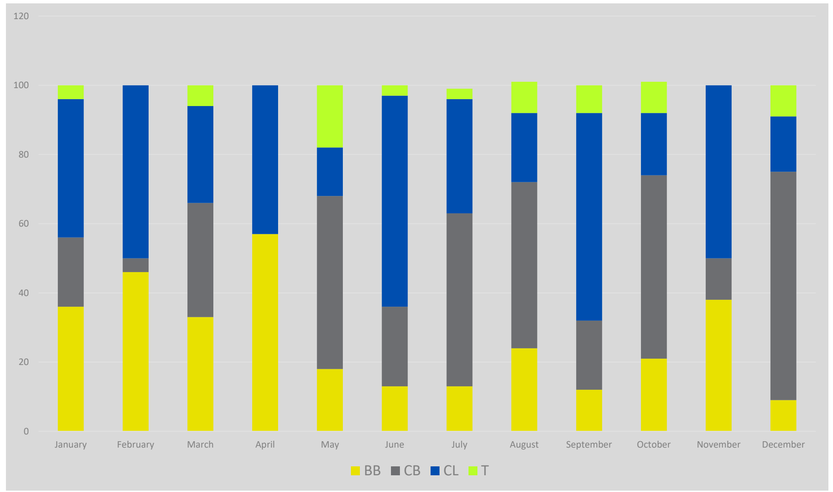
- Enterotoxaemic nature of infection
- NetB (Necrotic enteritis B-like toxin) and phospholipase C are the main tools of death
- A rich set of enzymes: collagenase, proteases, hemolysins, hyaluronidase, deoxyribonuclease and neuraminidase
- Permanent resident of the intestines
- Diet is key – the “protein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

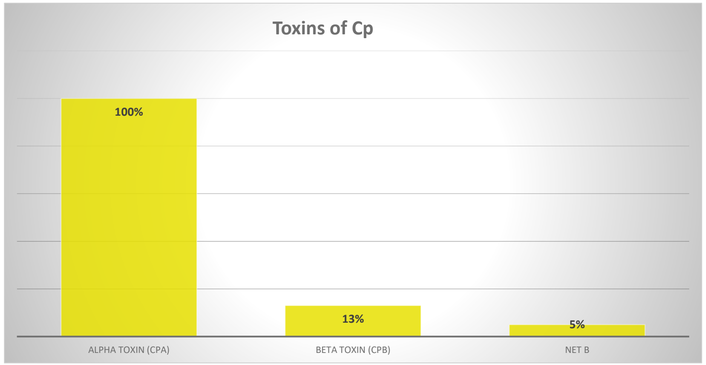




Necrotic Enteritis (NE) – figures 2024







Necrotic Enteritis (NE)

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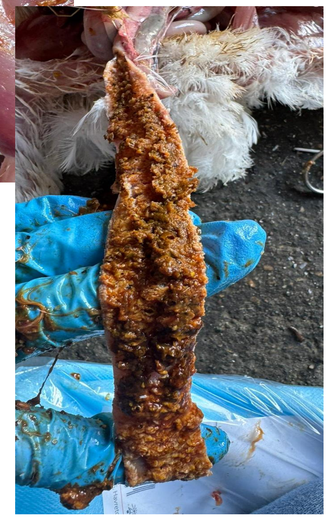

Poultry colibacillosis

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- 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 (PAIrs) of chromosomes or plasmids.

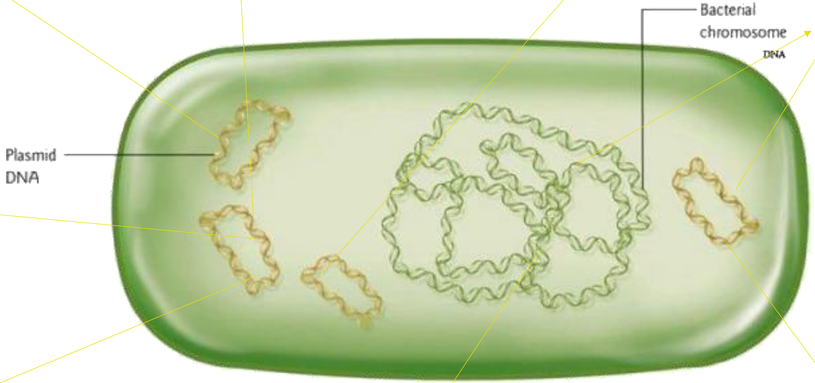
astA - encodes heat stable EAST enterotoxin, which facilitates colonization of the intestines by APEC strains

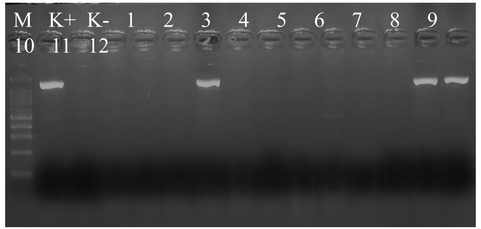
iucD - encodes the siderophore aerobactin chelating iron ions in the environment

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





tsh - encodes temperature sensitive hemagglutinin Tsh responsible for erythrocyte agglutination

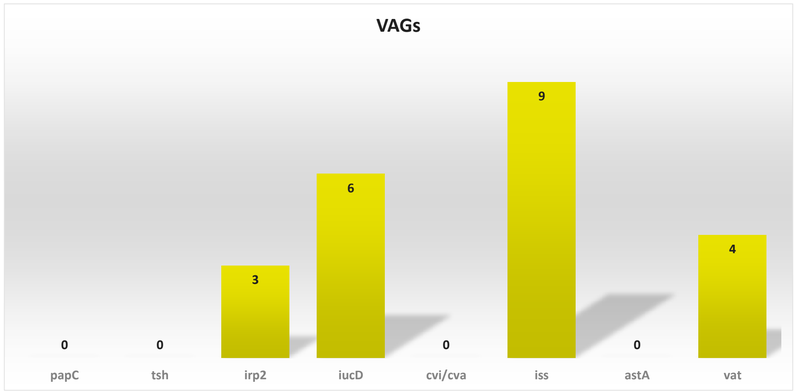
vat - encodes a cytotoxin that causes changes in the epithelial tissue of the host

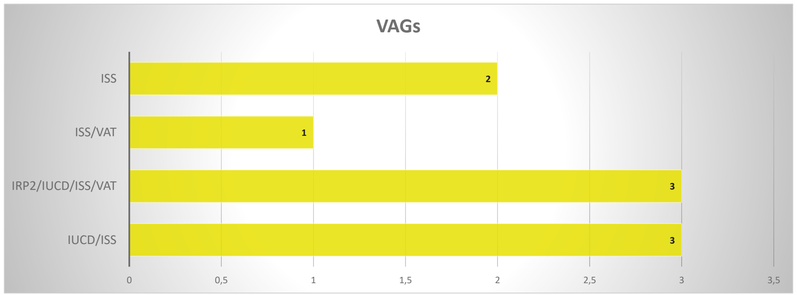
papC - encodes P fimbria adhesins enabling the binding of bacteria to host epithelial cells

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

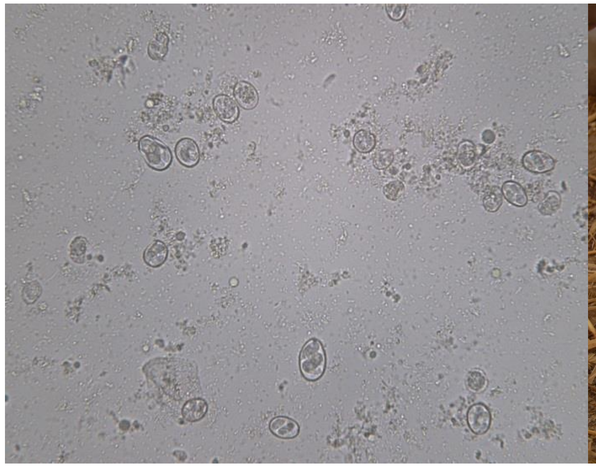




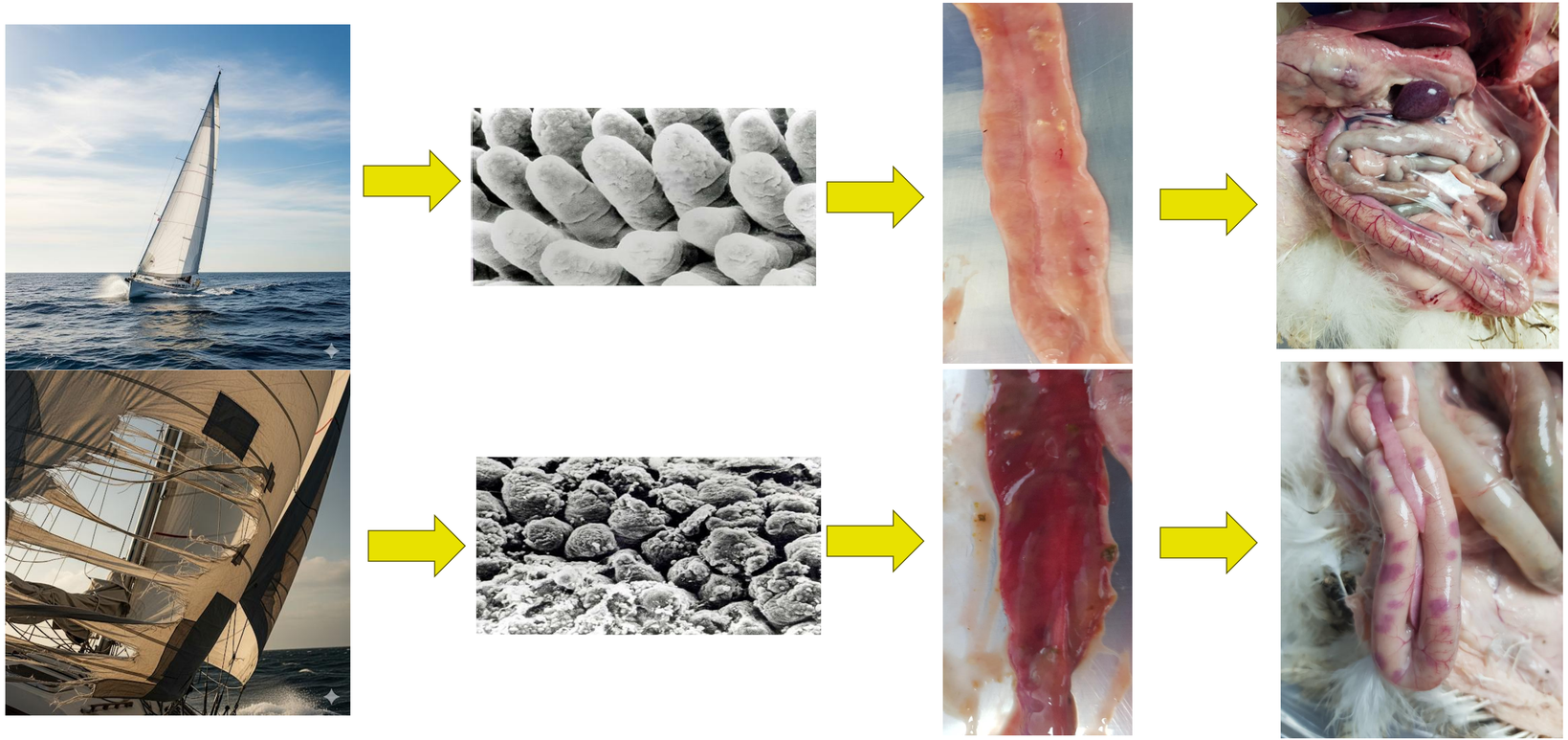
Pathological picture of colibacteriosis

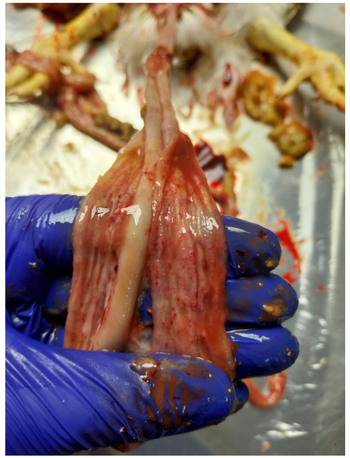
Coccidiosis in chickens

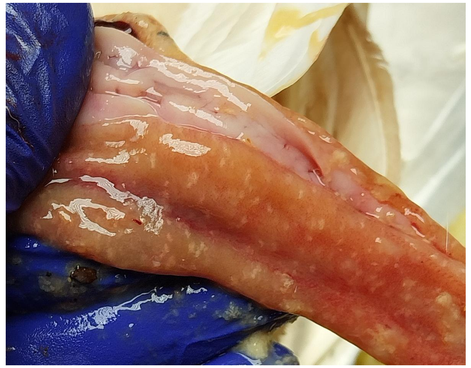
- Coccidiosis is a disease of the entire flock
- New cycle every 4-7 days depending on species/strain
- The biggest challenge - eradication from the environment
- The most expensive subclinical form



Coccidiosis in chickens: Gateway to further infections

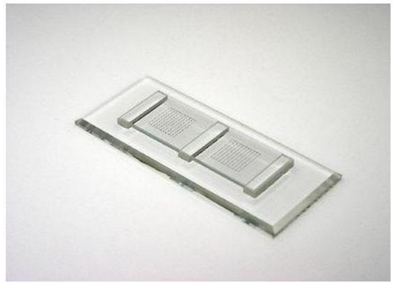


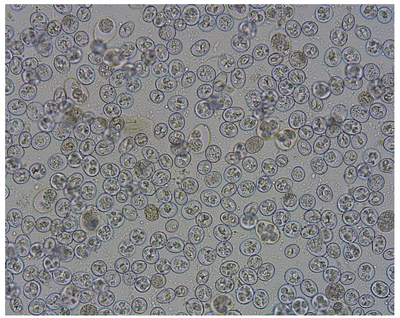




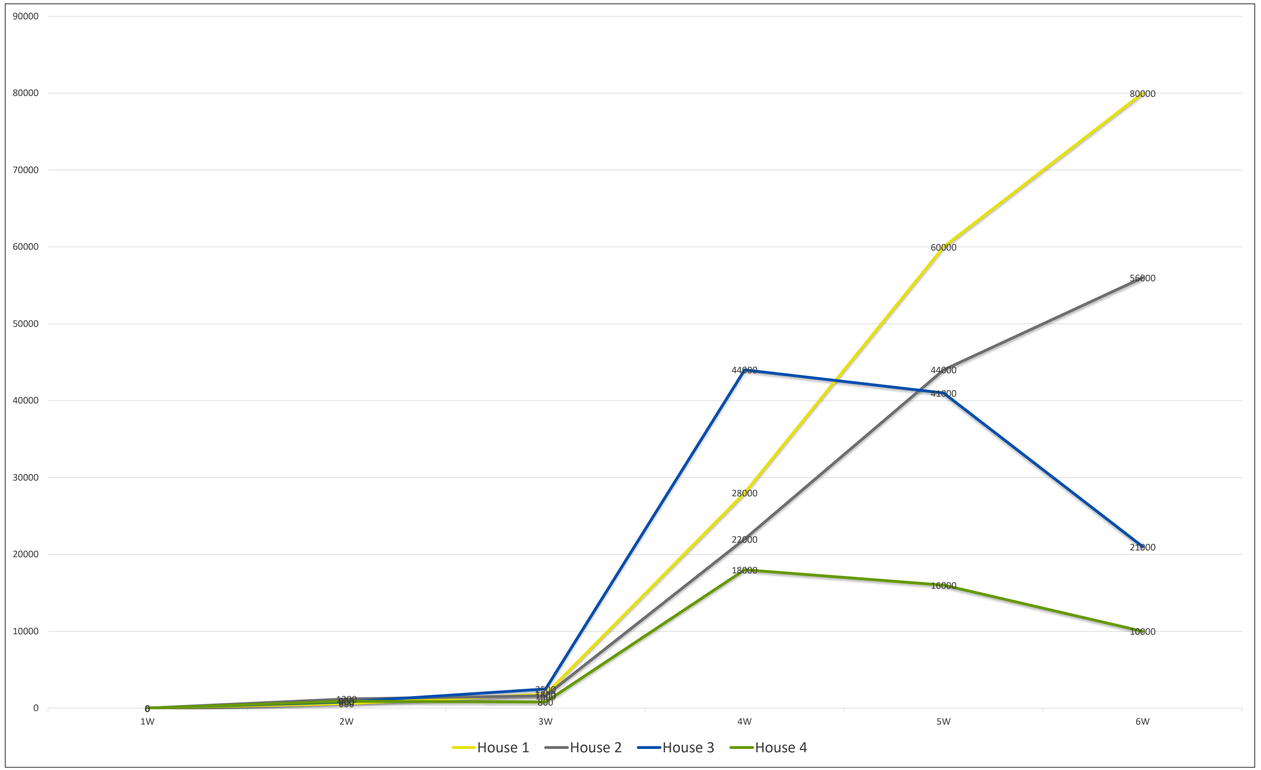
Coccidiosis monitoring

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





OPG results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18000
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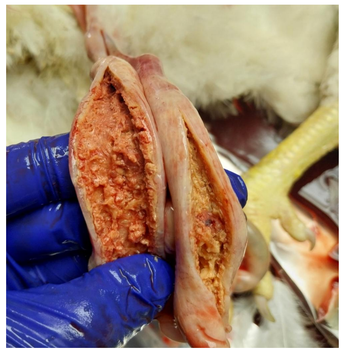
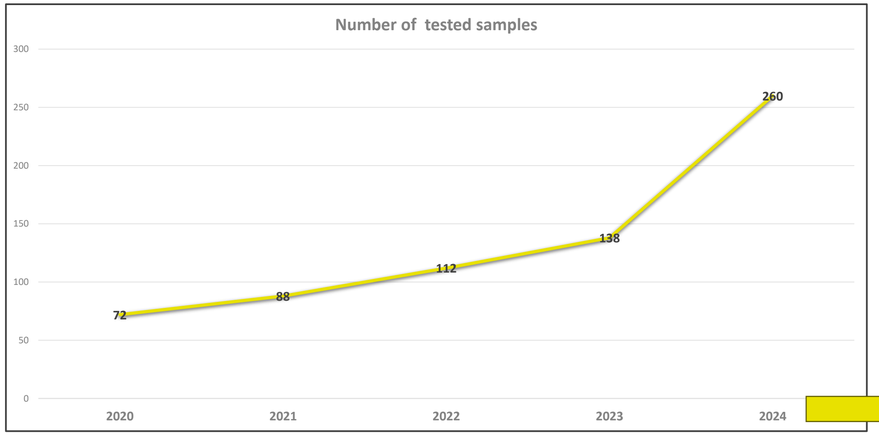
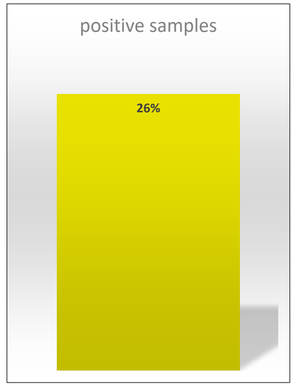
House 1
House 2
House 3
House 4

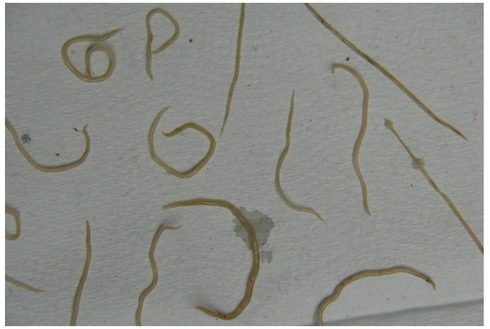
Histomonas meleagridis infection

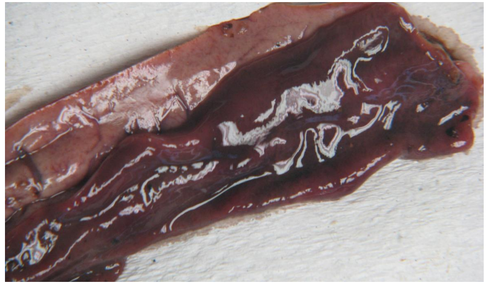






Parasitosis of chickens





Integrated control and prevention strategies in the post-antibiotic era

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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

- 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

Numbers don't lie -
Only data speaks for itself

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!