



INTERNATIONAL

The key to your profit!

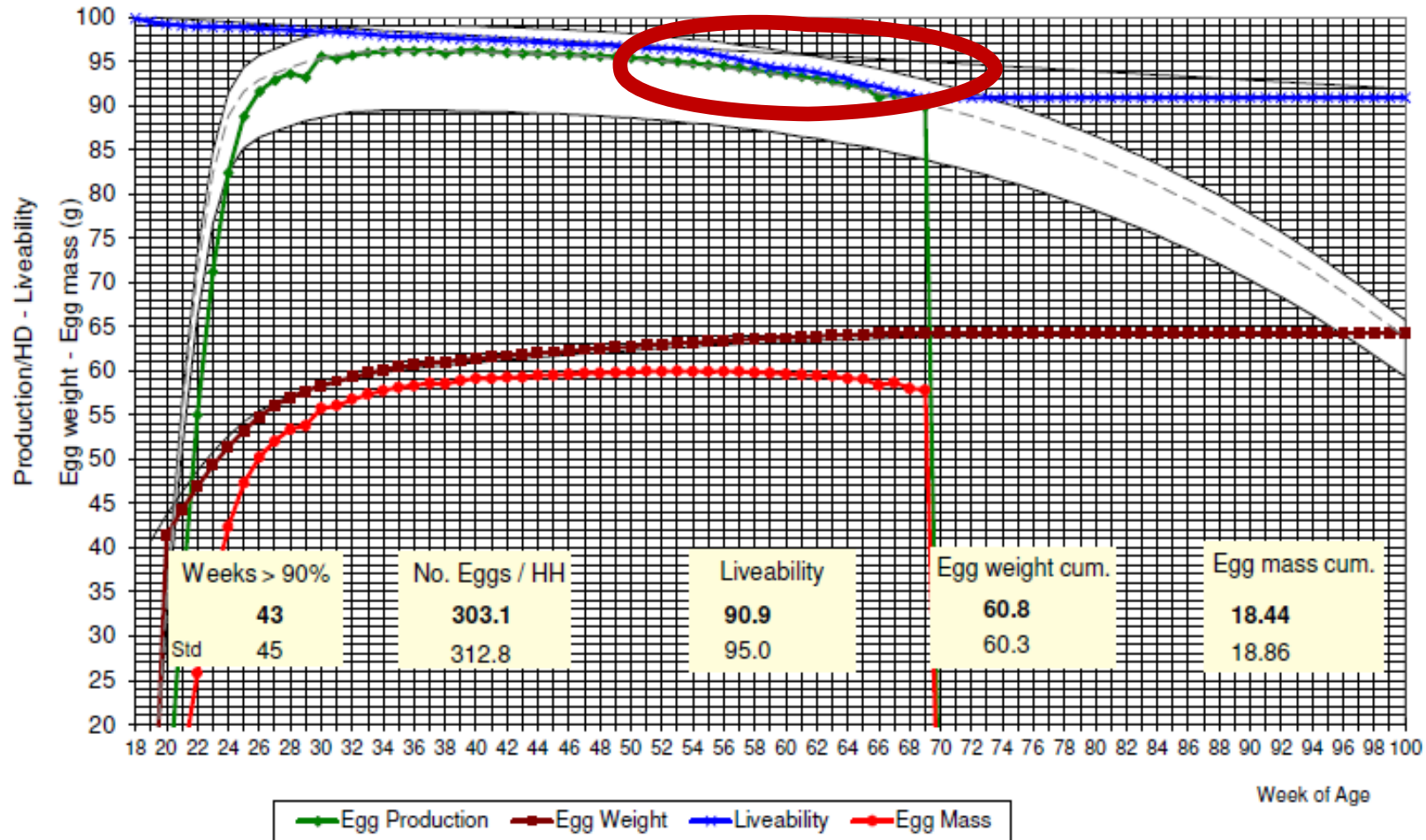


Immunity at the end of production

Fernando Carrasquer DVM CEAV

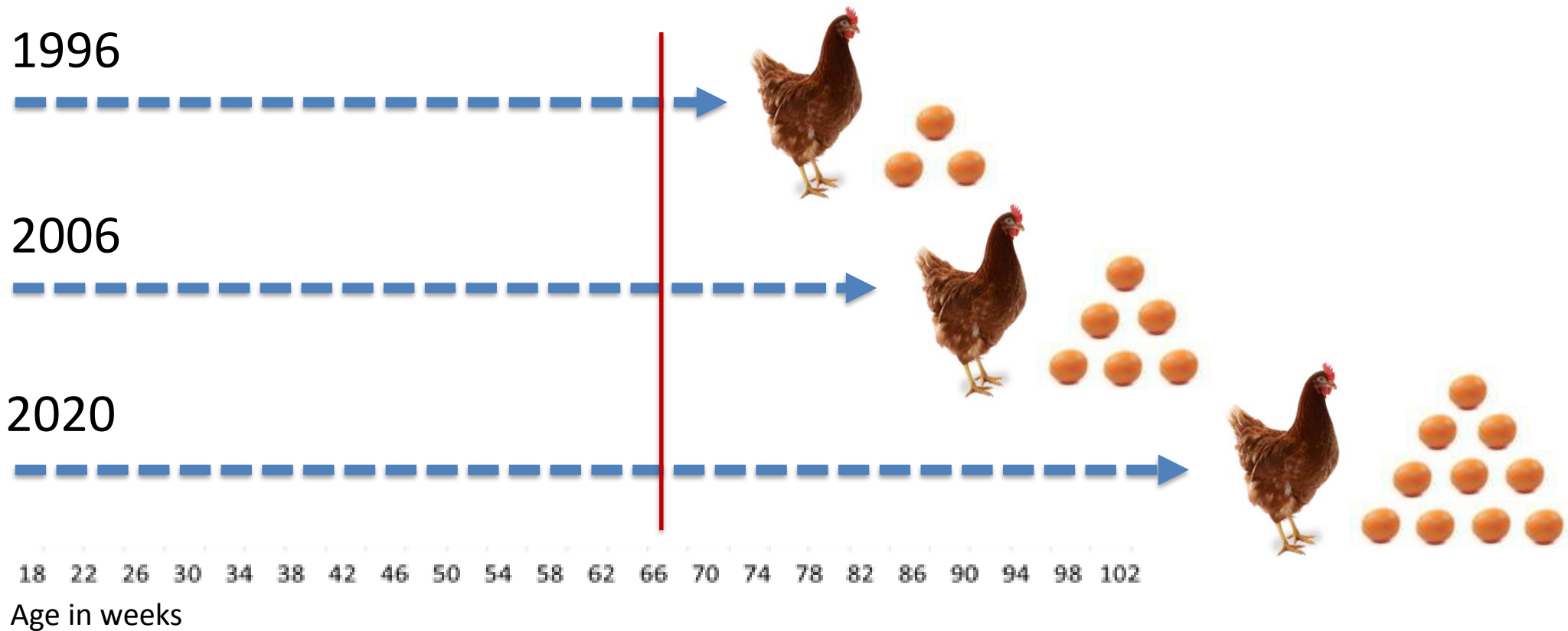
Global technical service – H&N International GmbH

It was a good flock but ...



- Anemia
- Liver in poor condition
- Sporadic E. Coli Infection
- Poor feathering

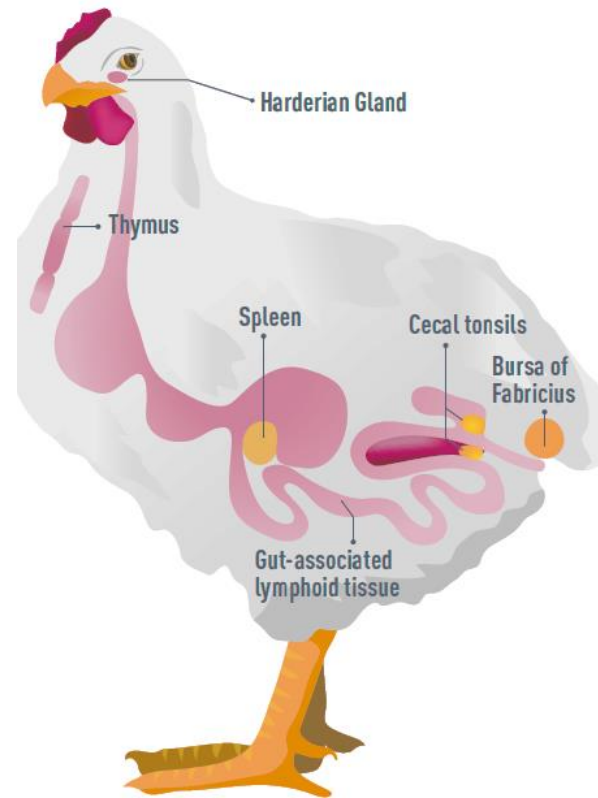
Many non-produced eggs ...



Is the bird's immunity prepared to give good protection during this extended production cycle?

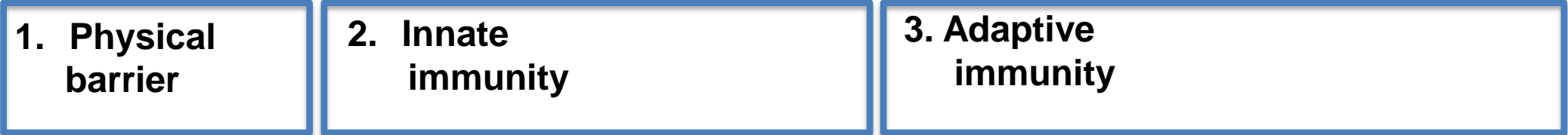
The avian immune system

PRIMARY	Bursa of Fabricius Thymus
SECONDARY	Spleen Cecal tonsils Harderian gland GALT



- Birds' immune system is similar but not exactly as in mammals
- Lack of capsulated lymph nodes
- 70% of white cells attached to the gut

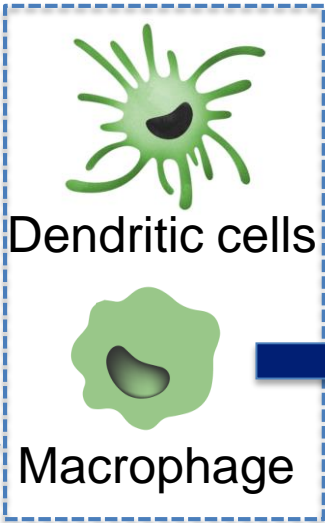
The immune response: first contact



Mucus
Flora



Mucosa
Skin



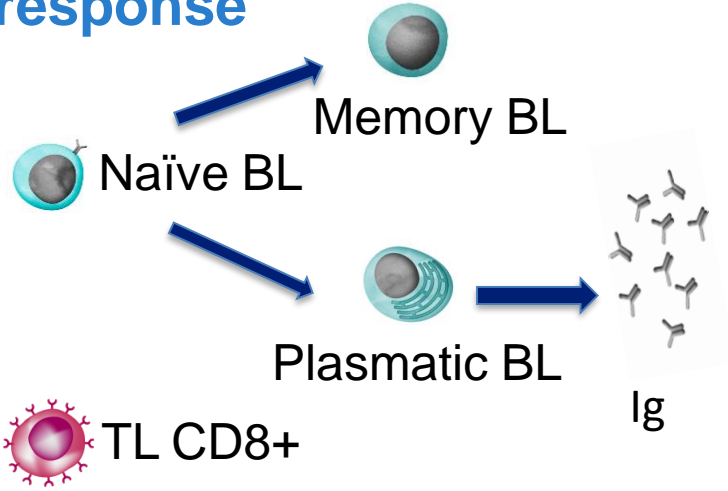
NK Cells



TL CD4+

Humoral response

Cell-mediated response

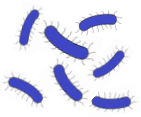


The immune response: second contact

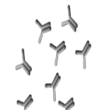
1. Physical barrier



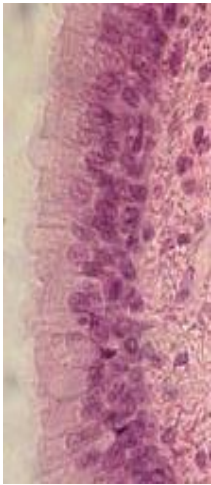
Mucus



Flora



Ig A



2a. Innate immunity

Heterophils
Basophils
Acidophils

Three circular icons representing different types of white blood cells: Heterophils (blue with black spots), Basophils (purple with black spots), and Acidophils (blue with black spots).A green, star-shaped icon with multiple long, thin protrusions.

Dendritic cells

A green, irregularly shaped icon with a dark, kidney-shaped nucleus.

Macrophage

A blue, Y-shaped icon with three branches.

Complement

A blue, irregularly shaped icon with a dark nucleus.

NK Cells

2b. Adaptive immunity

A cluster of Y-shaped icons representing Ig M antibodies.

Ig M

A red, spherical icon with small protrusions.

TL CD8+

Two circular icons representing lymphocytes. The first is a dark grey circle with a light blue border, labeled 'Memory LB'. An arrow points to the second, which is a larger, light blue circle with a dark grey border, labeled 'Plasmatic LB'.

Memory LB → Plasmatic LB

A red, spherical icon with small protrusions.

TL CD4+

↑ Humoral response

↓ Cell-mediated response

Communication: immuno peptides

Interleukins

IL-1 β , IL-18

IL-2, IL-15, IL-21

IL-3, IL-4, IL-5, IL-13

IL-12, IL-12 α , IL-12 β

IL-17A, IL-17B, IL-17D, IL-17F

IL-10, IL-19, IL-22, IL-

26, IL-7, IL-9, IL-11, IL-16

Chemokines

XC, CC, CXC and CX3C

Interferons

IFN- α , IFN- β , IFN- λ

IFN- γ

Transforming growth factor β

TGF- β 2, TGF- β 3, TGF- β 4

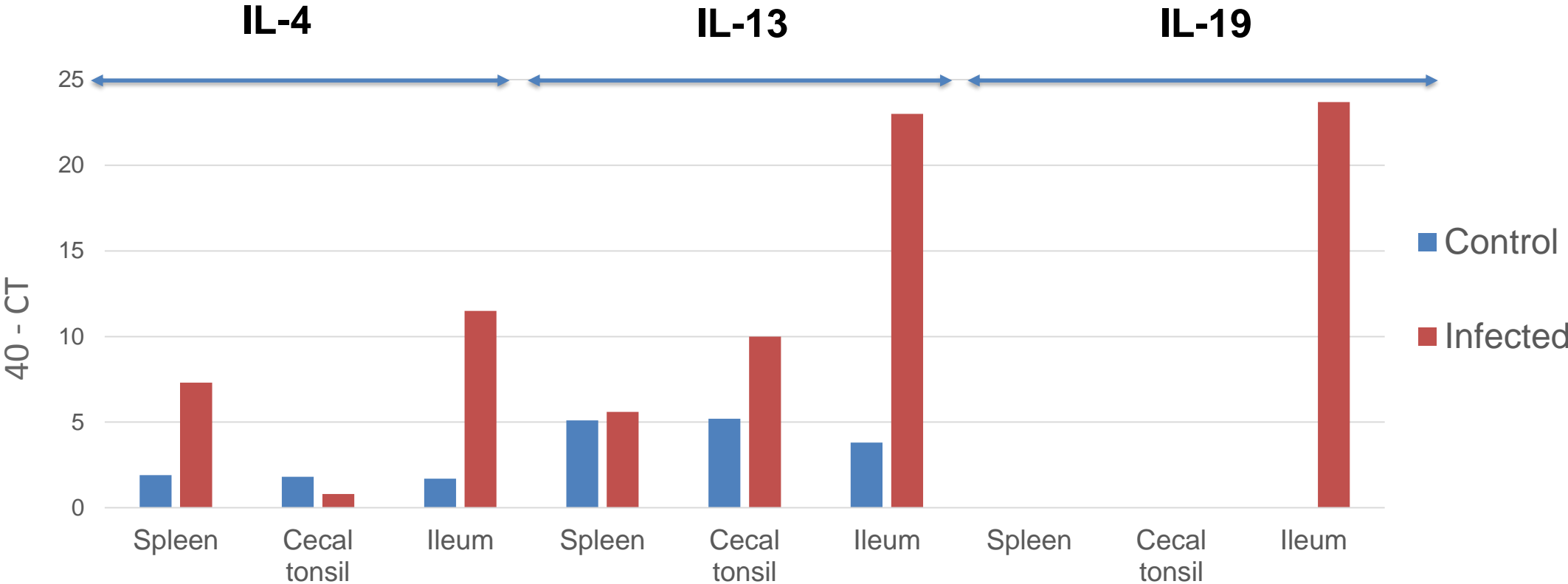
Tumour Necrosis Factor

TNFSF2 (TNF- α), TNFSF4, TNFSF18, TNFSF6, TNFSF8, TNFSF15, TNFSF5, TNFSF10, TNFSF11, TNFSF13B

Colony-Stimulating Factors

GM-CSF, MGF

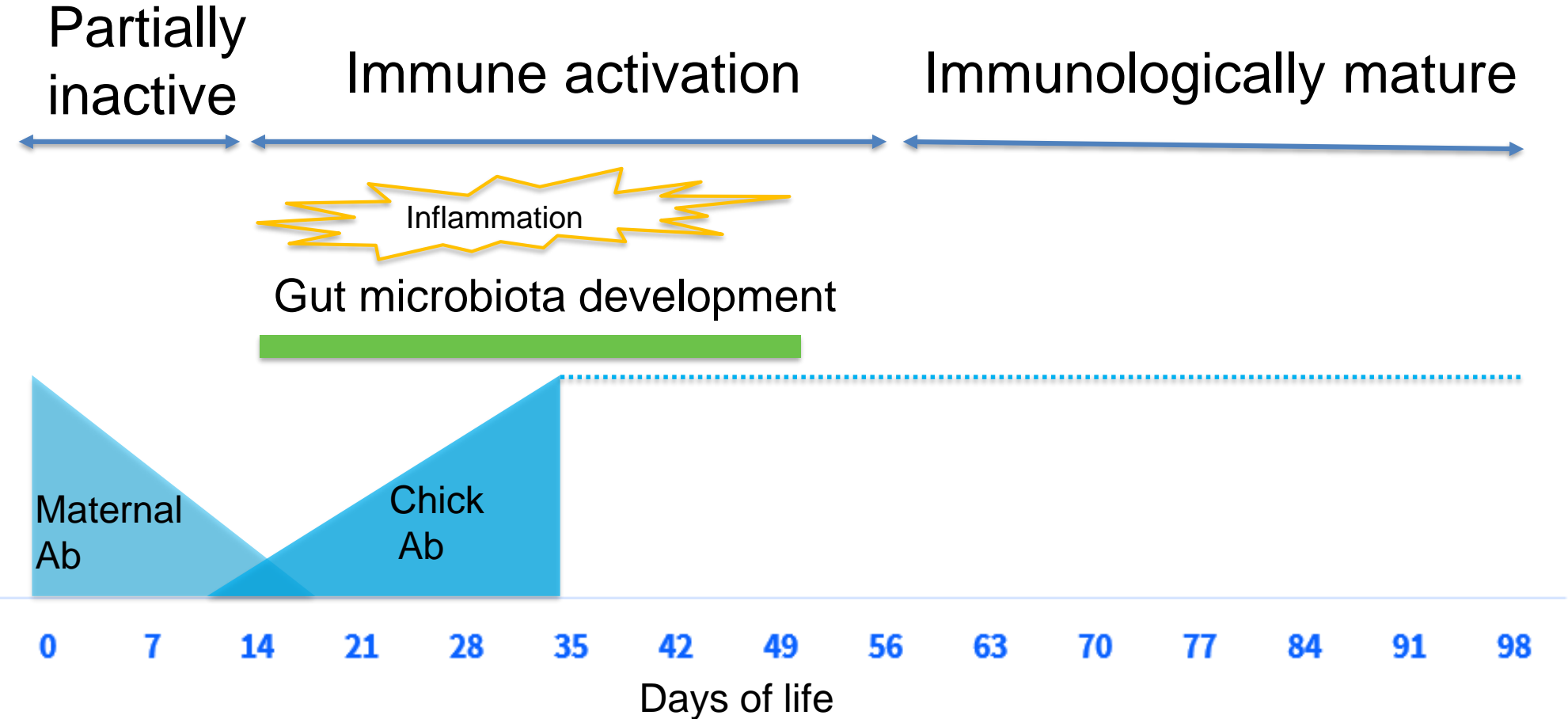
Expression of mRNA for Th2 cytokines following oral infection with 1000 *Ascaris galli* worm eggs



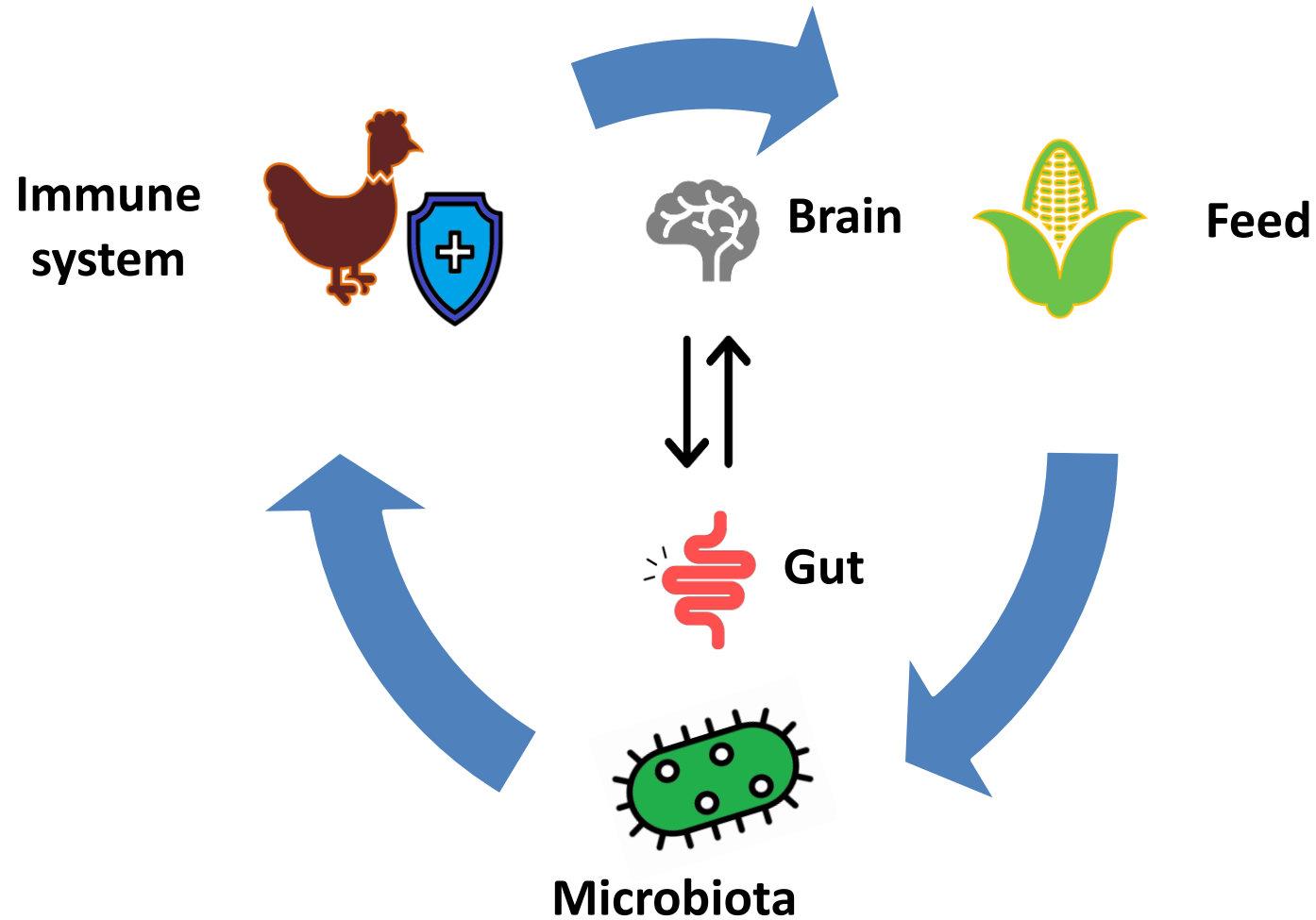
Degen, Daal and Schijns 2004



The immune system development

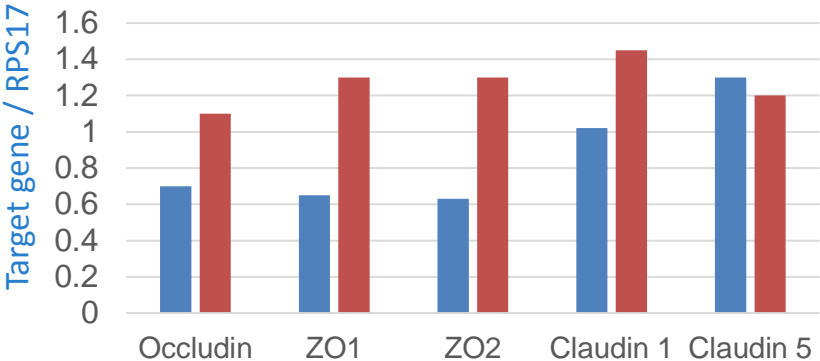


The immune system (extended version)

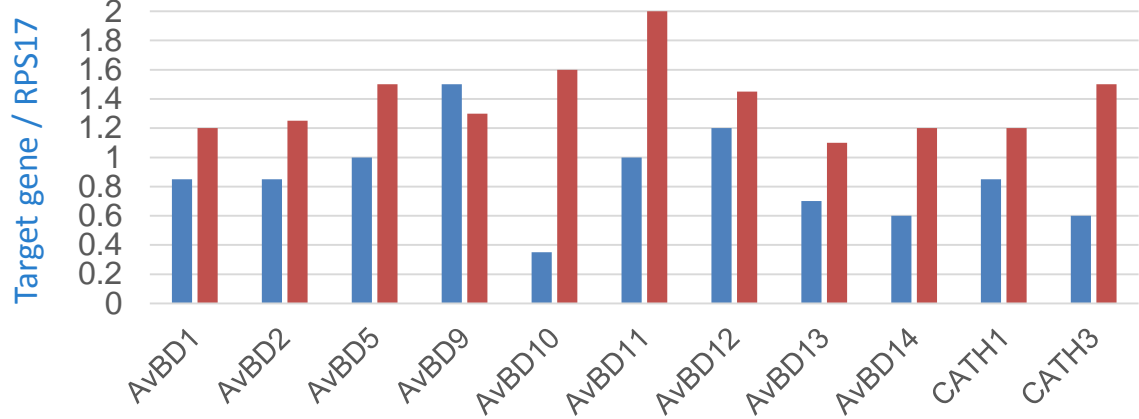


Age-related modulation of the uterine mucosal innate immunity in white laying hens

Cell tight junctions



Innate immunity proteins

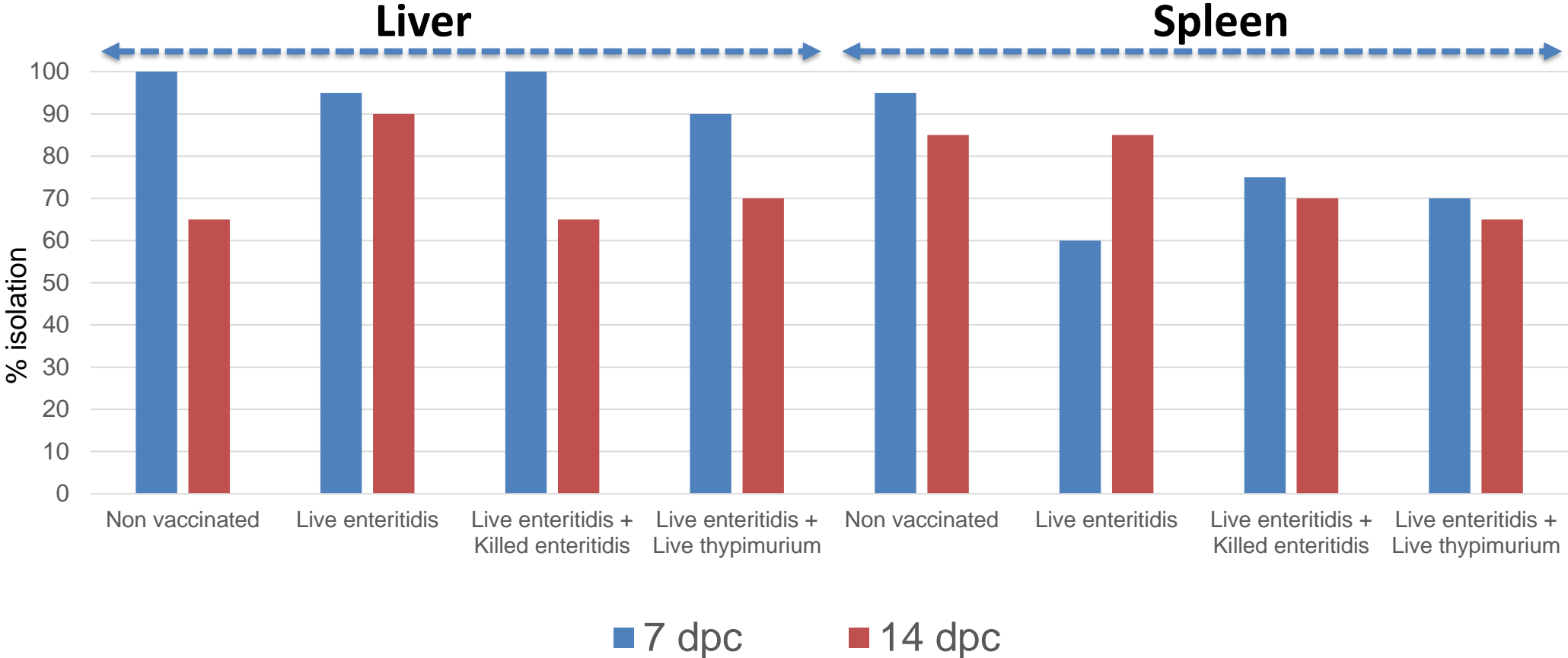


■ Young hens (35 weeks old) ■ Old hens (130 weeks old)

Elhamouly 2019



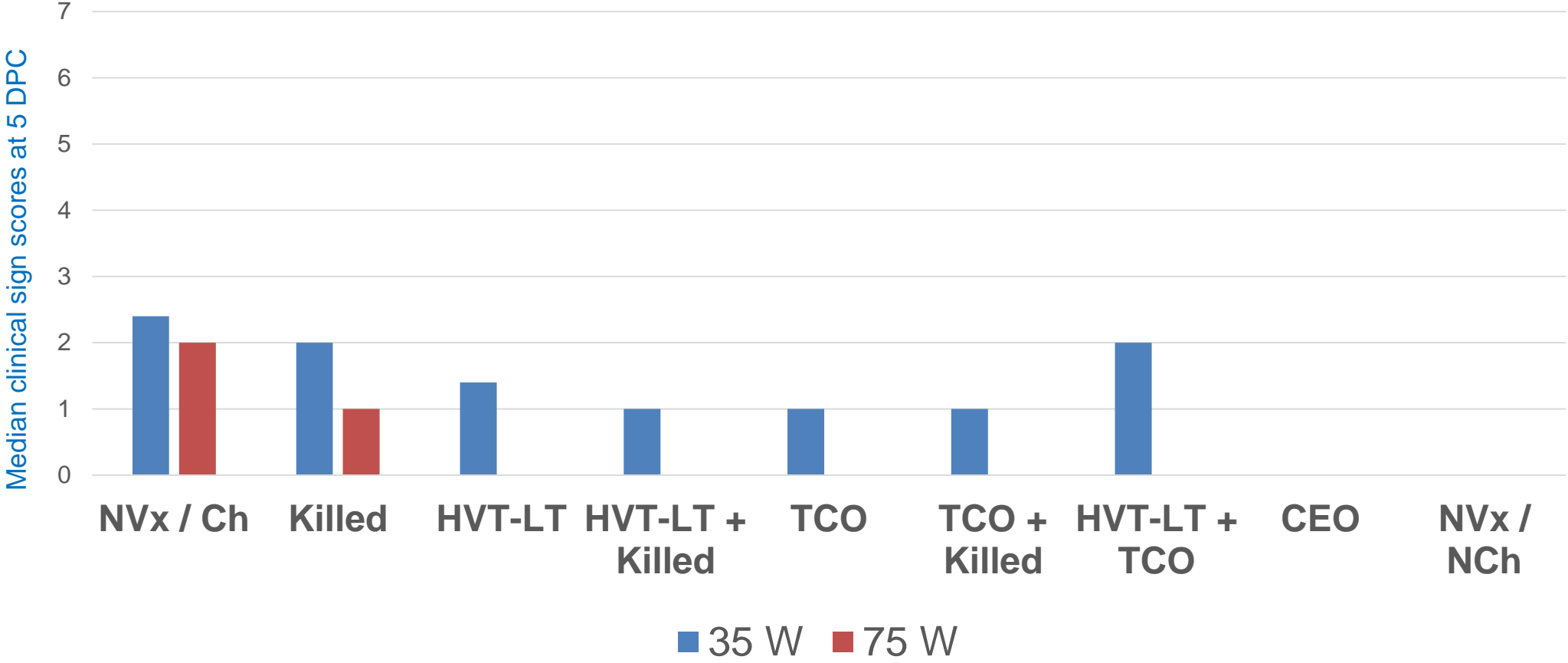
S. Enteritidis isolation after challenge (10^9 CFU) in 85-weeks-old laying hens with different vaccines



Reep 2019



Protection against ILT virus induced by different vaccines program in young and old laying hens

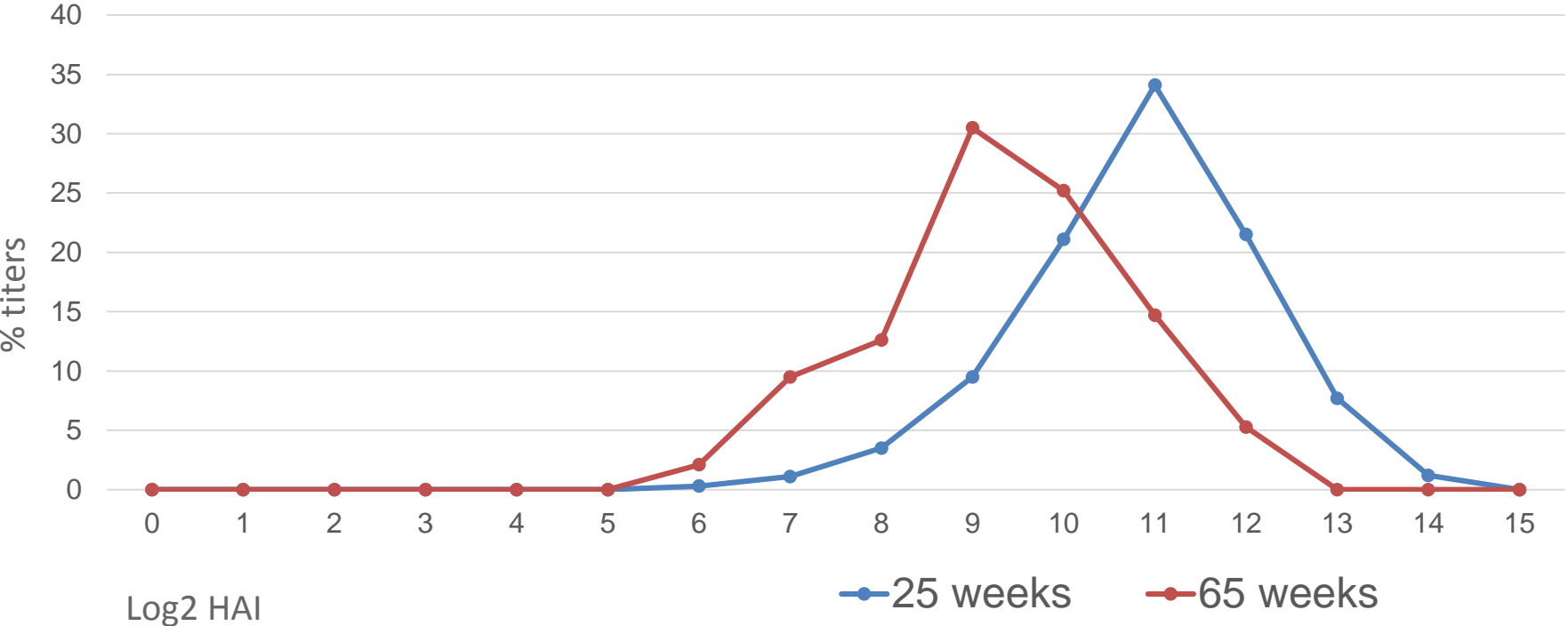


Palomino-Tapia 2019



ND antibody titers distribution from 2M layers operation

Vaccine programme: 2-3 live vaccines + 1 killed in rearing.
No revaccination in production





H&N LAYER ACADEMY

INTERACT WITH US!

Make use of our multiple-choice poll tool and pick what you think is correct.

What may be behind the immune suppression processes in the late period of the production cycle of laying hens?

Factors leading to immunosuppression



Diet -induced

- Unbalanced diet
- Long-term feed restriction

Stress -induced

- Temperature
- Social
- Environmental

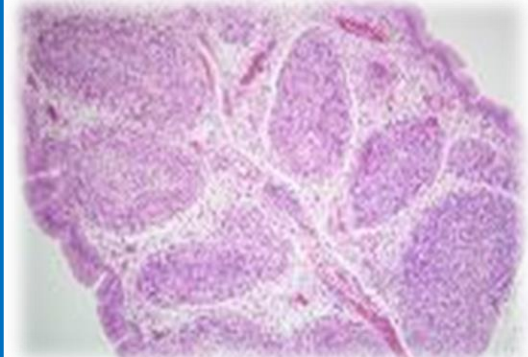


Toxic- induced

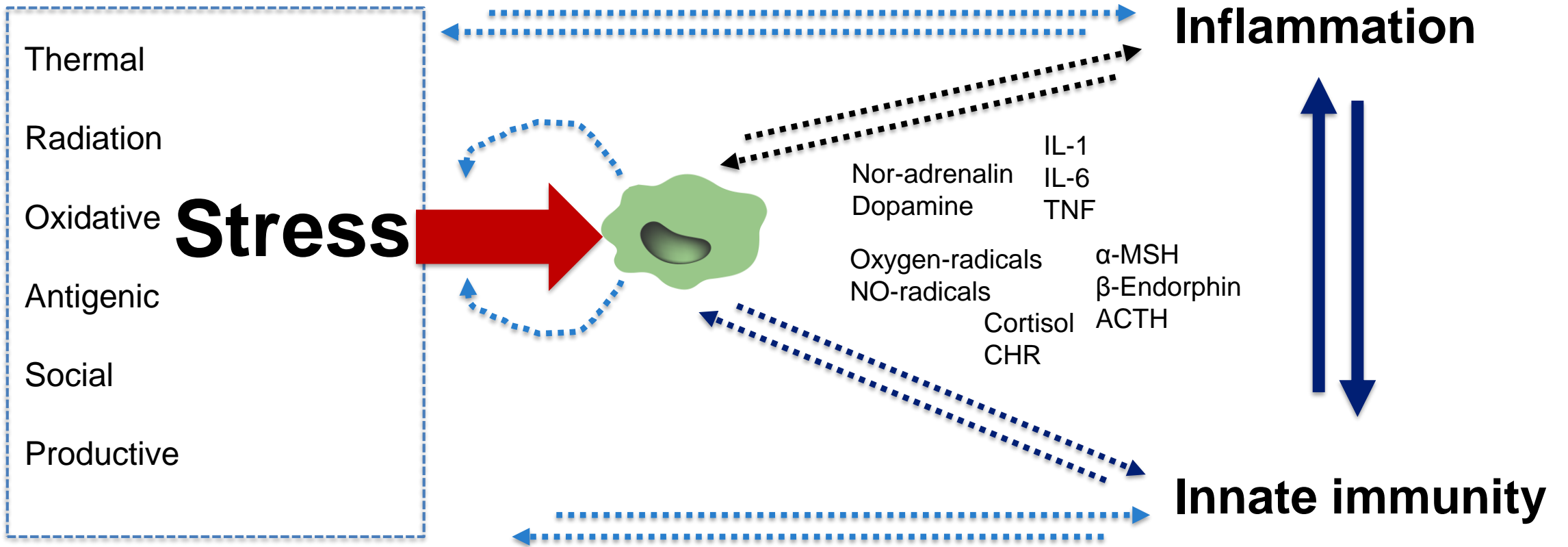
- Mycotoxins
- Pesticides
- Organochlorine compounds

Disease –induced

- Coccidia, IBD, CAV, REO, MD, ALV-REV

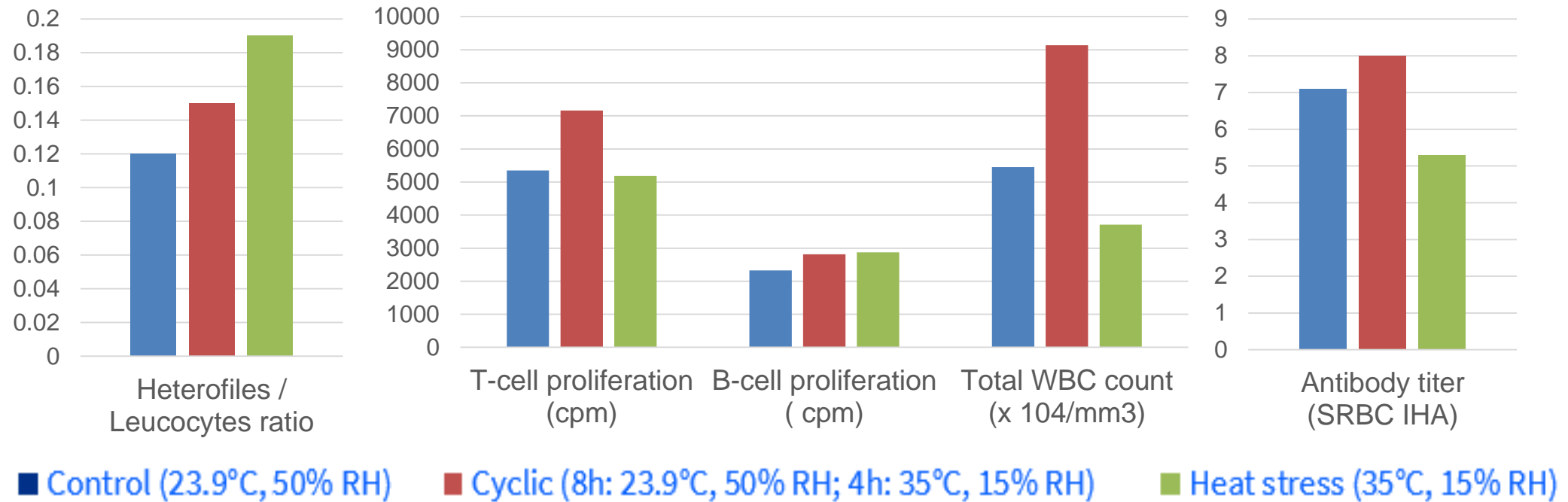


Inflam-aggging theory in humans



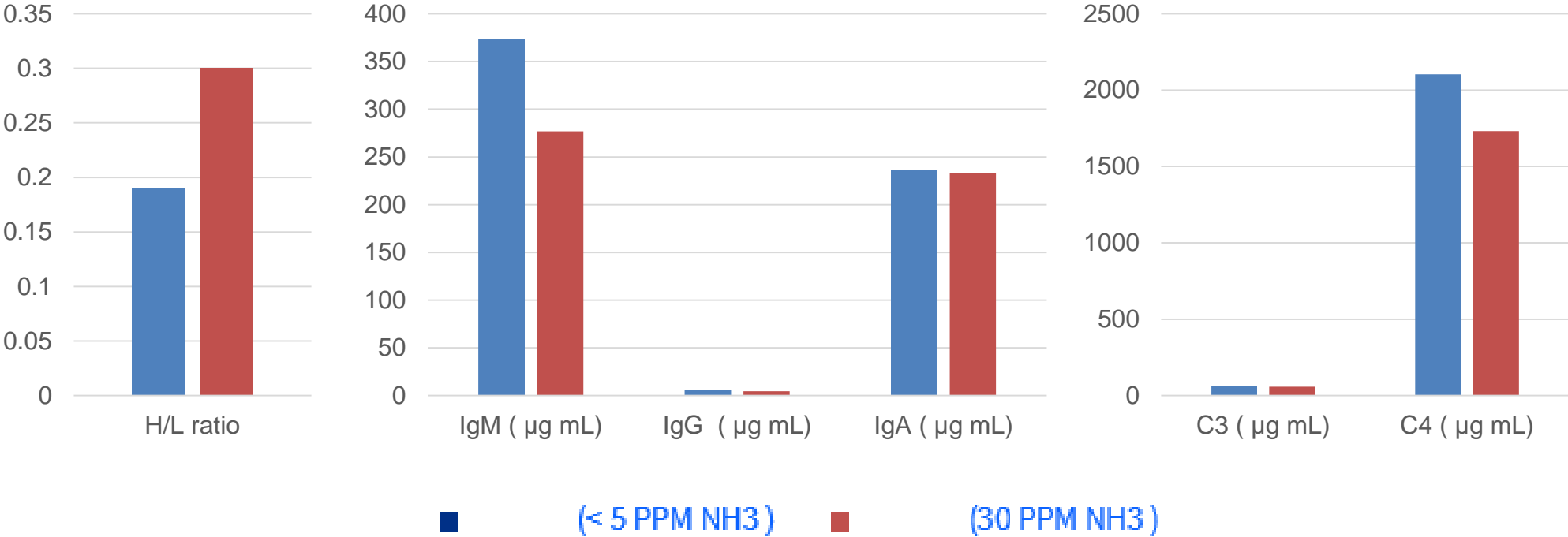
Franceschi et al 2000

Effect of heat stress for 4 weeks on different immunological parameters in 35-week-old hens.

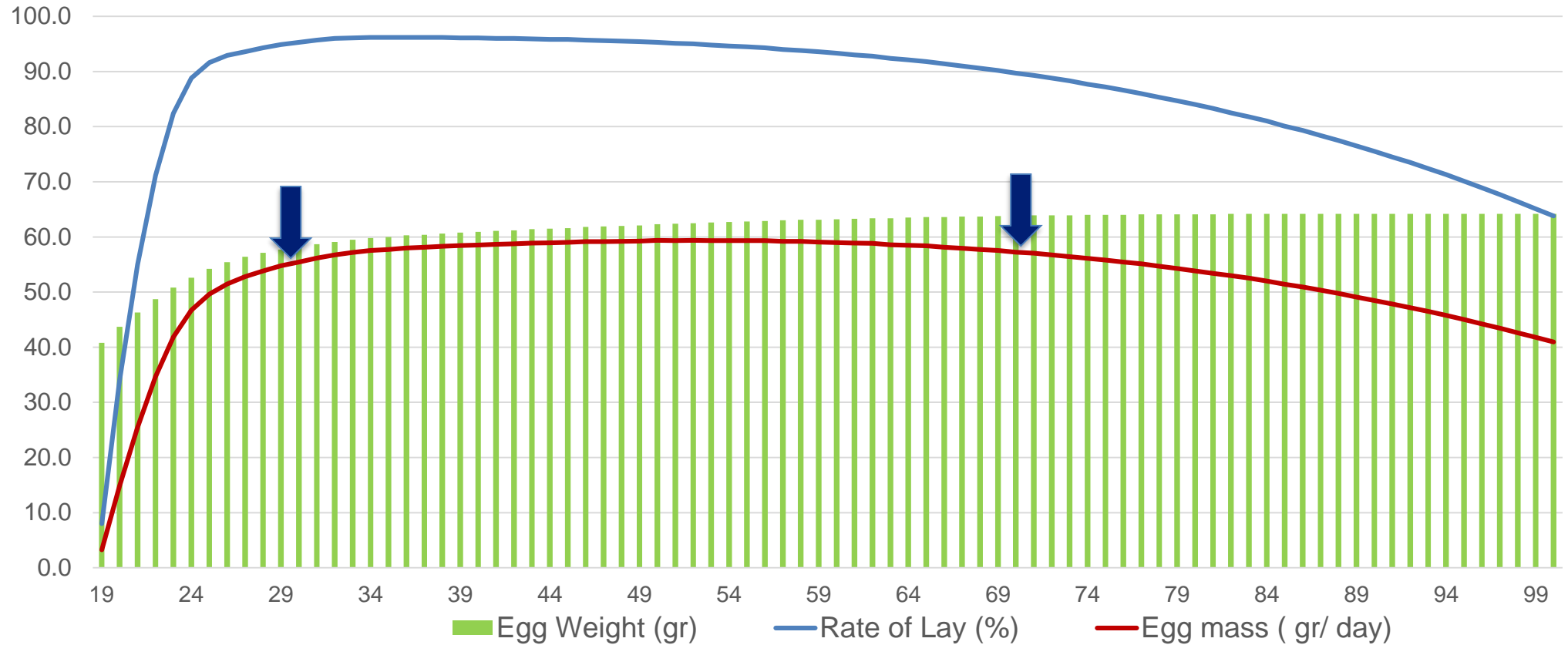


Mashaly 2004

Immune Response of laying hens exposed to 30 ppm ammonia from week 25 to week 50

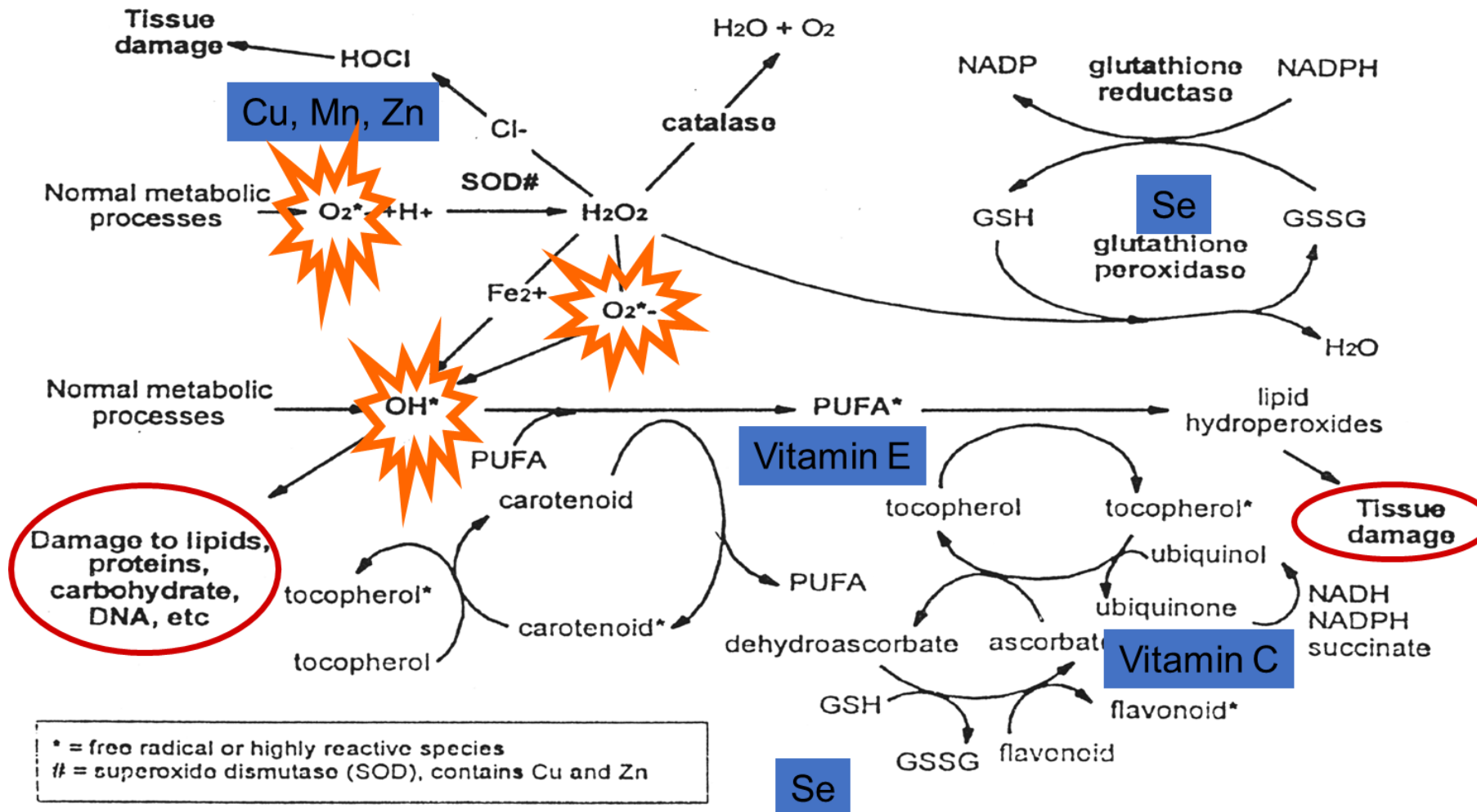


Egg mass production (Nick Chick)



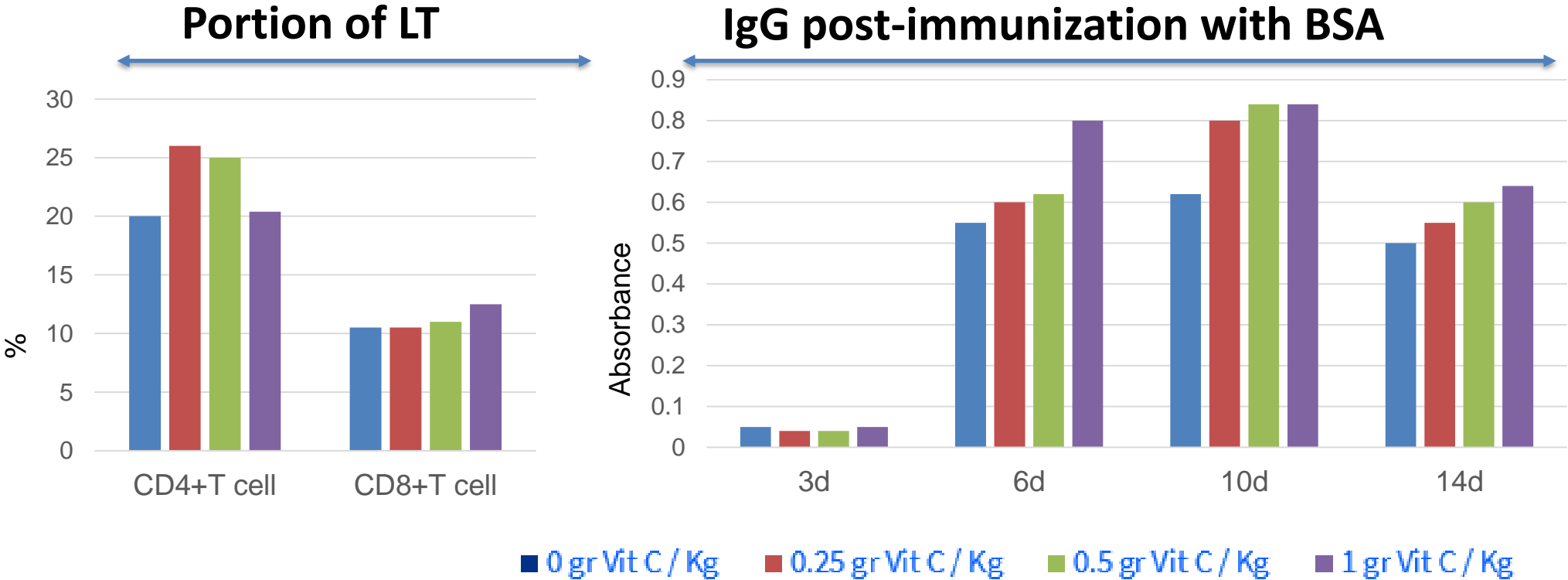
Weeks of life

Oxidative stress



* = free radical or highly reactive species
 # = superoxide dismutase (SOD), contains Cu and Zn

Effects of 8-weeks dietary Vit C supplementation on immunity in 78-weeks-old laying hens



Gan 2018



Conclusion

1.

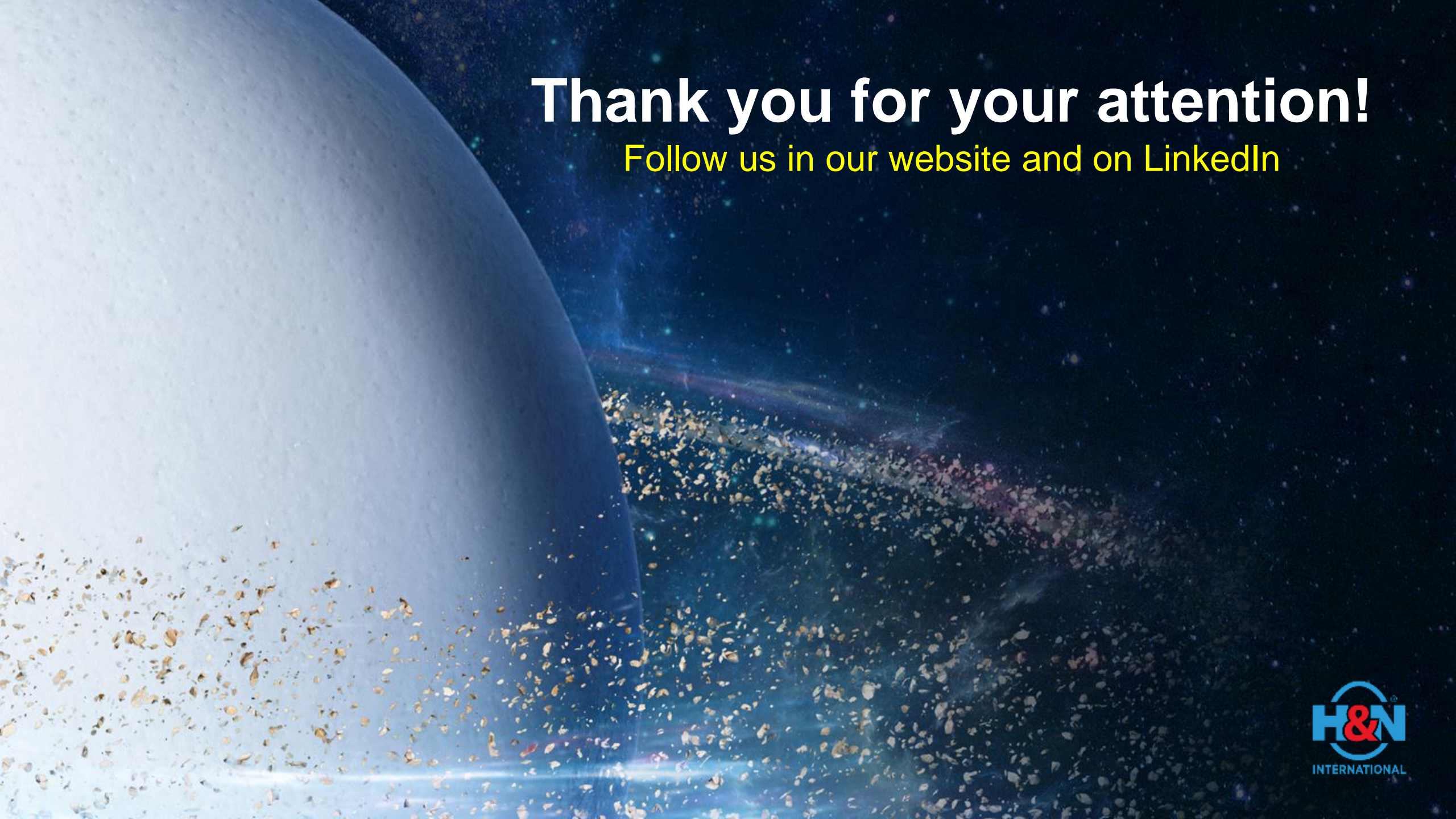
Mycotoxins and immunosuppressive diseases control is a **prerequisite** for good immunity at early and late production period.

2.

Stress of whatever origin can **exhaust** the immune system. Particular attention should be paid to **diet /egg mass imbalances**.

3.

For a **long-lasting and protective immunity, good rearing period** and a **revaccination** program in production if necessary is needed.

A space-themed background featuring a large, bright, cratered planet on the left side. The rest of the image is a dark, starry space filled with a dense field of small, golden-brown particles or dust, possibly representing a protoplanetary disk or a debris field. The lighting is dramatic, with a bright glow from the planet illuminating the surrounding dust.

Thank you for your attention!

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