

# Breeding for high natural antibody levels reduces impact of *E. coli* (APEC) challenge in chickens

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Tom Berghof



# Co-authors/Acknowledgement

## Wageningen University & Research

- Henk Parmentier
- Jan van der Poel
- Henk Bovenhuis
- Joop Arts
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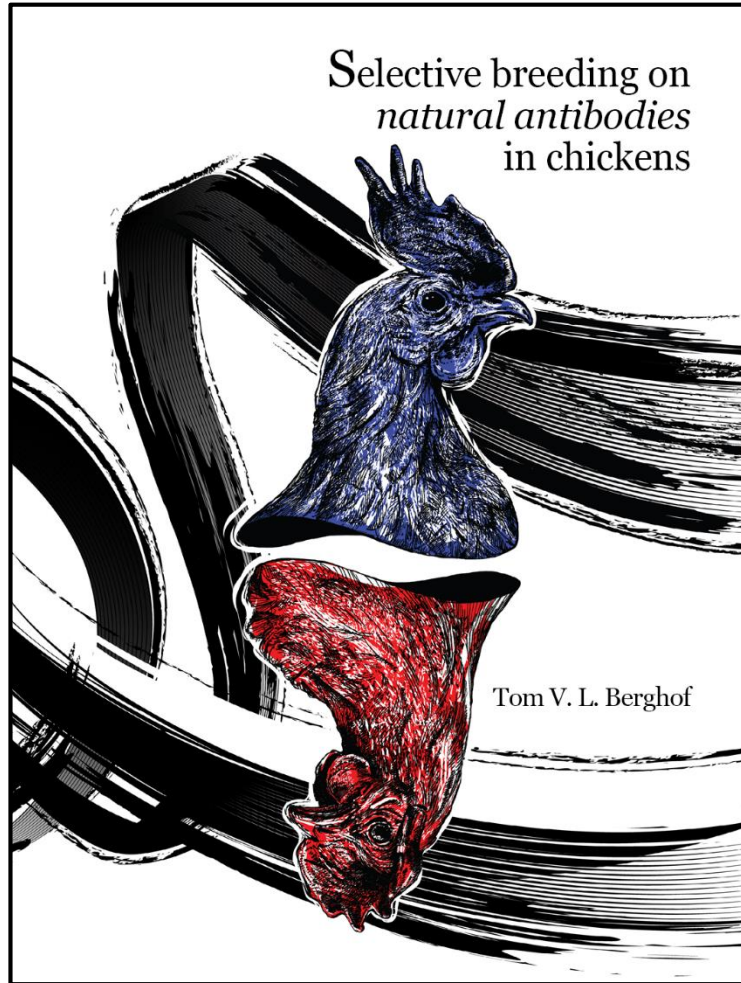
## Utrecht University

- Mieke Matthijs
- Marius Dwars

## NWO-TTW

## Hendrix Genetics

# Part of my PhD thesis

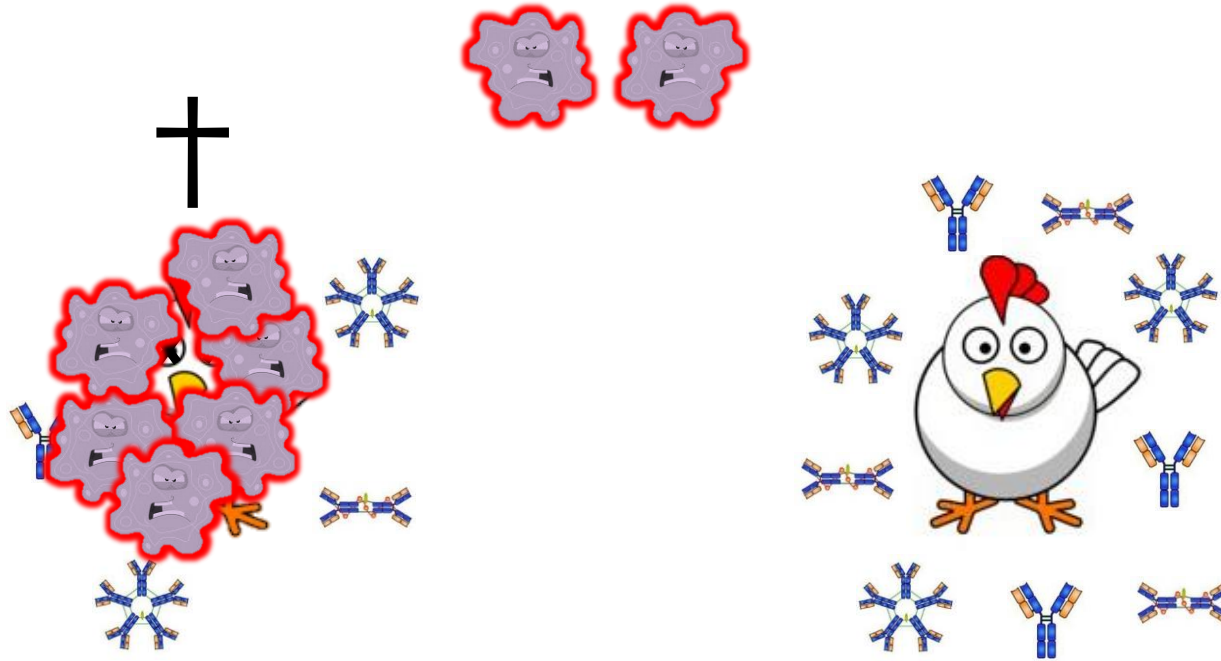


Chapter 6 in  
“Selective breeding on  
*natural antibodies* in chickens”

Manuscript to be submitted

→ Ask me for a copy!  
[tom.berghof@wur.nl](mailto:tom.berghof@wur.nl)

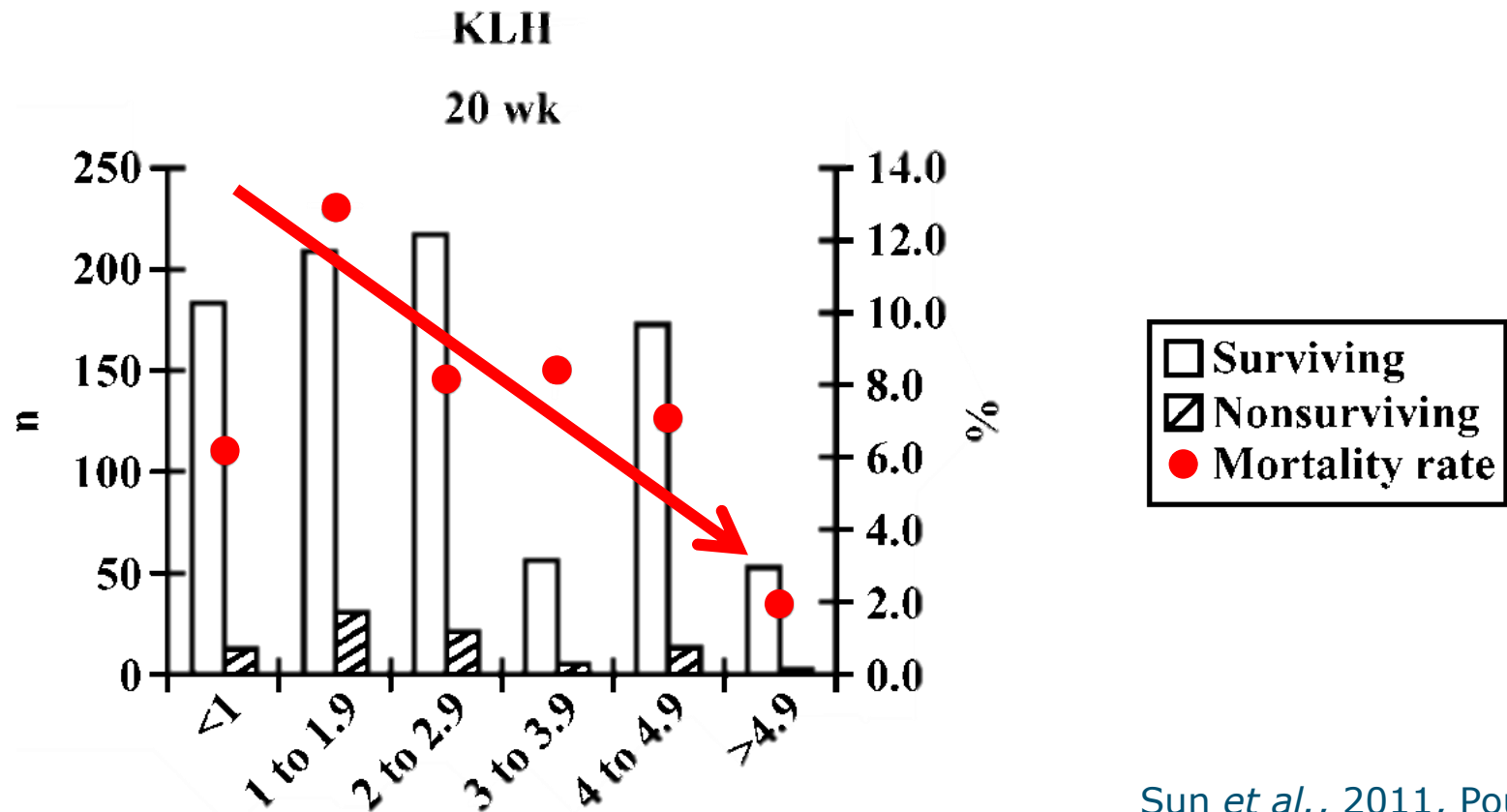
# Natural antibodies?



ANIMATED SLIDE

# Natural antibodies!!!

Star *et al.*, 2007, Poult Sci



Sun *et al.*, 2011, Poult Sci

Wondmeneh *et al.*, 2015, Poult Sci

# Natural antibodies

Antigen binding antibodies present in individuals without exposure to this antigen

# Natural antibodies binding KLH

Antigen binding antibodies present in individuals without exposure to this antigen

Keyhole Limpet Hemocyanin (KLH)



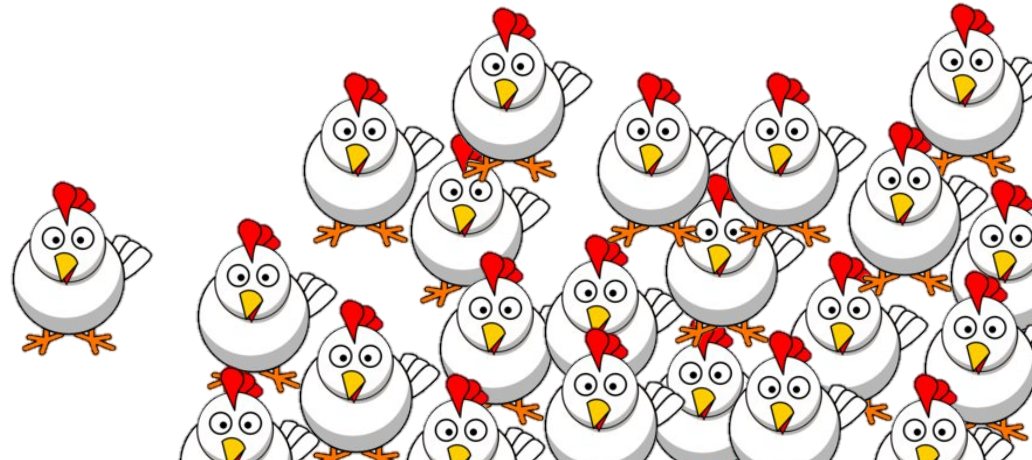


# Hypothesis

General disease resistance of chickens can be improved by selective breeding for natural antibodies

## **Selection criterion**

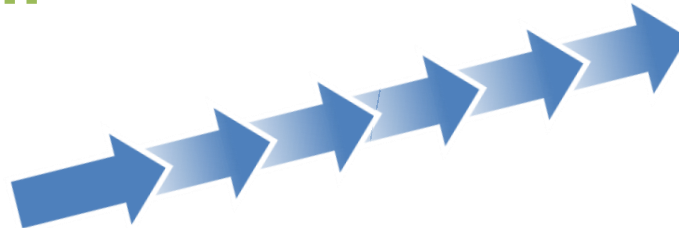
Total level of natural antibodies binding KLH at 16 weeks of age





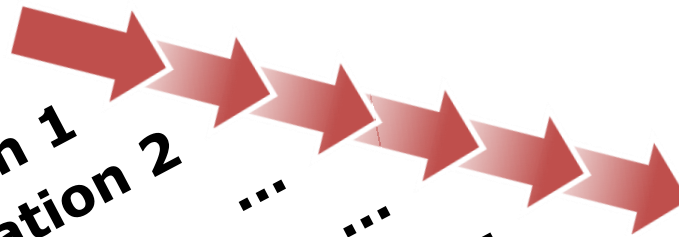
# Natural antibody-selection experiment

**Base population**



**High line**

**Low line**

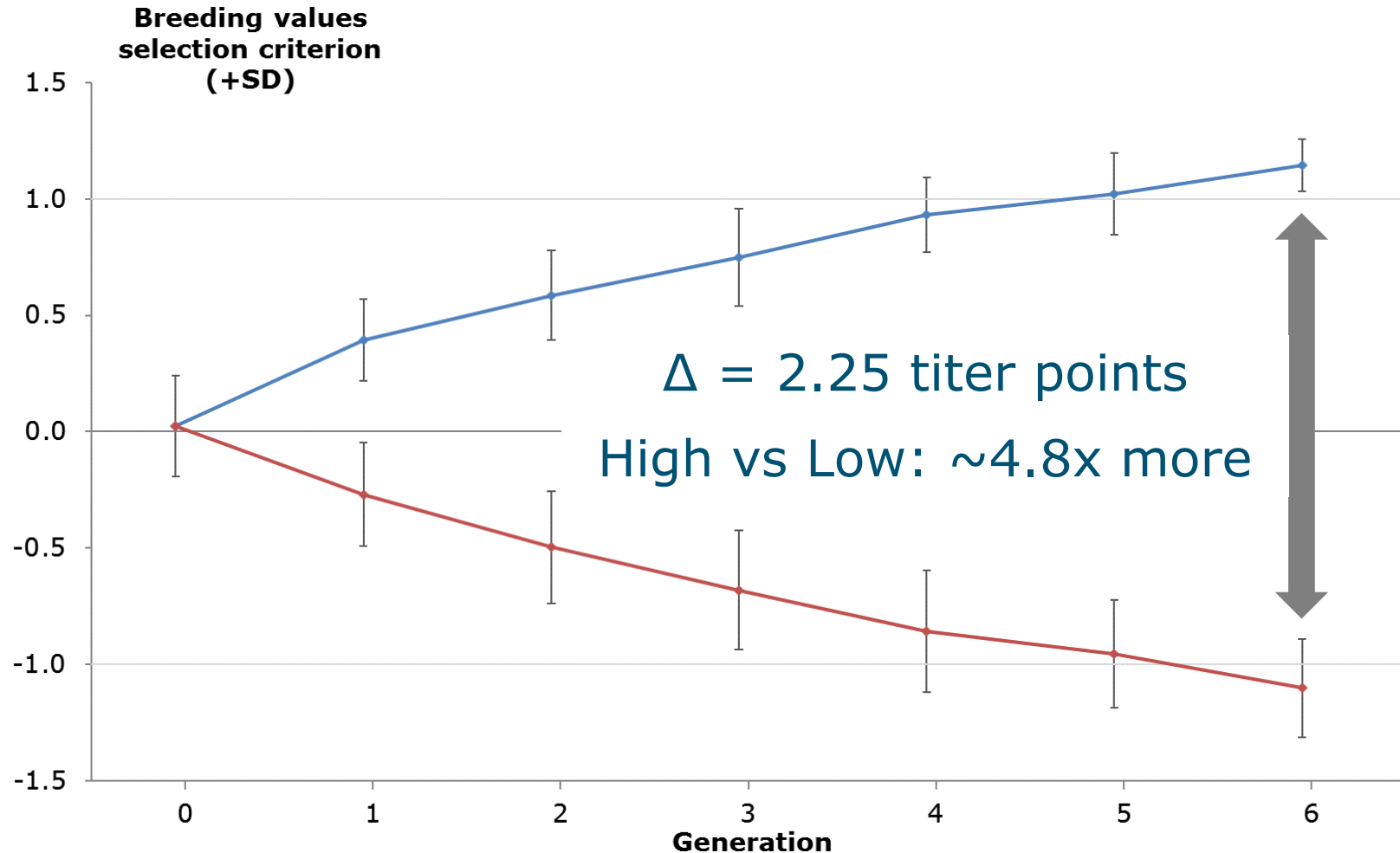


**Generation 1**  
**Generation 2**

...  
...  
...  
**Generation x**



# Selection progress



# Infection experiments

- Experiment I → Generation 4  
Experiment II → Generation 6

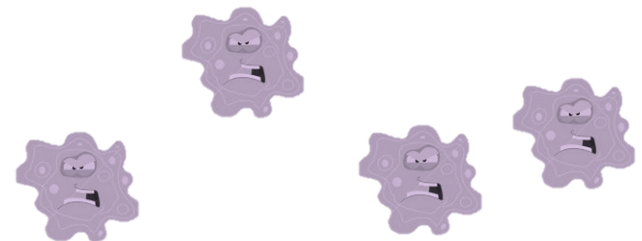
- Avian pathogenic *E. coli* (APEC)

- *Escherichia coli* serotype O78:K80 (strain 506)

- Increasing problem in layer industry

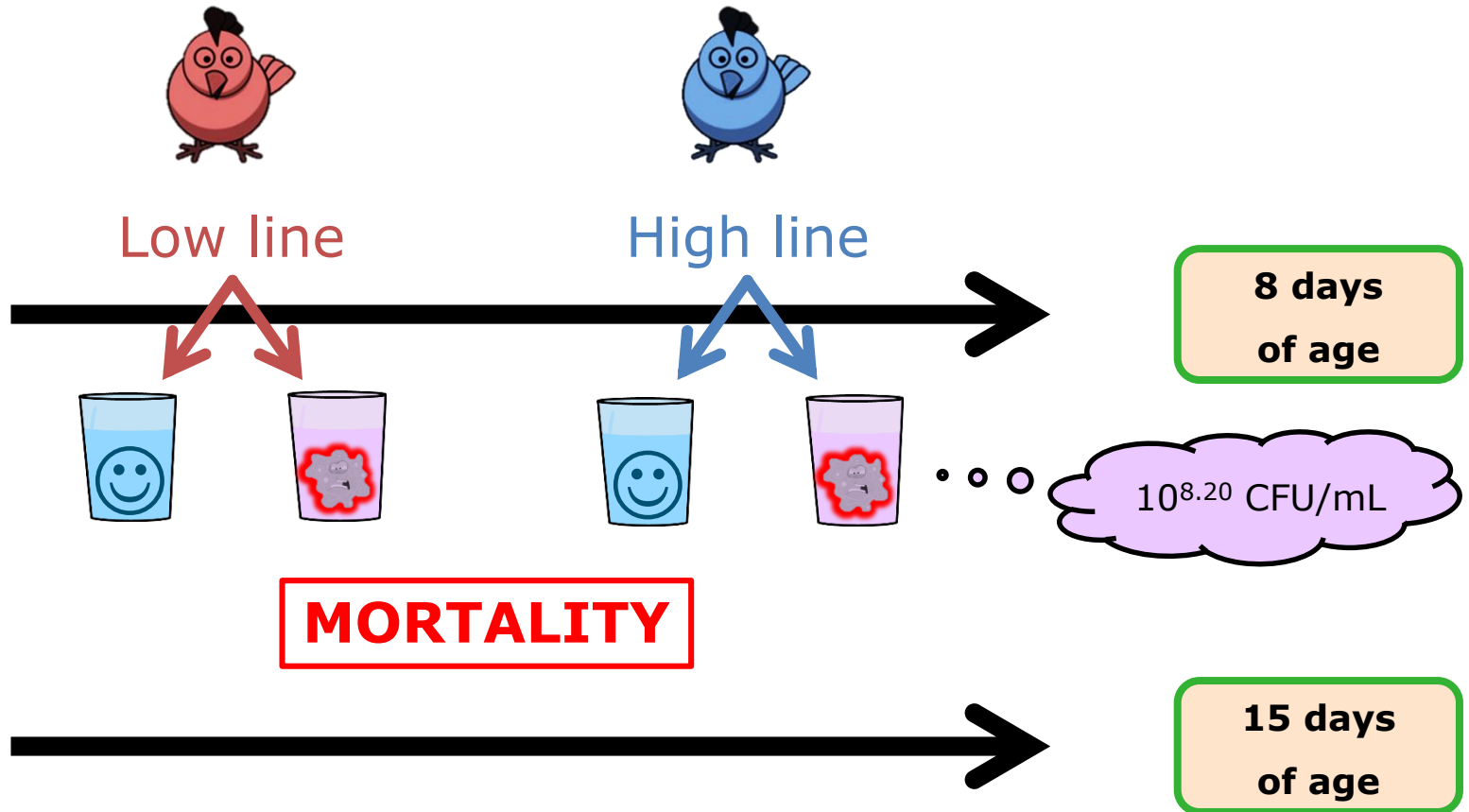
- Amenable for genetic improvement (Davies *et al.*, 2009, Animal)

- Intratracheal inoculation

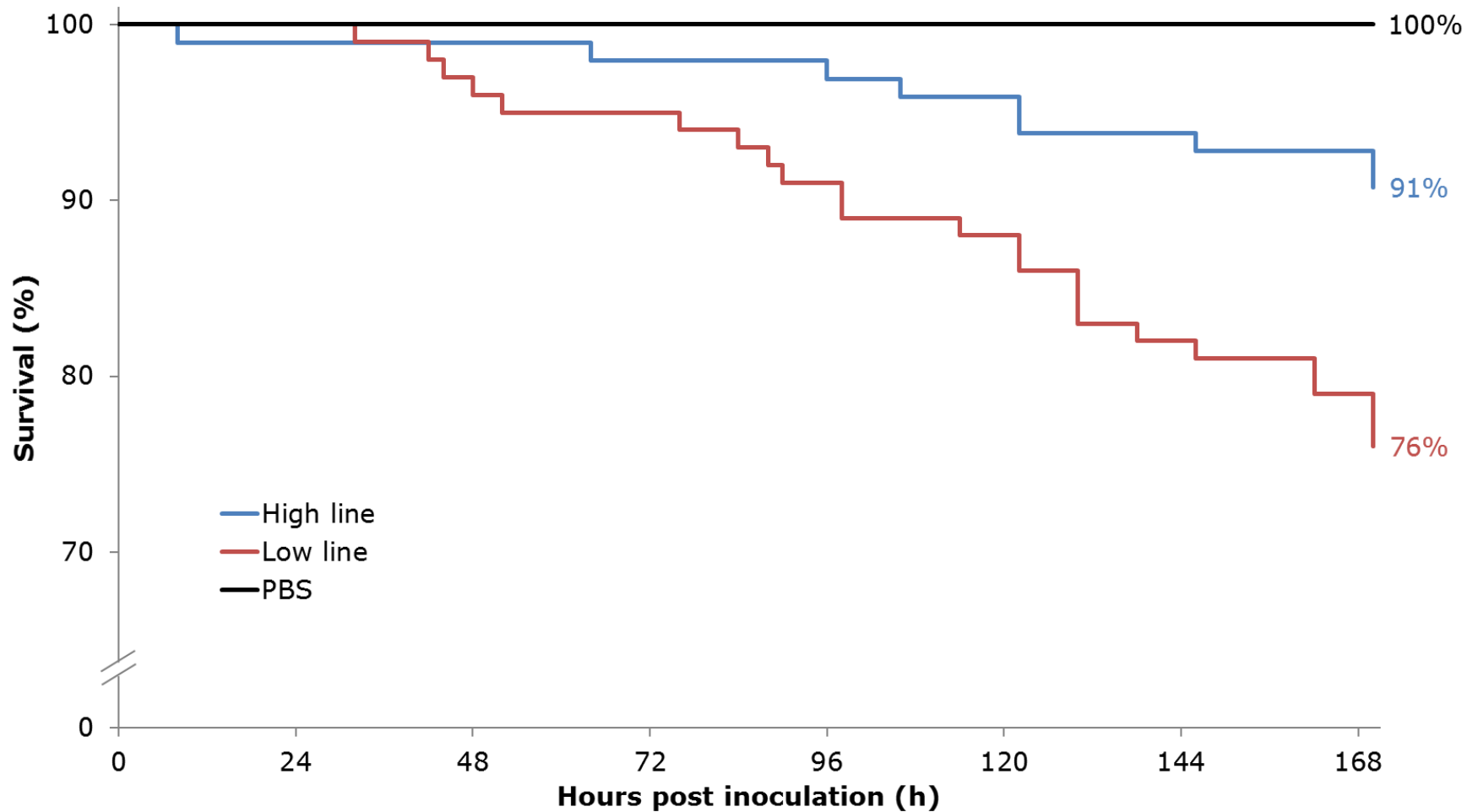


# Set-up Experiment I

$n = 100$  / treatment /line



# Mortality Experiment I



# Set-up Experiment II

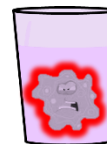
$n = 100$  / treatment /line



Low line

High line

8 days  
of age



**MORTALITY & MORBIDITY**

Repeat Exp. I

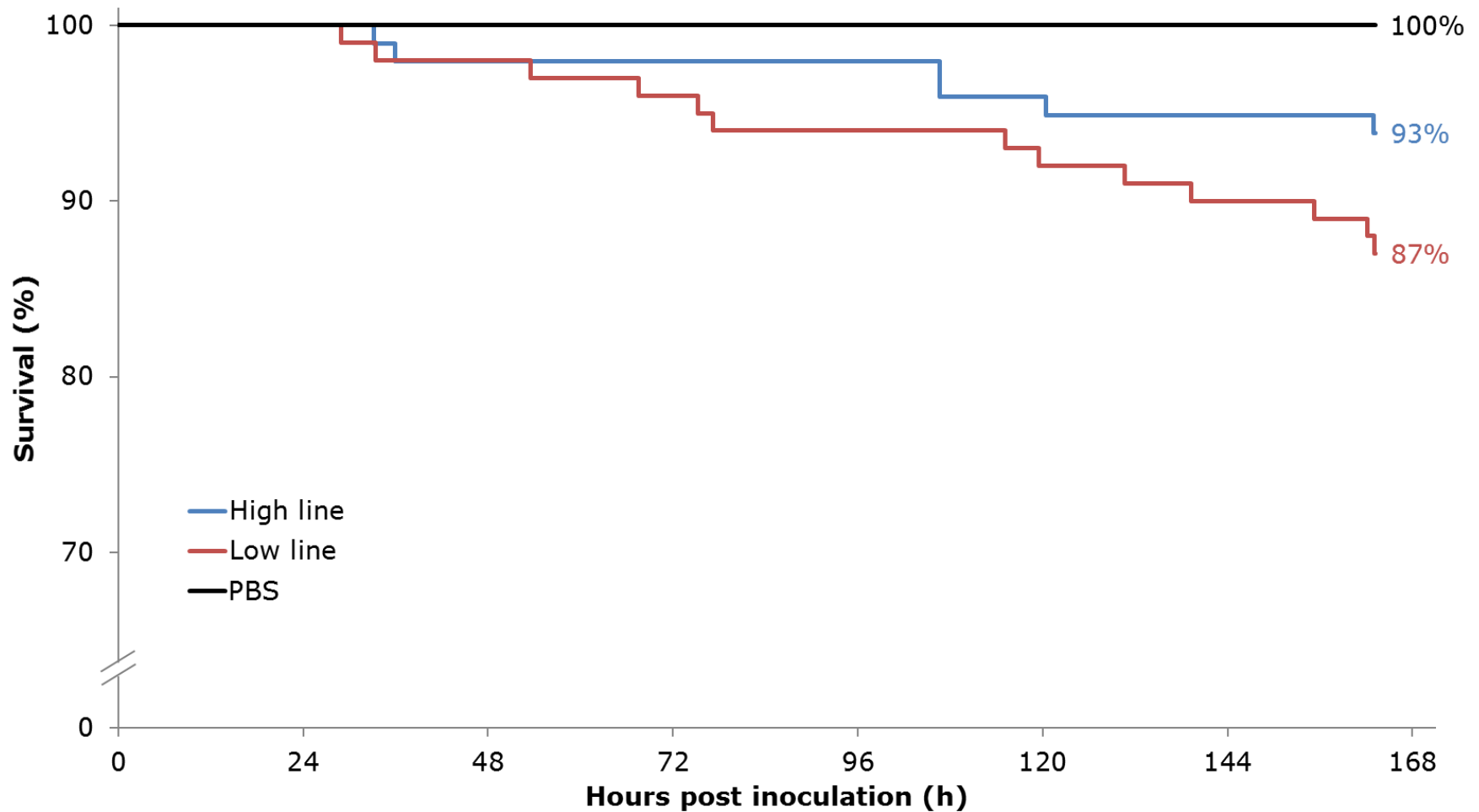
Score lesions

15 days  
of age

$10^{7.55}$  CFU/mL

$10^{6.64}$  CFU/mL

# Mortality Experiment II

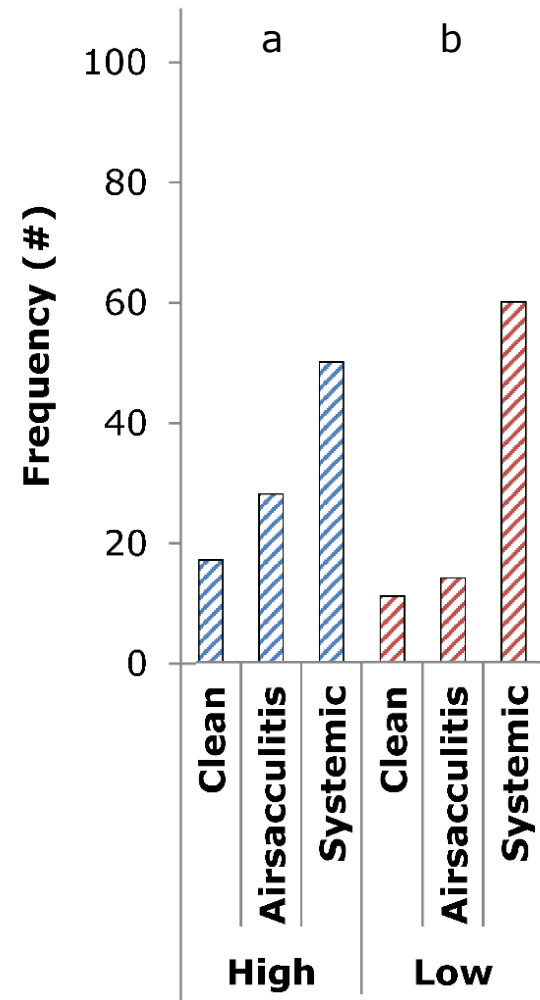




# Morbidity Experiment II



**Lesion prevalence**



# Take-home message

Selective breeding on **high natural antibody**  
compared to selective breeding on **low natural antibody**  
**reduces mortality and morbidity** after an intratracheal  
**E. coli** (APEC) infection at young age in chickens

Can't get enough?! Session 63 at 17:15h



# Selection progress

ADDITIONAL SLIDE

