New diseases and health risk in cage free systems

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What makes the pathology in cage-free birds different?

Faecal-oral infection is possible

Some behaviours are not mitigated

Low biosecurity on external parks

Flock management is more complicated

Most important health problems in US

Caged laying hens

Rank	Disease	Score
1 tie	E coli	2.63
1 tie	Infectious bronchitis	2.63
3	Infectious coryza	2.37
4 tie	FDN	2.16
4 tie	ILT	2.16
4 tie	Calcium Depletion	2.16
7	Coccidiosis	1.89
8 tie	Cannibalism	1.79
8 tie	NFM	1.79
8 tie	Necrotic enteritis	1.79

Cage-free laying hens

Rank	Disease	Score
1	E coli	3.28
2 tie	Infectious bronchitis	2.78
2 tie	Roundworms	2.78
4 tie	Piling	2.72
4 tie	Cannibalism	2.72
6	Coccidiosis	2.33
7	ILT	2.28
8	Infectious coryza	2.17
9	Necrotic enteritis	2.00
10 tie	FDN / FC / EDS	1.89

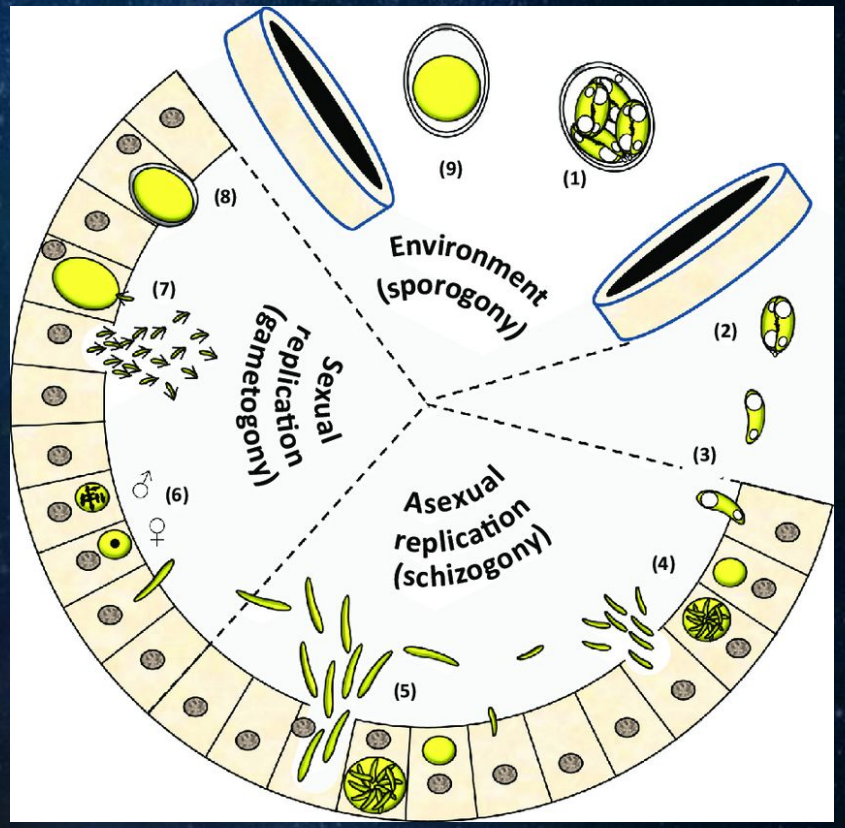
Source: AVEP 2022 Disease Survey

Coccidiosis

Coccidiosis

Etiologic agent: **Eimeria Spp.**

- It is a protozoan with a cycle in the poultry gut and in the environment.
- Different species produce different lesions in the gut.
- It is found worldwide.
- There is no cross-protection between species



Picture:
Finley 2013

Coccidiosis

Eimeria Tenella

Source: ANSES

Coccidiosis

Eimeria maxima

Source: ANSES

Coccidiosis

Eimeria Acervulina

Source: ANSES

Coccidiosis

Eimeria Brunetti

Source: ANSES

Coccidiosis

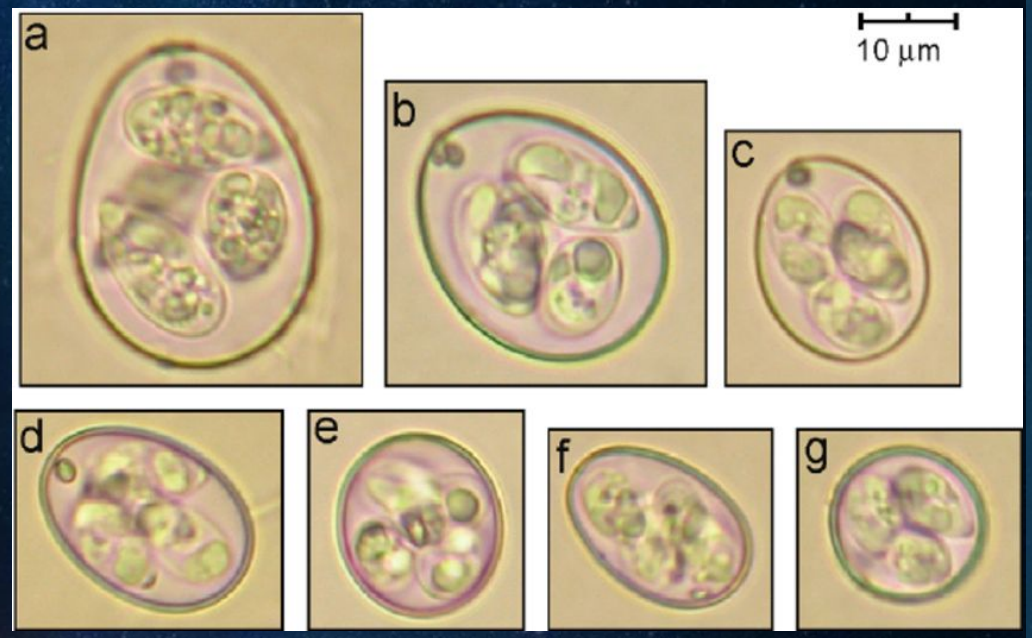
Eimeria necatrix

Source: ANSES

Coccidiosis

Infectious form: **oocyst**

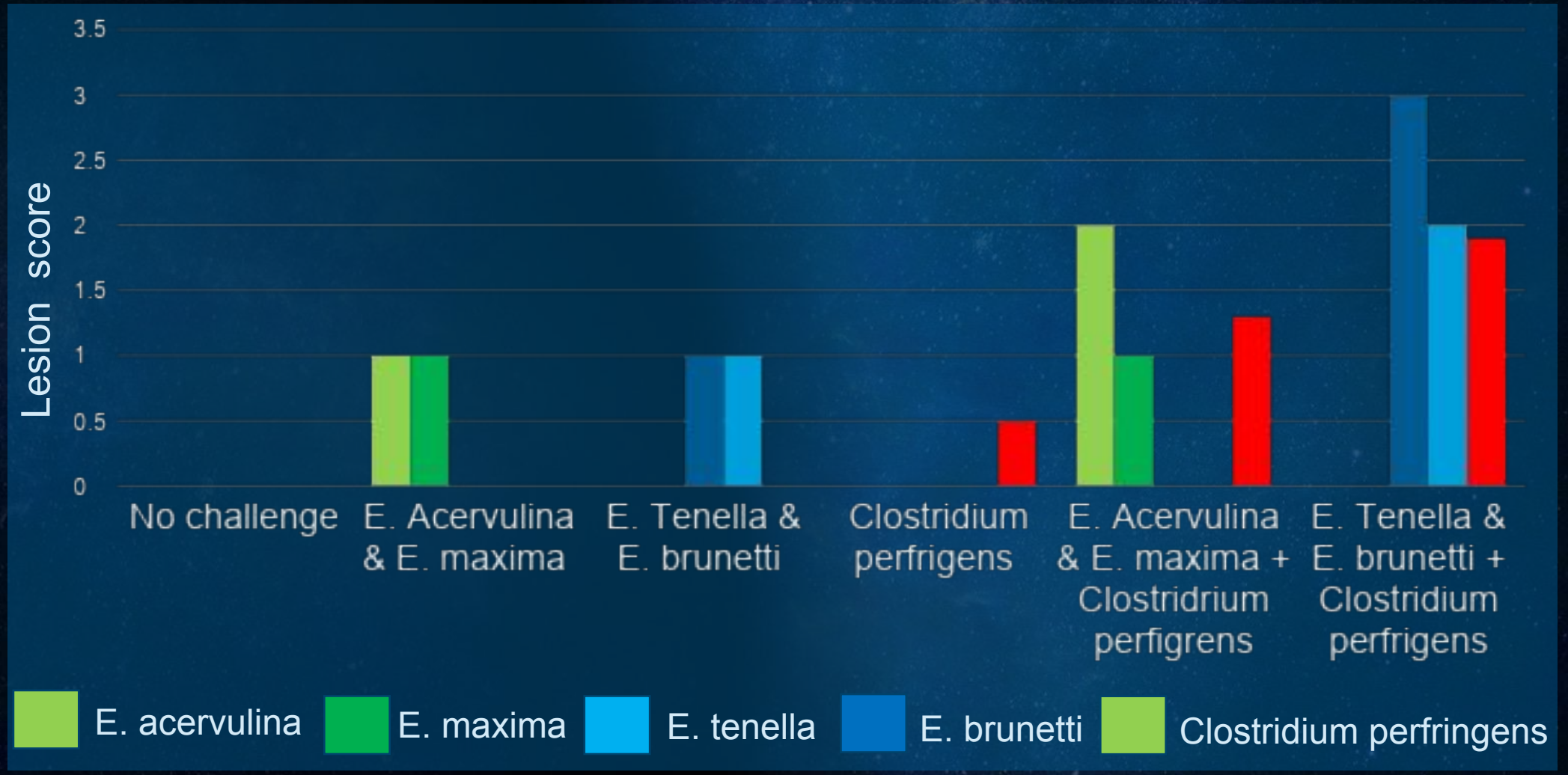
- Very resistant to the environment
- Heavy and large in size
- Must sporulate to become infectious in a humid and warm environment
- Different species vary in size and morphology



Picture: Beltran Castanon 2013

Coccidiosis

Gut health & Coccidia



Source:
Alnassan 2014

Coccidiosis

Health program objective

Short life birds

No delayed growth
No anticocci resistance

1. **Anticocci program**
   Rotation program
   Shuttle program
   Bio-shuttle program
2. **Vaccine programs**
3. **Phyto programs**

Long life birds

Long lasting immunity against the different Eimeria species

Challenge required !!!

1. **Vaccines program**
   + Anticocci
   + Phyto
2. ~~**Anticocci programs**~~

Coccidiosis

Vaccine by type of bird

Short life birds vaccines

Eimeria acervulina
Eimeria maxima
Eimeria Tenella
Eimeria Mitis
…

Long life birds vaccines

Eimeria acervulina
Eimeria maxima Eimeria tenella
Eimeria mitis
Eimeria brunetti
Eimeria praecox
Eimeria Necratix

Coccidiosis

Vaccine by strain attenuation

Natural strains

\+
- Low cost
- Excellent dissemination in the barn

\-
- Still pathogenic strains: mitigation may be required
- Introduction of pathogenic strains into the house

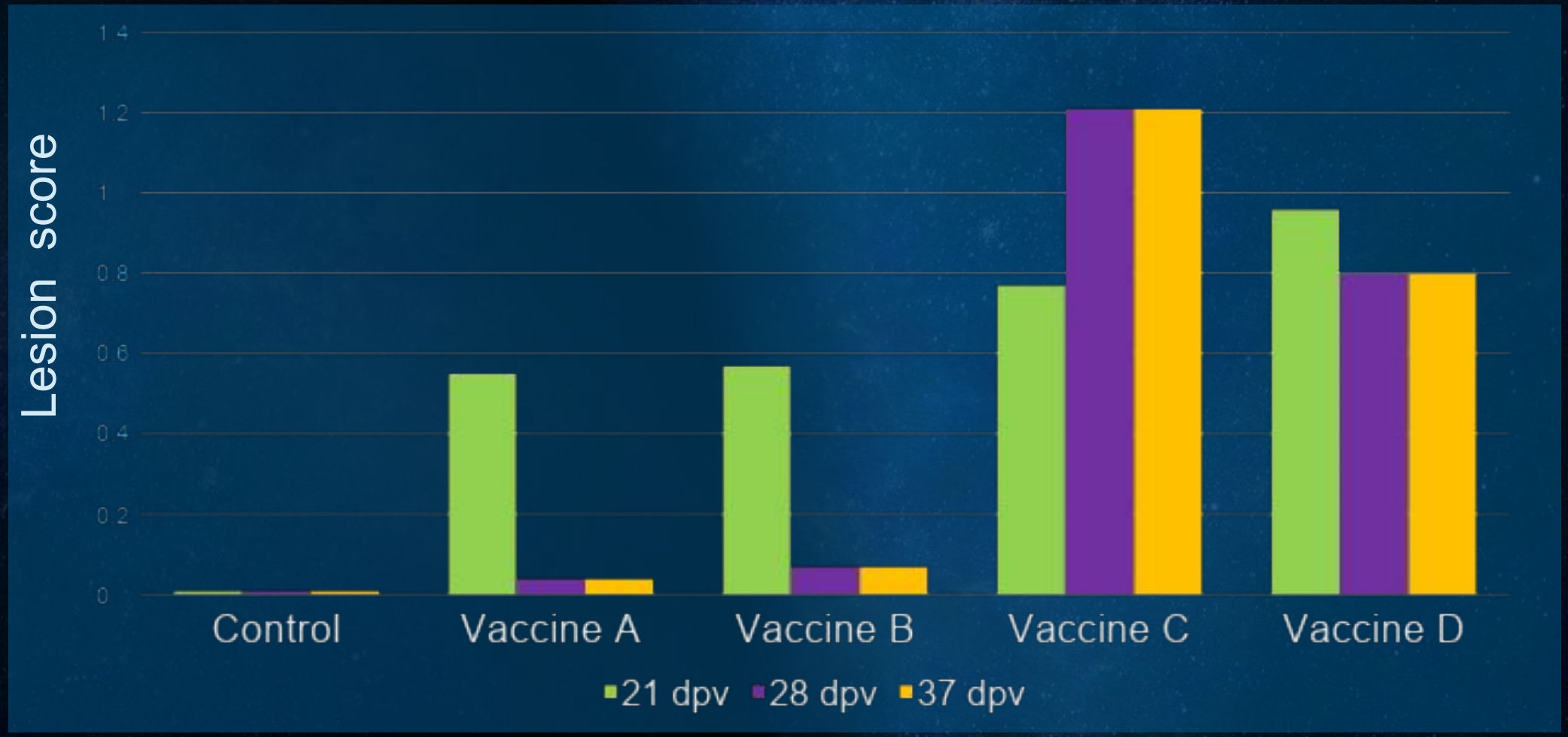
Attenuated strains

\+
- Less lesions produced during the Eimeria cycle
- Non pathogenic strains

\-
- High cost
- Poor dissemination in the barn

Coccidiosis

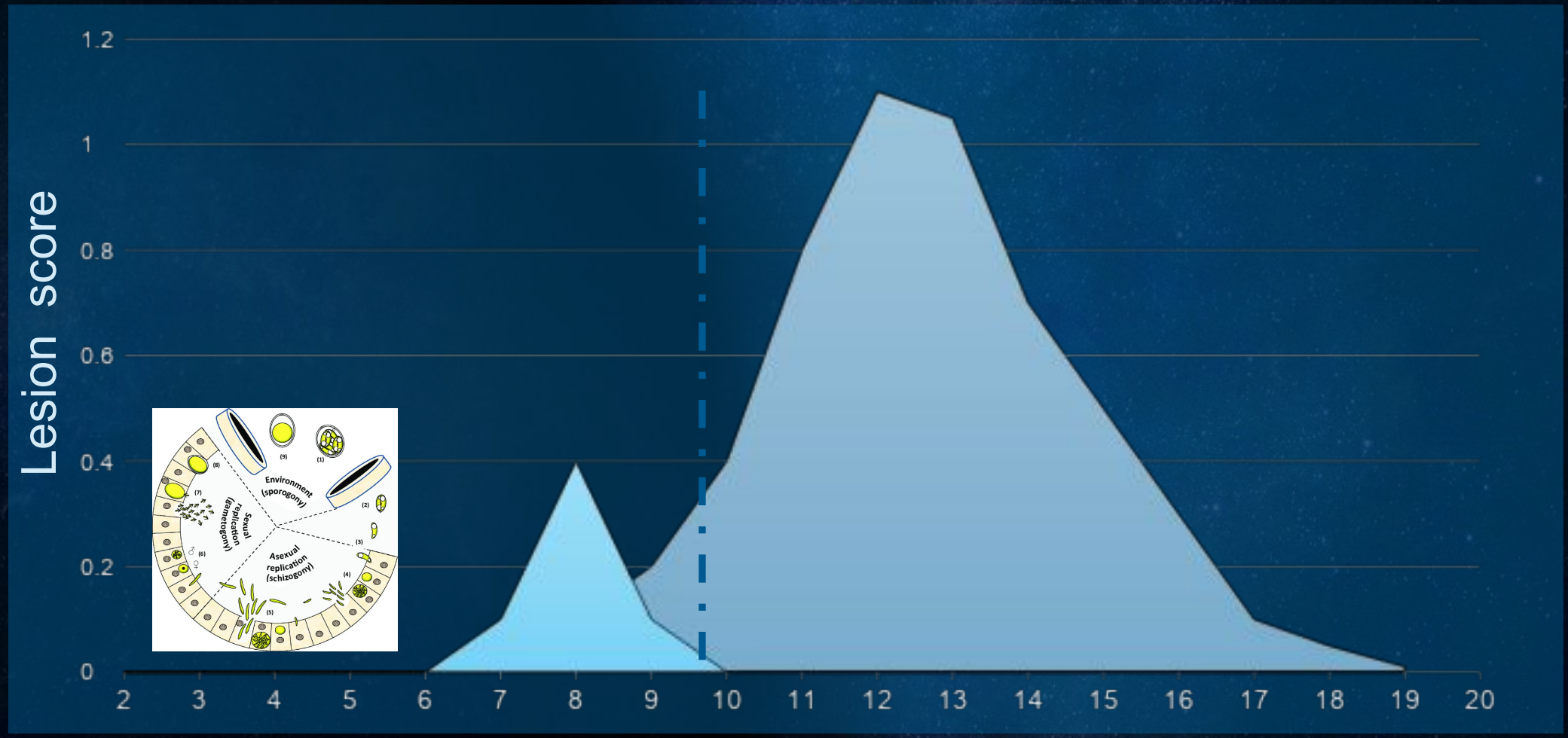
Attenuated vaccines VS Natutal vaccines



Source:
M. Dardi

Coccidiosis

Attenuation by precocity method



Coccidiosis

Vaccine administration methods

~~Spray in feed~~

Spray chick boxes at farm

~~Drinking water (Nipples)~~

Spray chick boxes at hatchery

Coccidiosis

Spray vaccine process

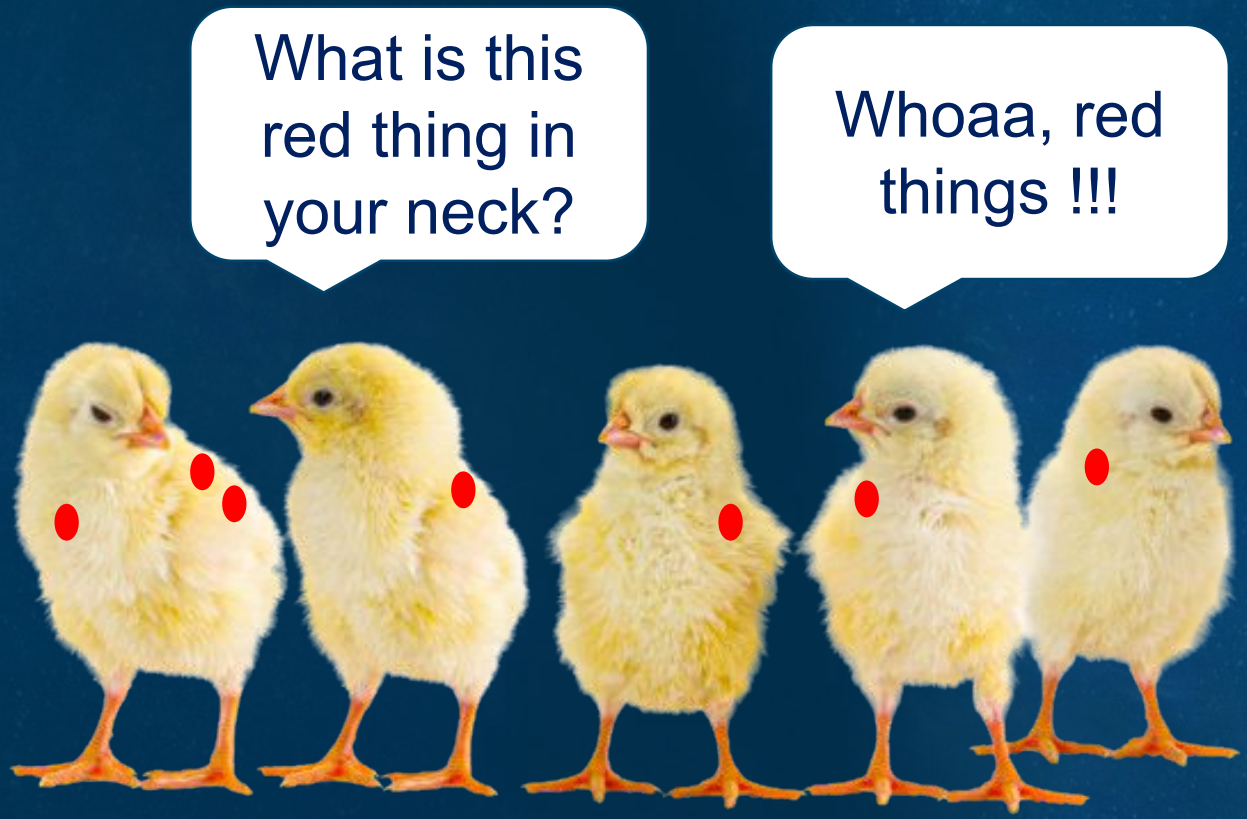
Vaccine preparation → Coarse Spray → Droplet ingestion → Vaccine strain recirculation

Coccidiosis

Coarse spray: The size (and the weight) matters

Coccidiosis

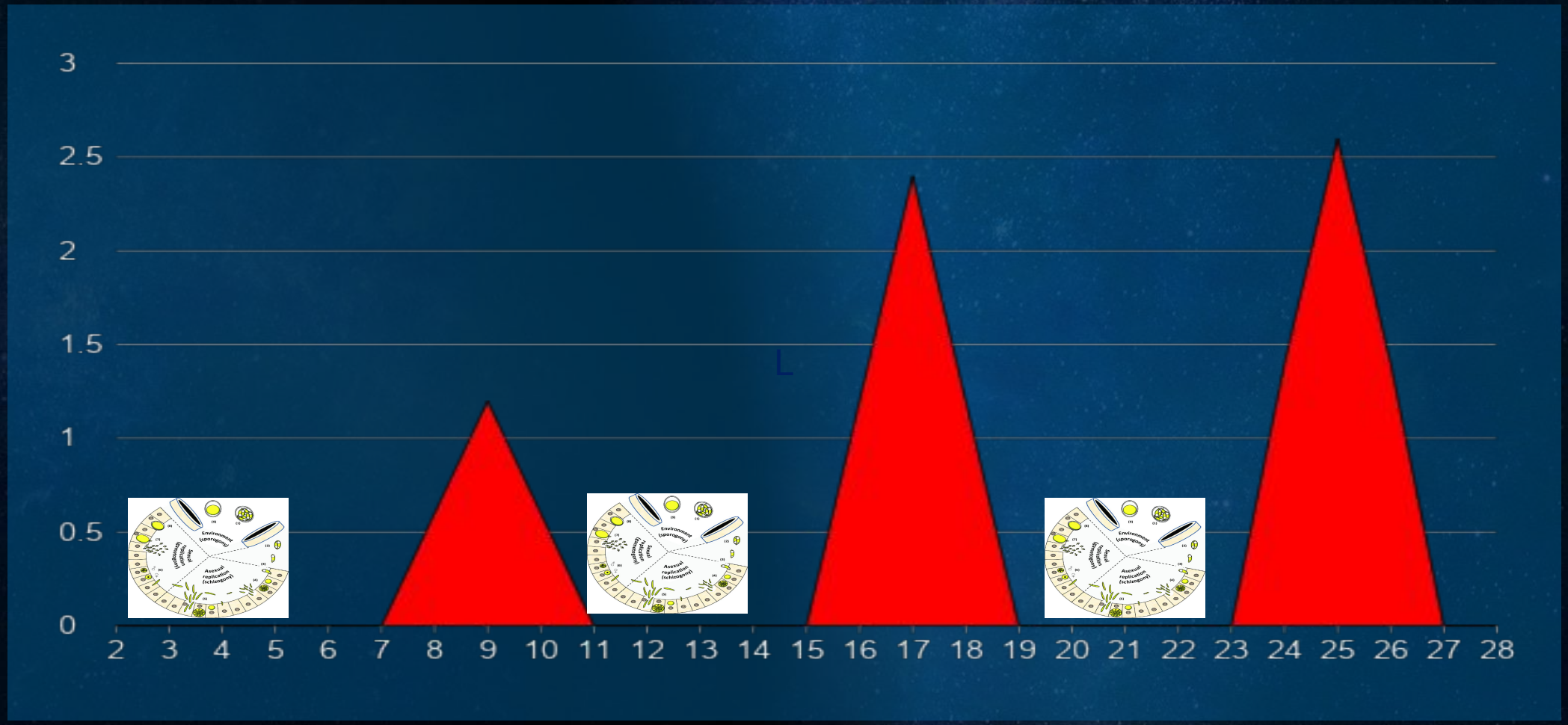
Droplet ingestion: using the curiosity to our advantage



- Beautiful droplet
- Curious chicks
- Light
- Time
- Temperature

Coccidiosis

Vaccine recirculation



Coccidiosis

Vaccine recirculation

Natural strains

- **Assure vaccine dissemination**
- **Mitigate strains pathogenicity**
  - Give more room ASAP
  - Control litter humidity
  - LAST RESOURCE: Anticocci treatment

Attenuated strains

- **Facilitate strain dissemination**
  - Give more room while respecting the Eimeria cycles.
  - When giving more room, move litter with the chicks
  - Assure correct litter humidity

Coccidiosis

Main types of litter

Wheat straw

WHC: 290%

Wood shaving

WHC: 141%

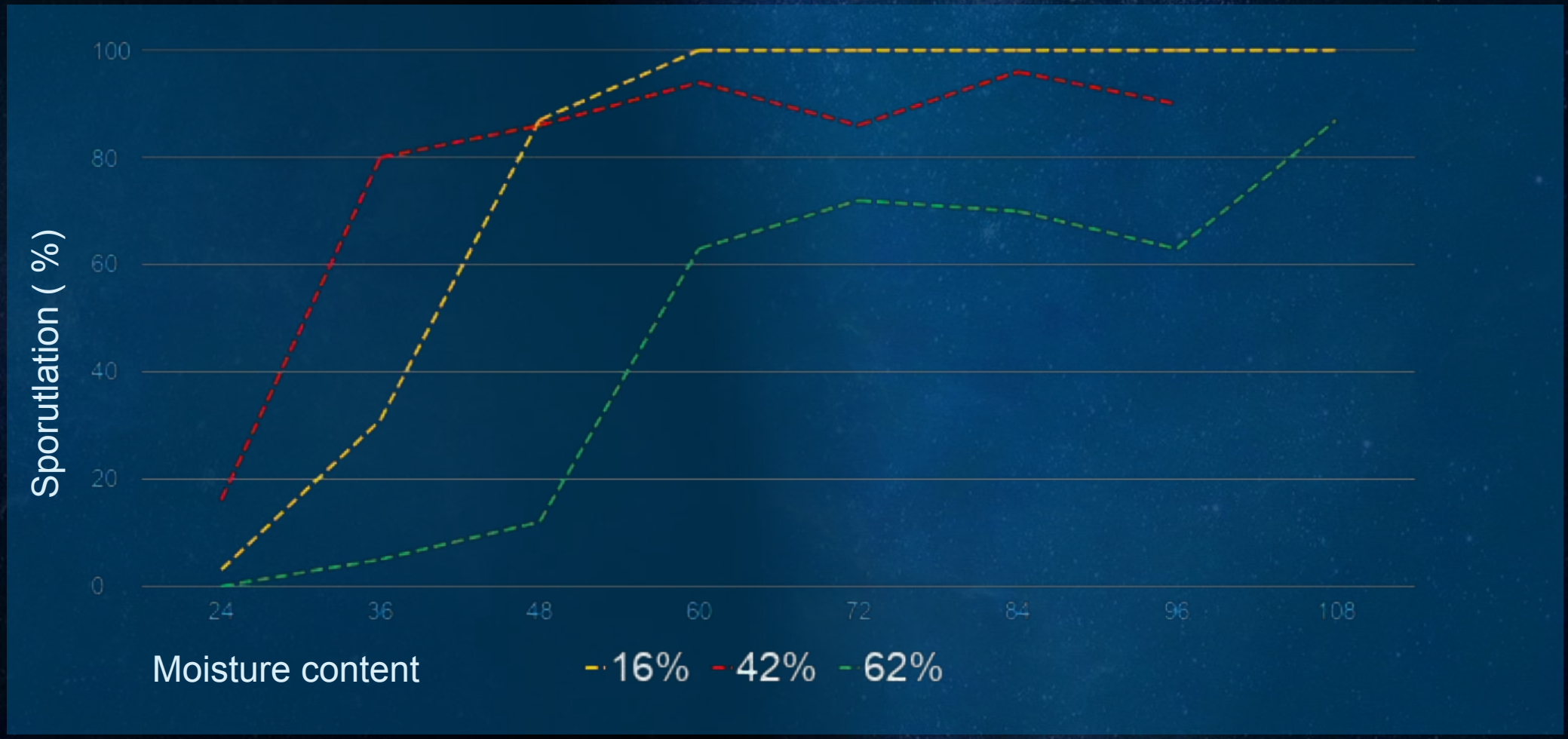
Rice hulk

WHC: 116%

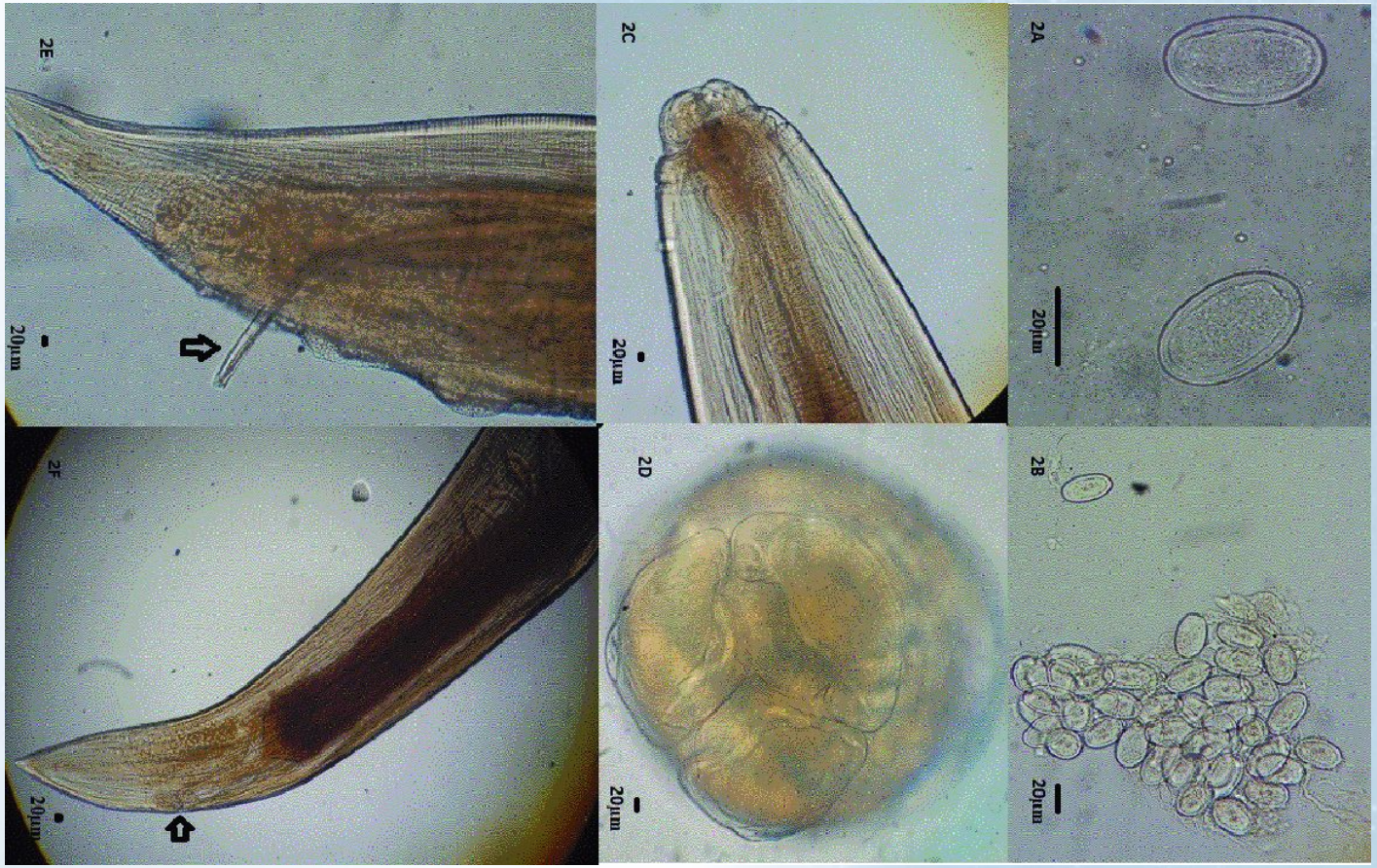
Source:
Farhadi 2014

Coccidiosis

Litter humidity & oocyst



Source:
Waldenstedt 2001



Helminths

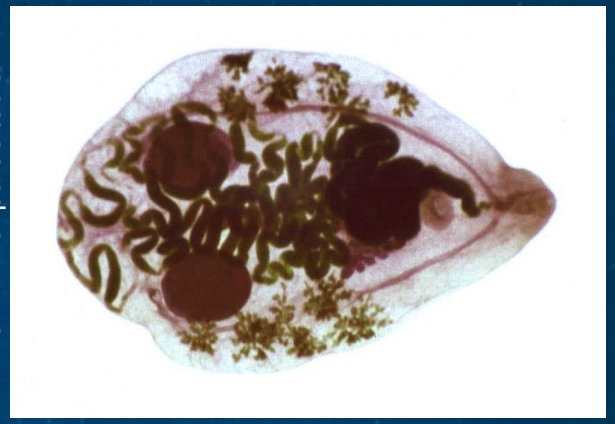
Helminths

What are we talking about?

Nematodes
Round worms

Pic :Poultry site

Cestodes
Tape worms



Pic :Animal parasitosis

Trematodes
Flukes

Pictures: Rajkovic

Helminths

Prevalence by production type – Systematic review

Source:
Shifaw
2021

Helminths

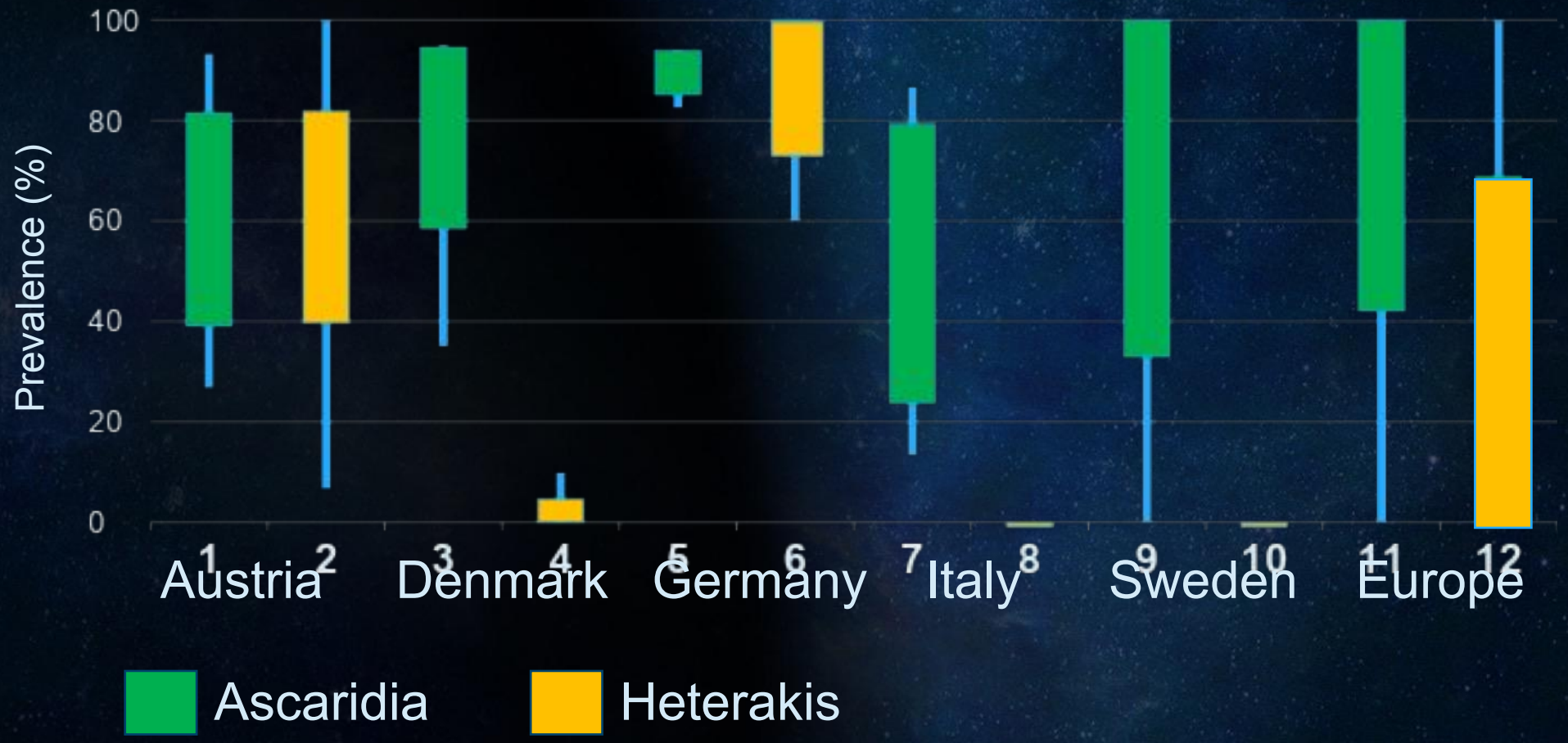
Nematodes (Round worms)

- Ascaris
  - Ascaridia sp.
  - Heterakis sp.
- Capillaires
  - Capillaria sp.
- Spirures
- Strongles
  - Trichostrongylus tenuis

Picture:
Reussir.fr

Ascaris

Ascaris species prevalence in European organic farms



Source: Thapa 2015

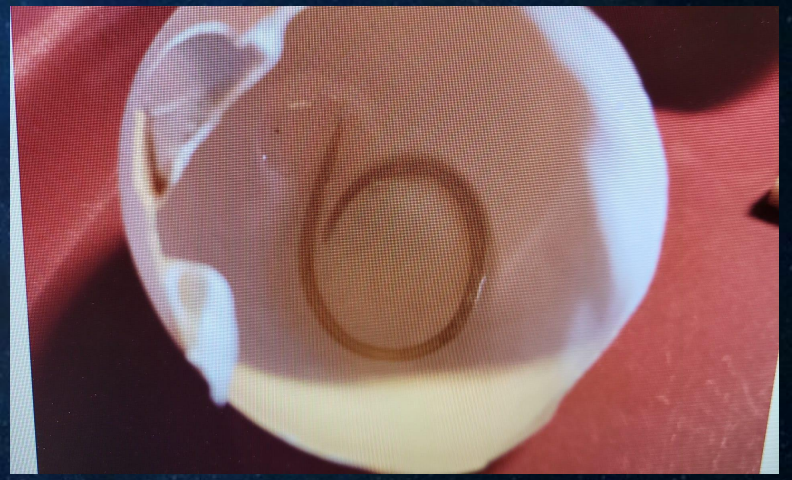
Ascaris

Ascaridia

Etiologic agent:

Ascaridia Galli.

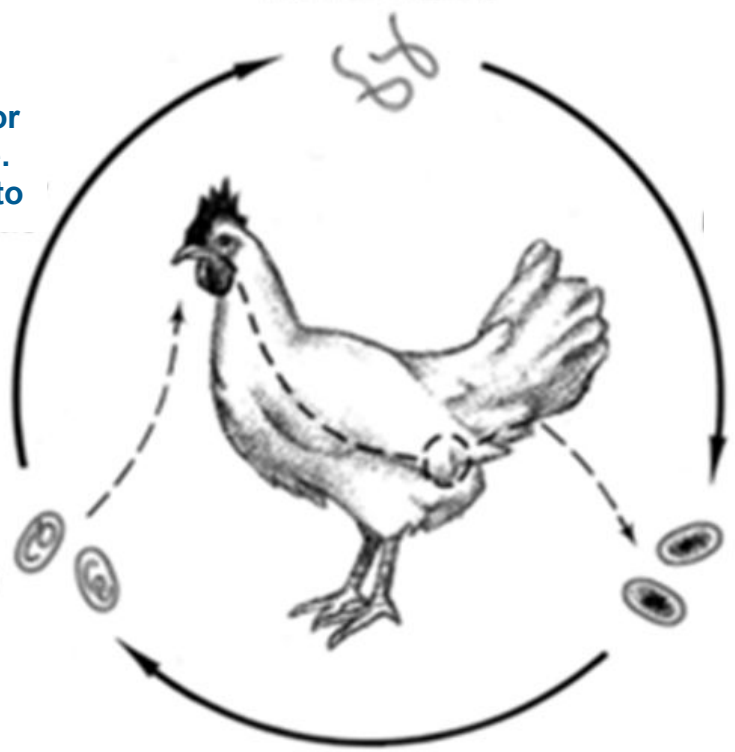
- Nematodes. It can measure 6 - 11cm as adult and infest the intestine
- Egg drop and bodyweight losses is possible in case of strong infestation
- No report of infestation in humans



Pictures:
Wattagen

Ascaris

Life cycle



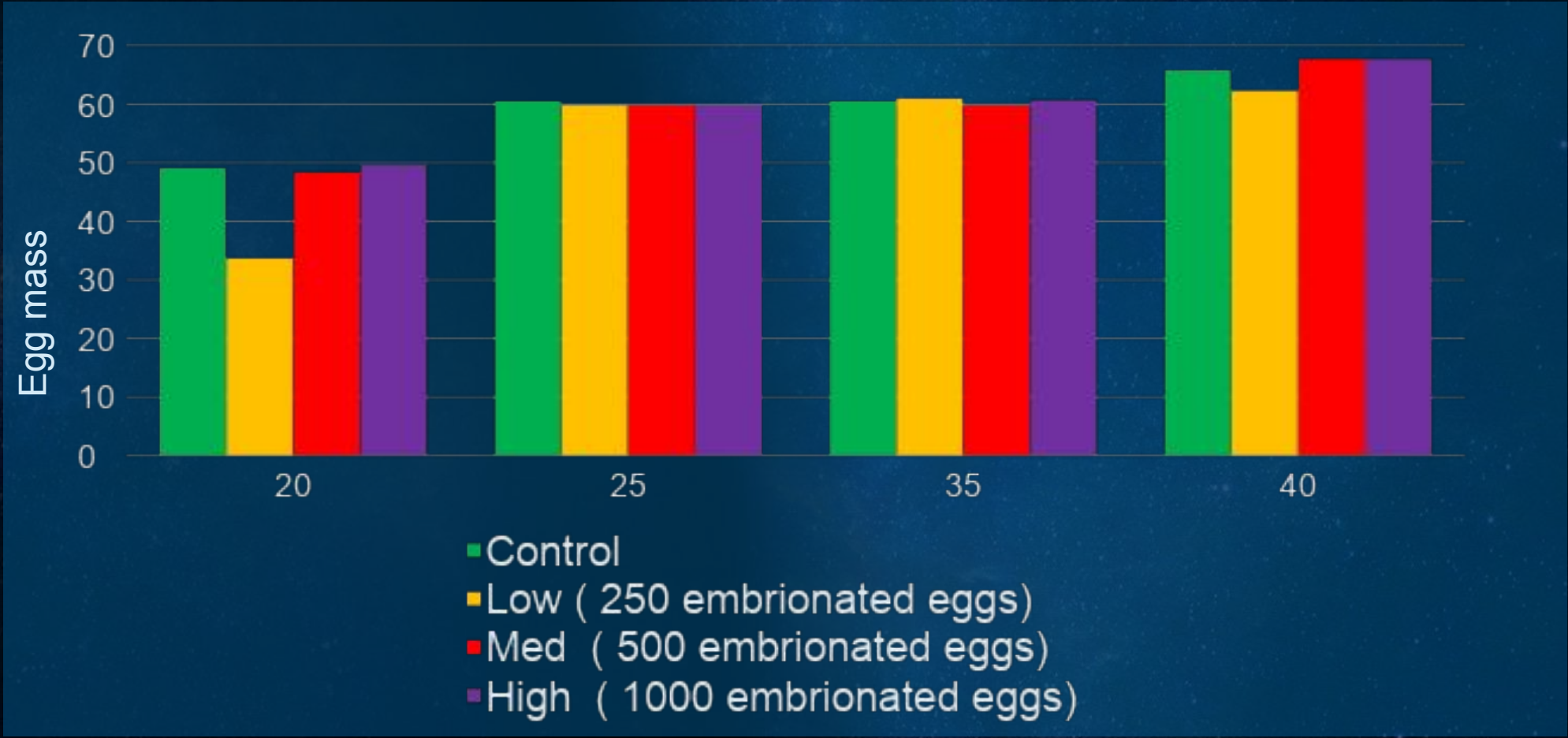
Ascaris

Clinical sign

Anorexia
Loss of body weight
Ruffled feathers
Drooped wings
Retarded growth,
Altered hormone levels
Depression
Increased cannibalism

Ascaridia

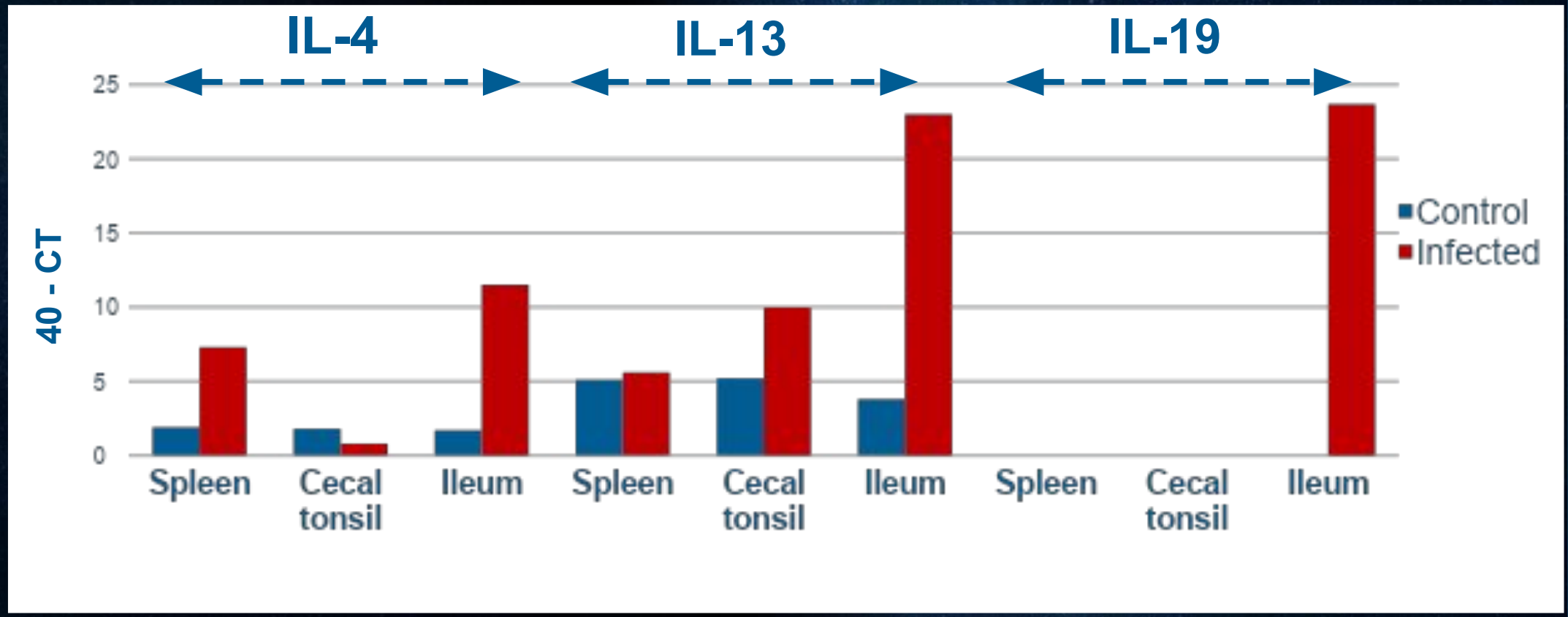
Effect of different infestation levels of Ascaridia galli on egg mass.



Source: Sharma 2017

The immune response

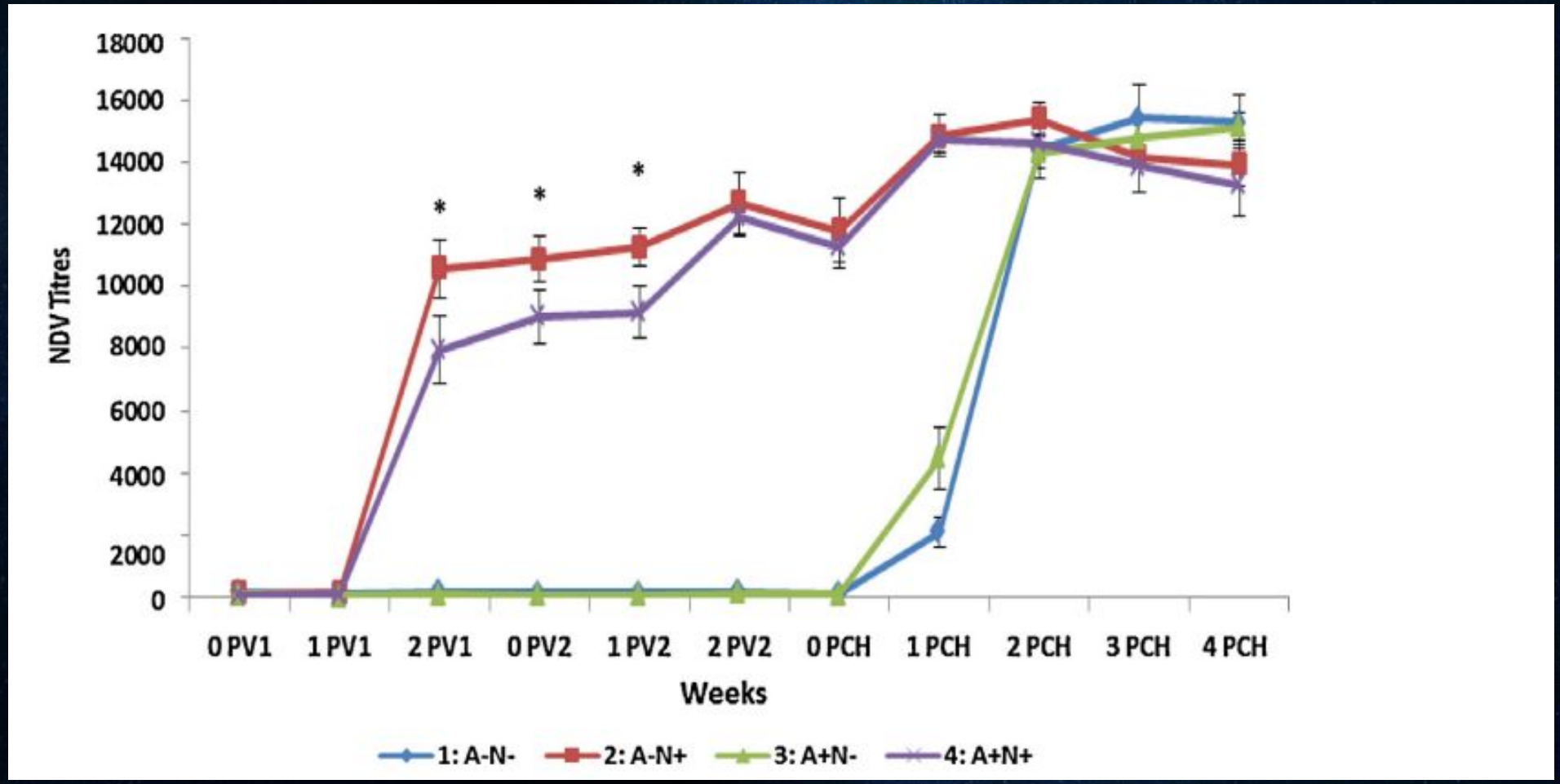
Expression of mRNA for Th2 cytokines following oral infection with 1000 Ascaris galli worm eggs



Source:
Degen 2004

Ascaris

NDV-specific IgG titres in serum for leghorn hens infested by A. gally and vaccinated and challenge for NDV



Heterakis

Heterakis

Etiologic agent:

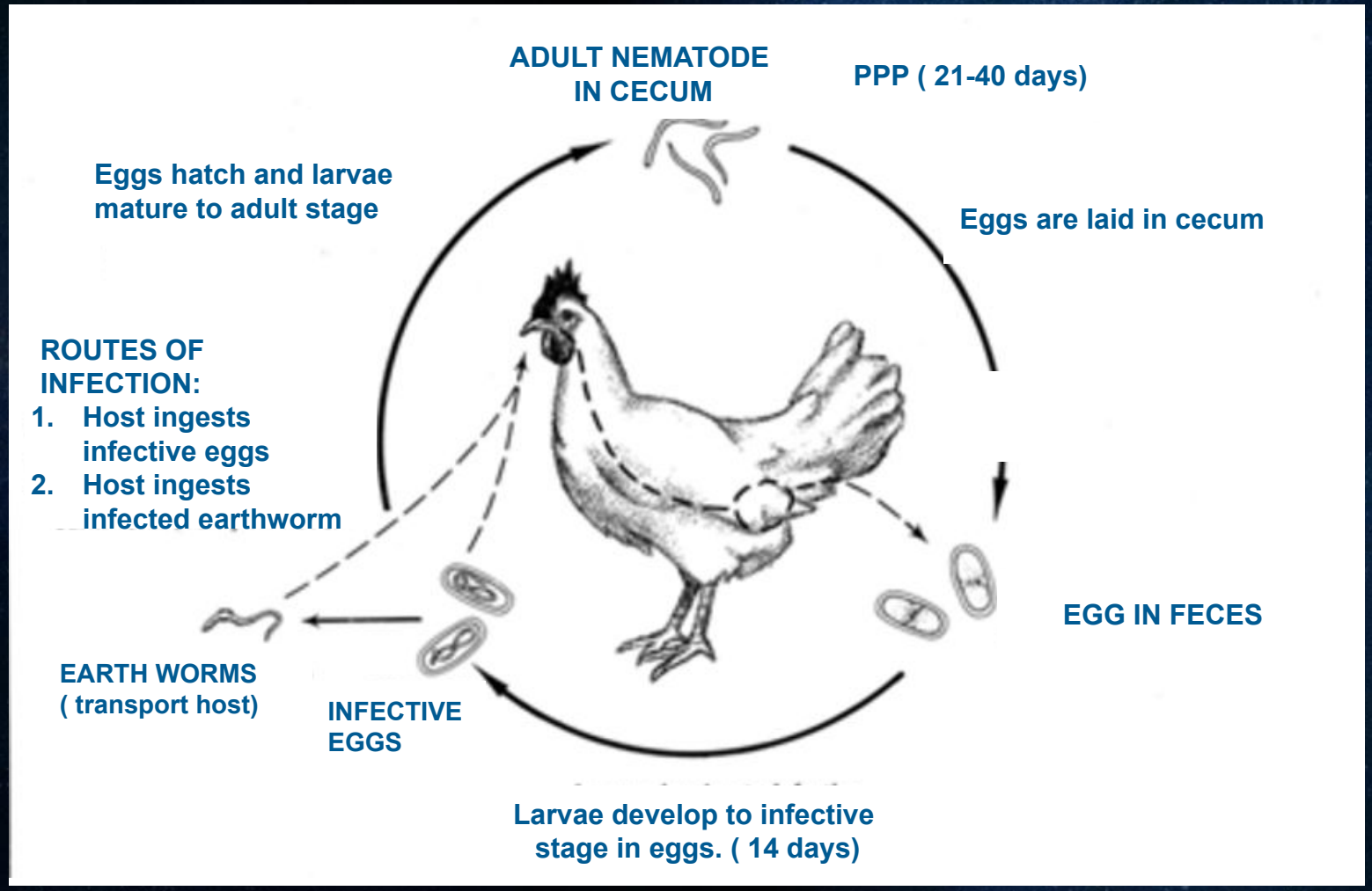
Heterakis gallinarum

- Nematode. It can measure 1-1,5 cm and infest ceca.
- It can produce ceca inflammation
- It can be hosted by earth worms
- It can host Histomona meleagridis

Pictures:
Wattagen

Heterakis

Life cycle



(Beyond) Heterakis

Histomonosis

Etiologic agent:

Histomonas meleagridis.

- Flagellated amoeboid Protozoan
- Sulfur-colored droppings, characteristic lesion in ceca and liver
- High mortality (30%) can occur in chickens
- Very complicated treatment because the lack of authorized drugs

Pictures:
Wattagen

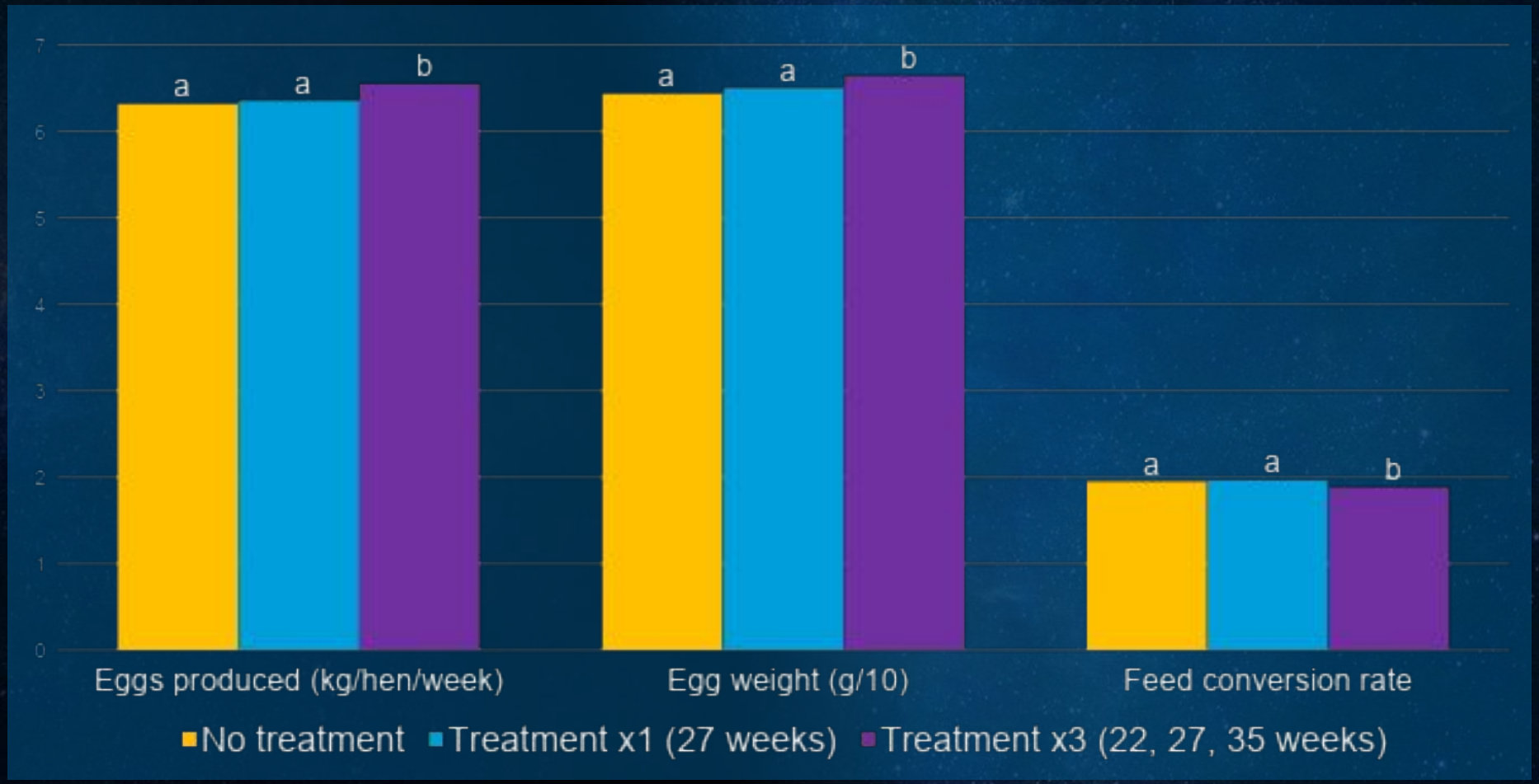
Ascaris

Health program

Prevention	Eradication	Control
Biosecurity (Free range???)	Not possible	Monitoring - Ascaris finding in autopsies - Egg in faecal droppings Treatement - Benzimidazoles (fenbendazole and flubendazole) - Imidazothiazoles (levamisole and pyrantel) - Macrocyclic lactones (ivermectin) Passive control - Specific disinfection - Outdoor park rotation ?

Ascaris

Cumulative production data between week 21 and 44 in three groups receiving three fenbendazole treatment models



Pictures:
Tarbiat 2019

Cestodes

Etiologic agent:

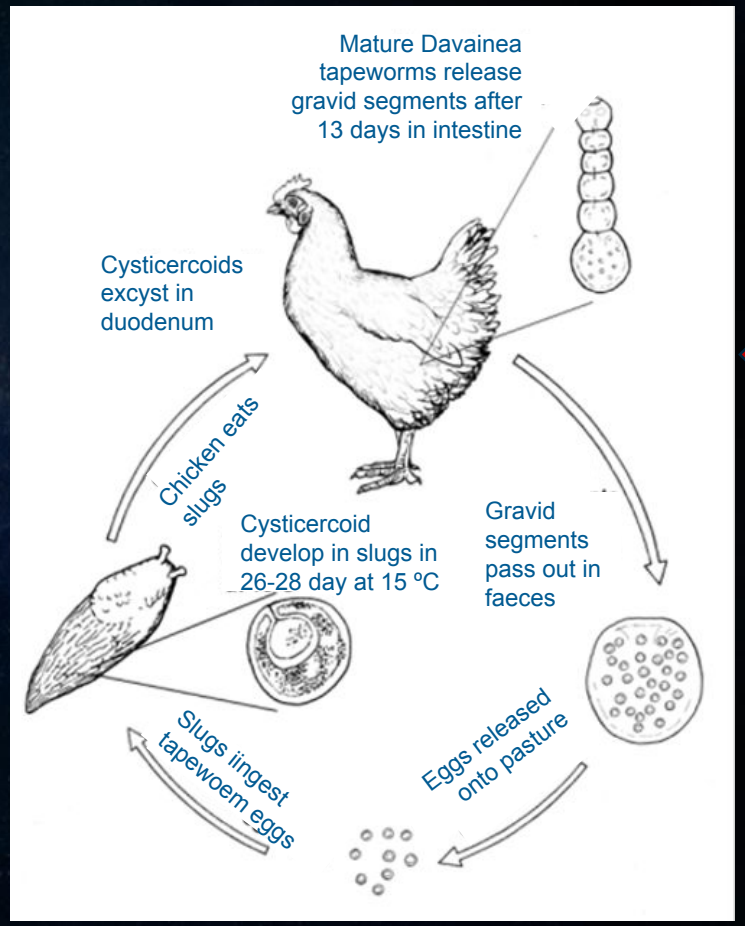
Raillietina spp (30 cm in length)
Davainea proglottina (< 4 mm in length)

- Only produce noticeable pathological effects in the case of extreme parasitosis
- its incidence is much more common in flocks with access to outdoor parks.

Pictures:
The Poultry site

Cestodes

Life cycle



Intermediate hosts are indispensable.

The effect of temperatures and humidity on them have a crucial effect on population dynamics.

Brachyspira

Health program

Prevention

Biosecurity

(Free range???)

Eradication

Not possible

Control

Reduce Intermediary host

- C&D protocol
- Strict biosecurity routines
- Insect control

Antimicrobial treatment.

- Piperazine (Not in EU)
- Praziquantel (Not in EU)

Brachyspira

Brachyspira

Brachyspira

Etiologic agent:

Brachyspira Piloscoli

Brachyspira intermedia

- Reduced egg production, downgrading of shell eggs, bodyweight loss
- Most common in free range birds
- Foamy yellowish ceca content

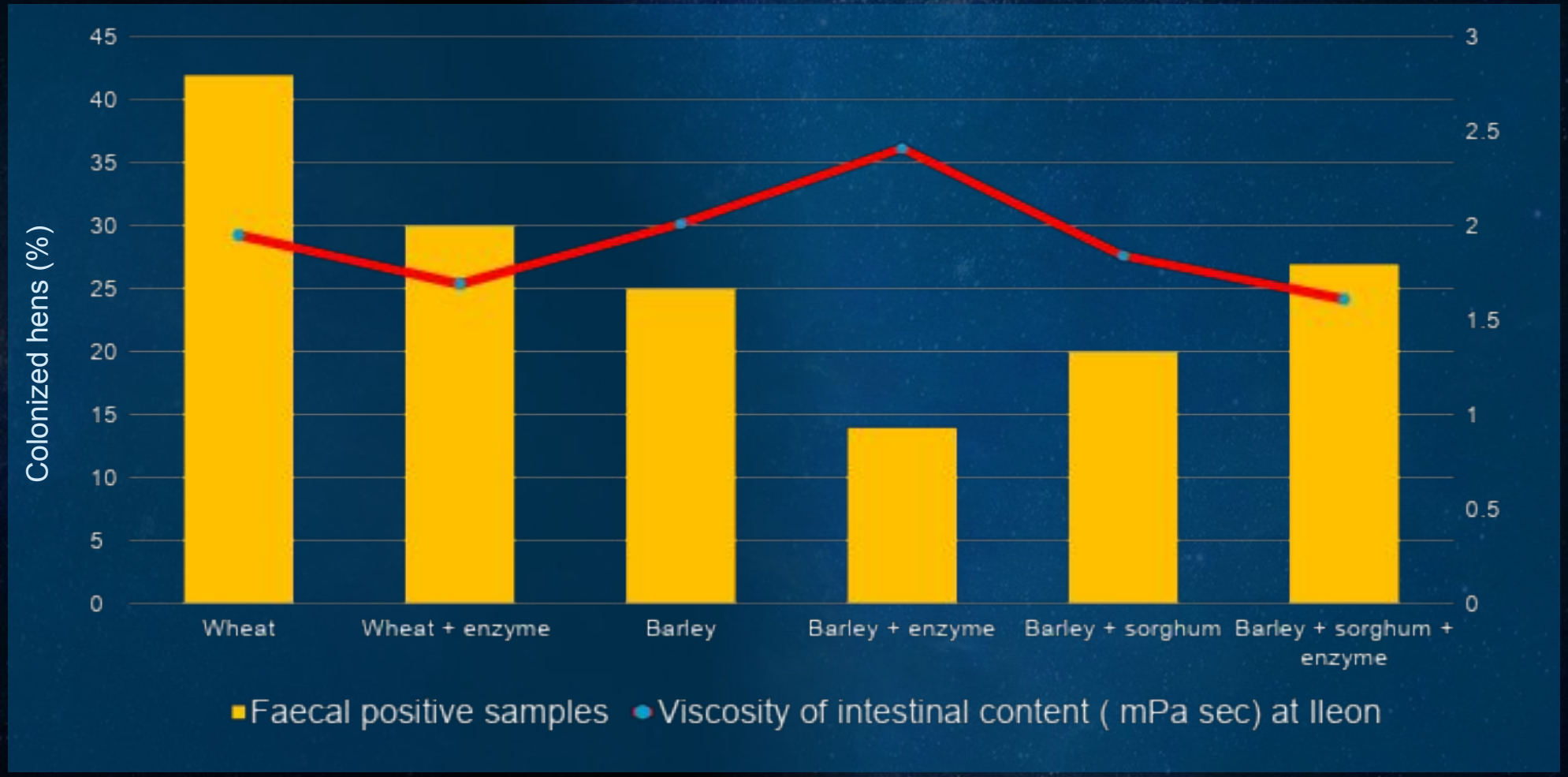
Brachyspira

Prevalence by production type –

Source:
Hess
2017

Brachyspira

Raw materials effect



Source: Phillips 2012

Brachyspira

Health program

Prevention

Biosecurity

(Free range???)

Eradication

Not possible

Control

Avoid colonization

- C&D protocol
- Strict biosecurity routines
- Rodent control

No vaccines are currently available

Antimicrobial treatment.

- Tiamuline
- Tetracicline ?

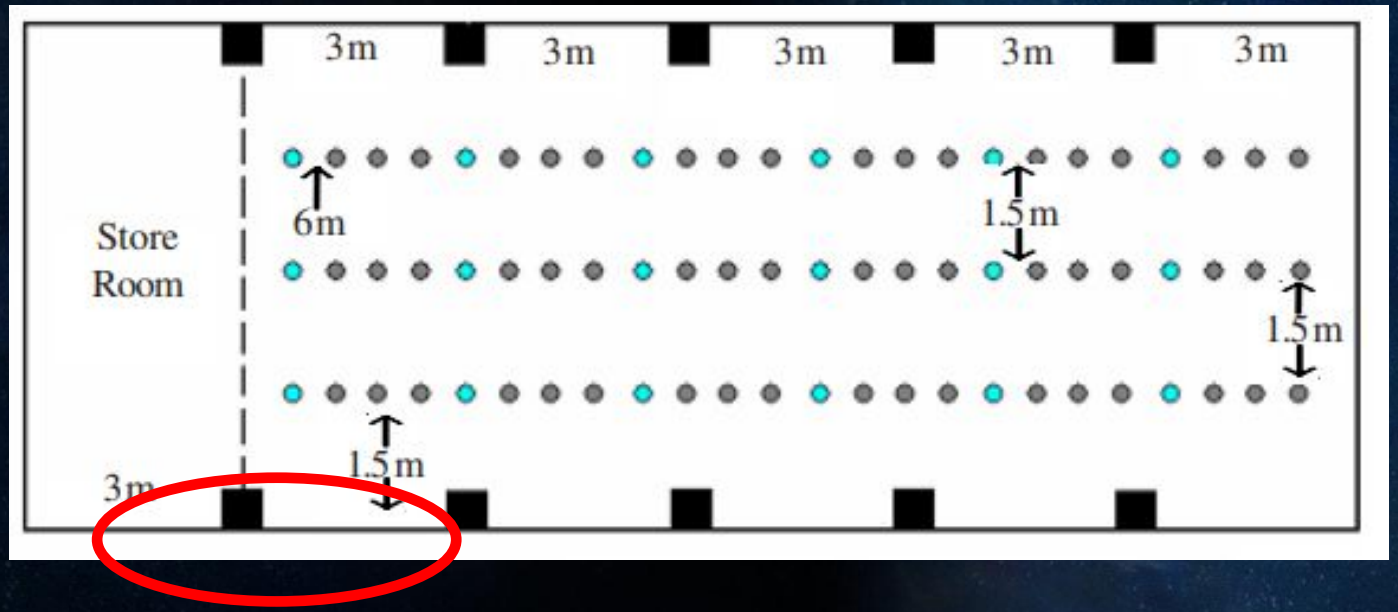
Piling

Piling

Nest Piling

Piling

Panic pilling



Predation episode

Loud sounds

Disturbing visits

Piling

Reiterative pilling

Source: Gray 2020

Bonus track: Toe-Pecking

WHAT IS IT ABOUT?

- Only in white layers
- Different Breeds
- No beak treatment
- Mortality from 0,1%-0,3%

Netherlands

Germany

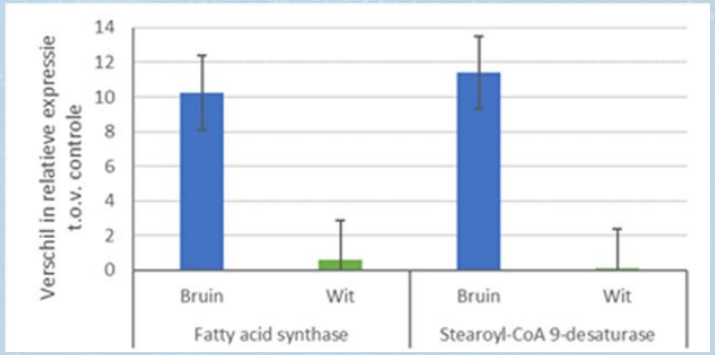
Switzerland

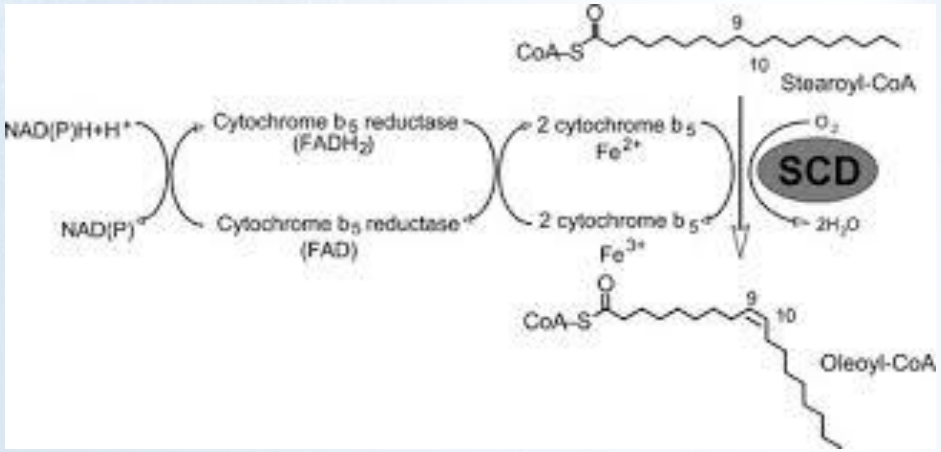
Finland

Bonus track: Toe-Pecking

Stearoyl-CoA 9-desaturase: A good explanation??

≠



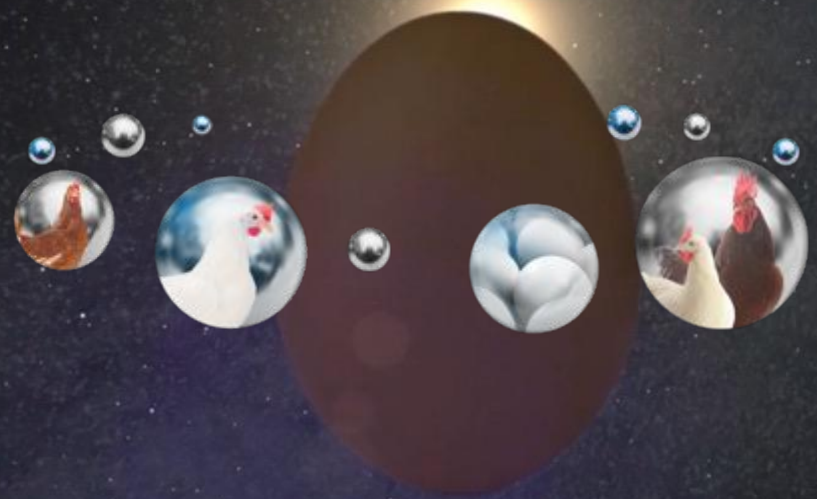


Differences in fatty acids in the paw skin
(Less palmitic acid and more palmitoleic acid)

More fragile paw skin ??

Source:
forfarmers.nl

Thank you for your attention



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