Should I lay, or should I grow?

Management of layer and broiler breeder pullets for optimum reproduction

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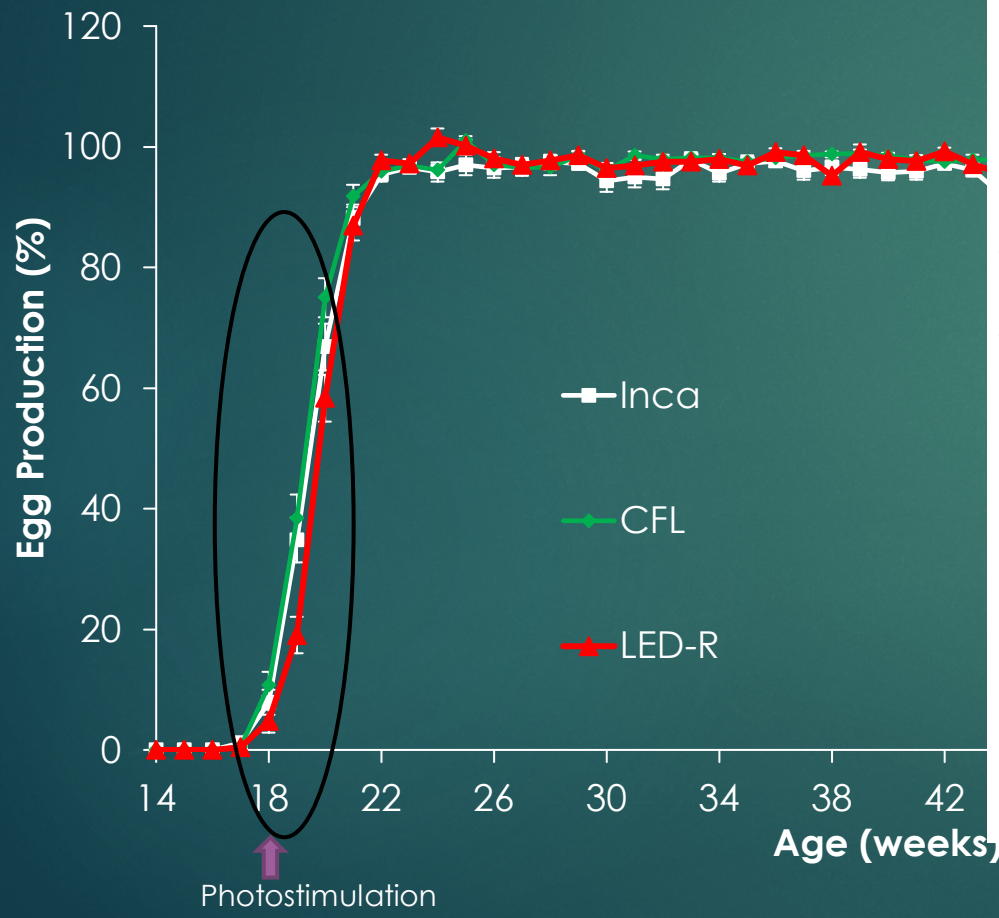
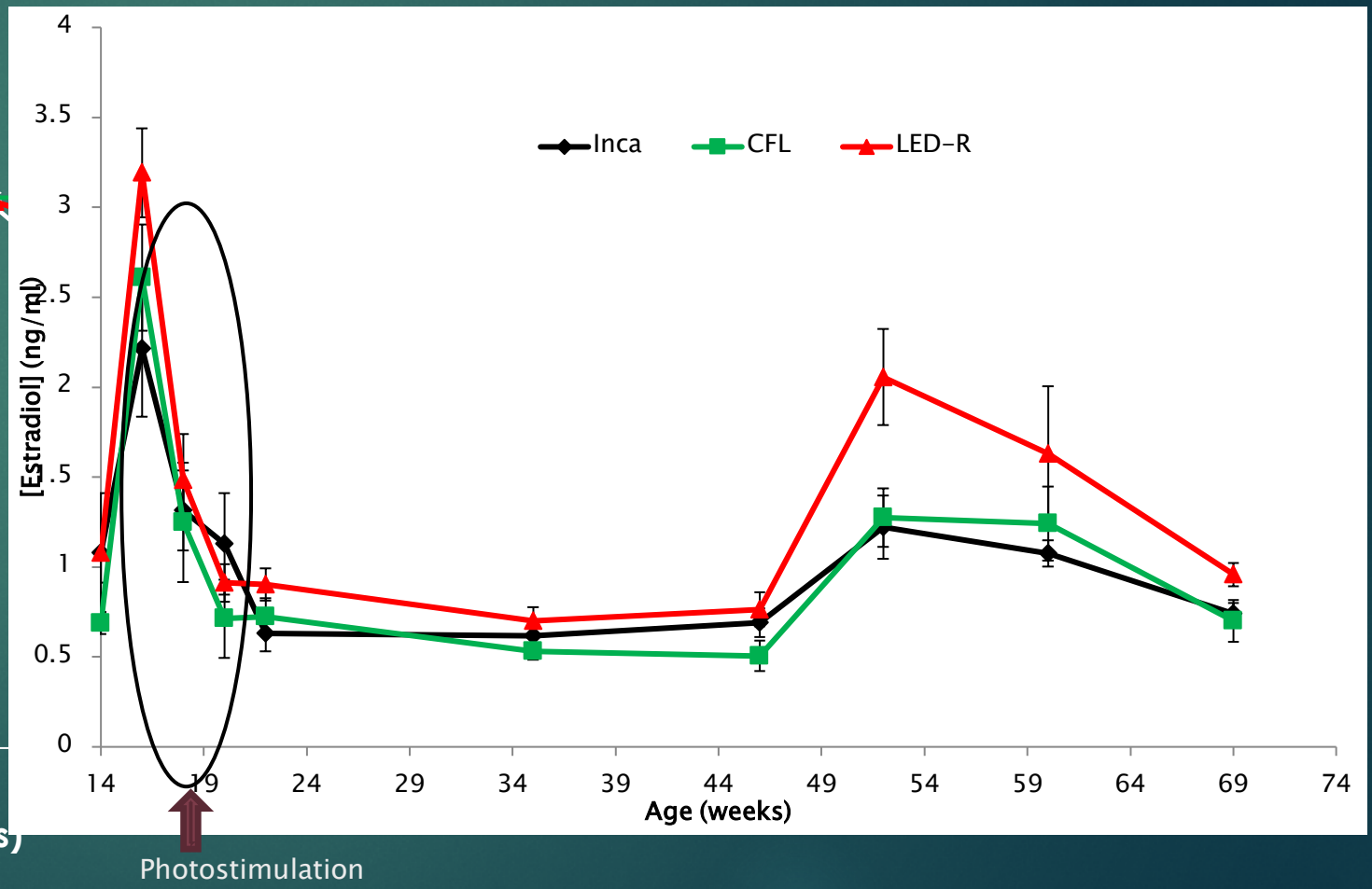
Does photoperiod control maturation?

Baxter & Bédécarrats. (2019). The Journal of Poultry Science 56:148.

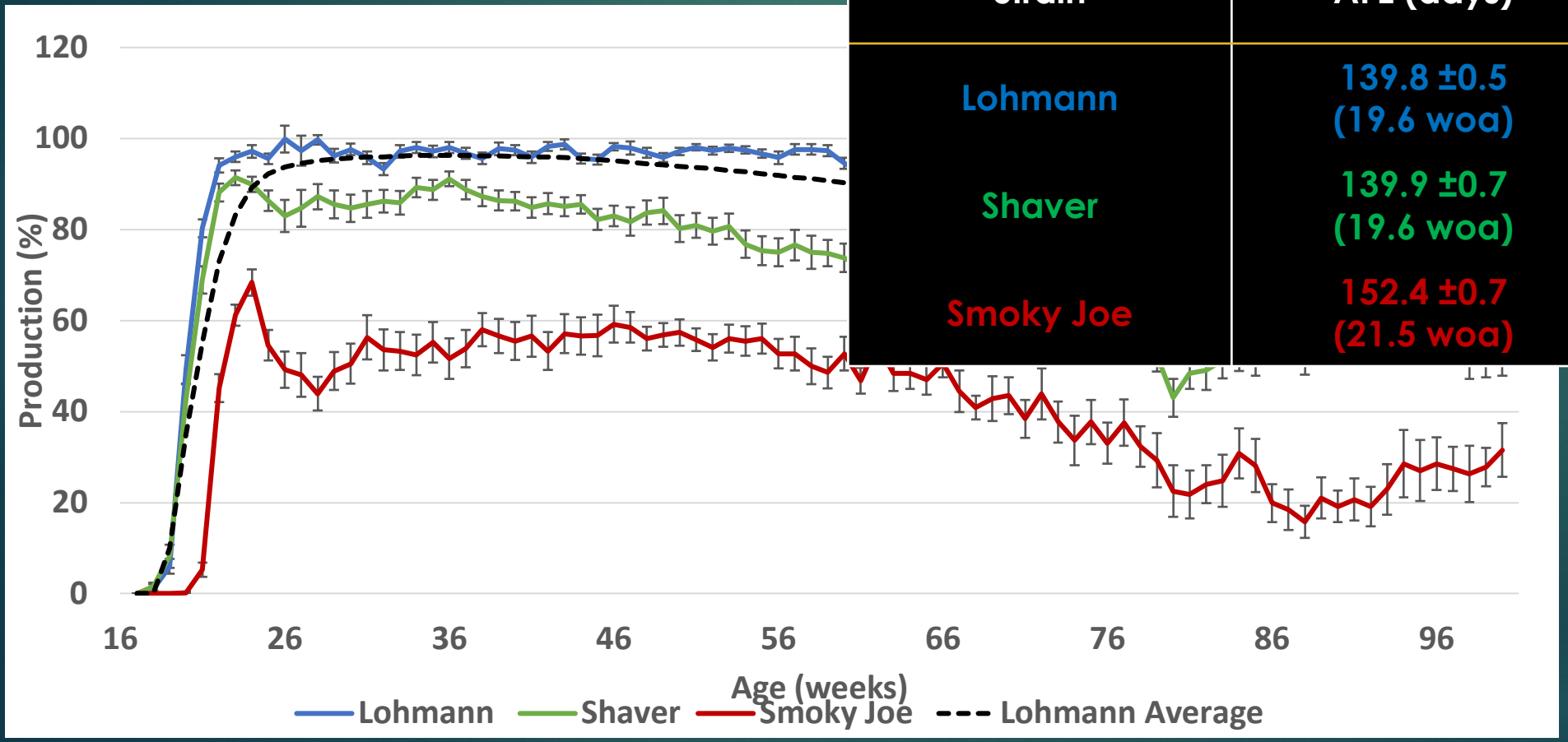




Was the advanced maturation the result of genetic selection?

Hanlon et al. (2021). Frontiers in physiology 12.

Strain	AFE (days)	Weight (kg)
Lohmann	139.8 ±0.5 (19.6 woa)	1.445
Shaver	139.9 ±0.7 (19.6 woa)	1.494
Smoky Joe	152.4 ±0.7 (21.5 woa)	1.431

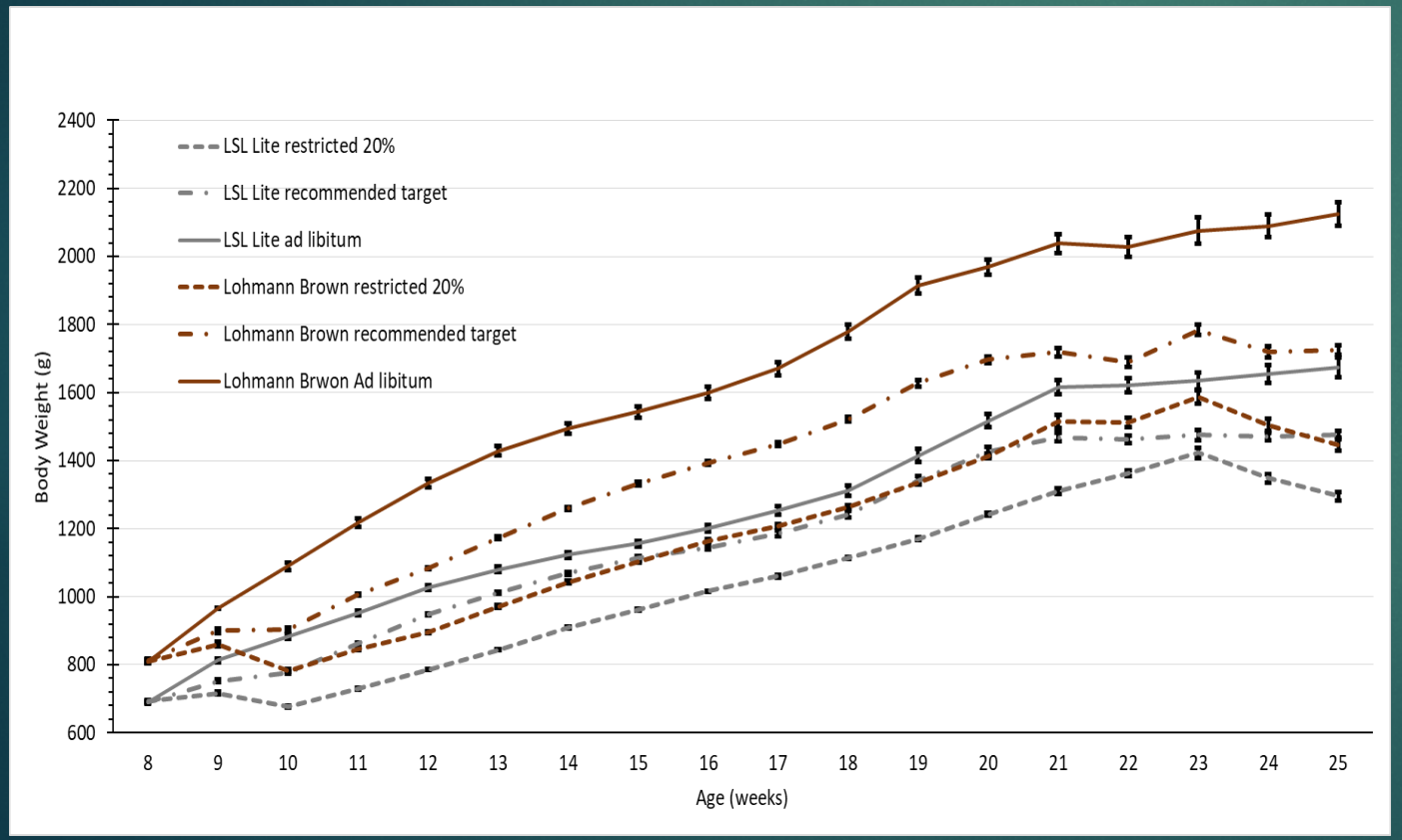


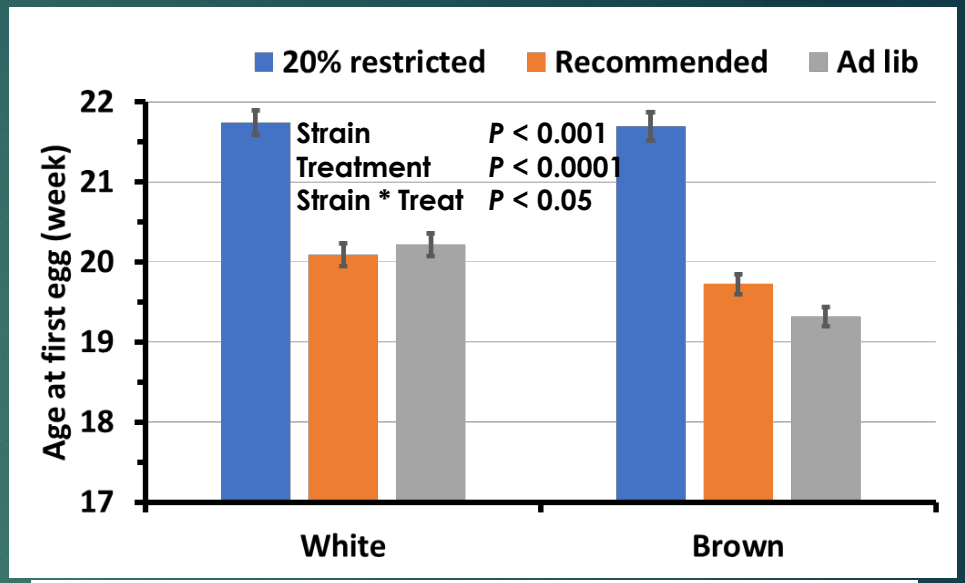
Photoperiod or body weight?

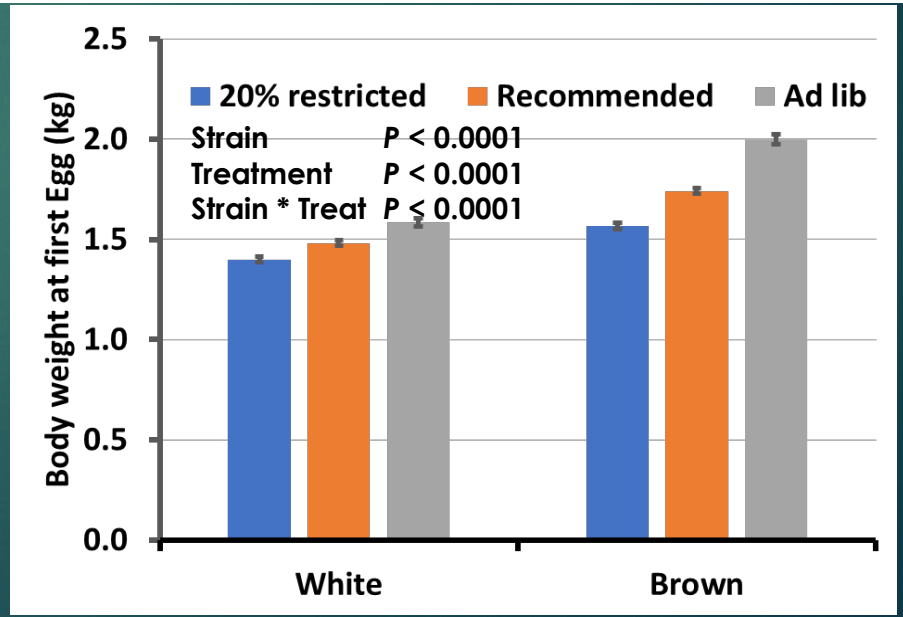
- Initiation of maturation prior to photostimulation suggests other triggers
- When comparing 3 strains of Leghorn derivatives spanning decades of selection:
  - All hens laid their first egg within a 63g body weight window
  - Regardless of strain, age or photoperiod

Is it a fixed body weight target? *(ongoing EFC sponsored project)*

- Comparing the effect of different growth trajectories in white and brown commercial strains





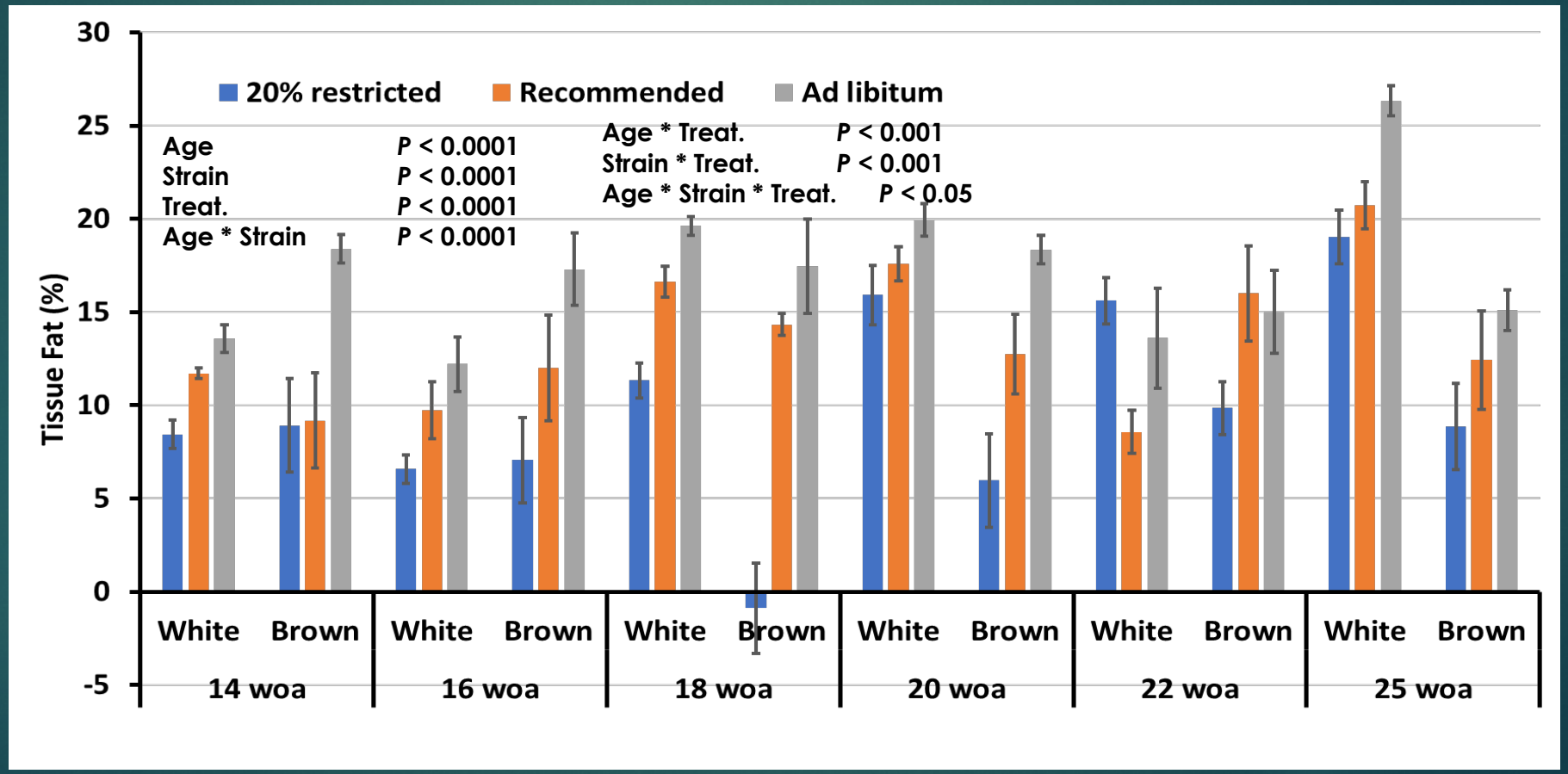


The body weight threshold appears to be dependent on:

- Breed: white versus brown layers – browns require a heavier set point
- Growth / feeding profile
  - Feed restriction leads to a delay in maturation but also lowers the threshold body weight
  - Feed intake (appetite control) differs between breeds leading to differing impact of ad libitum regimen
- Taken together, these results suggest an impact of body composition rather than actual body weight

Body composition measured by DEXA

- Data suggest a body fat threshold between 10 and 15% is required to allow sexual maturation to proceed

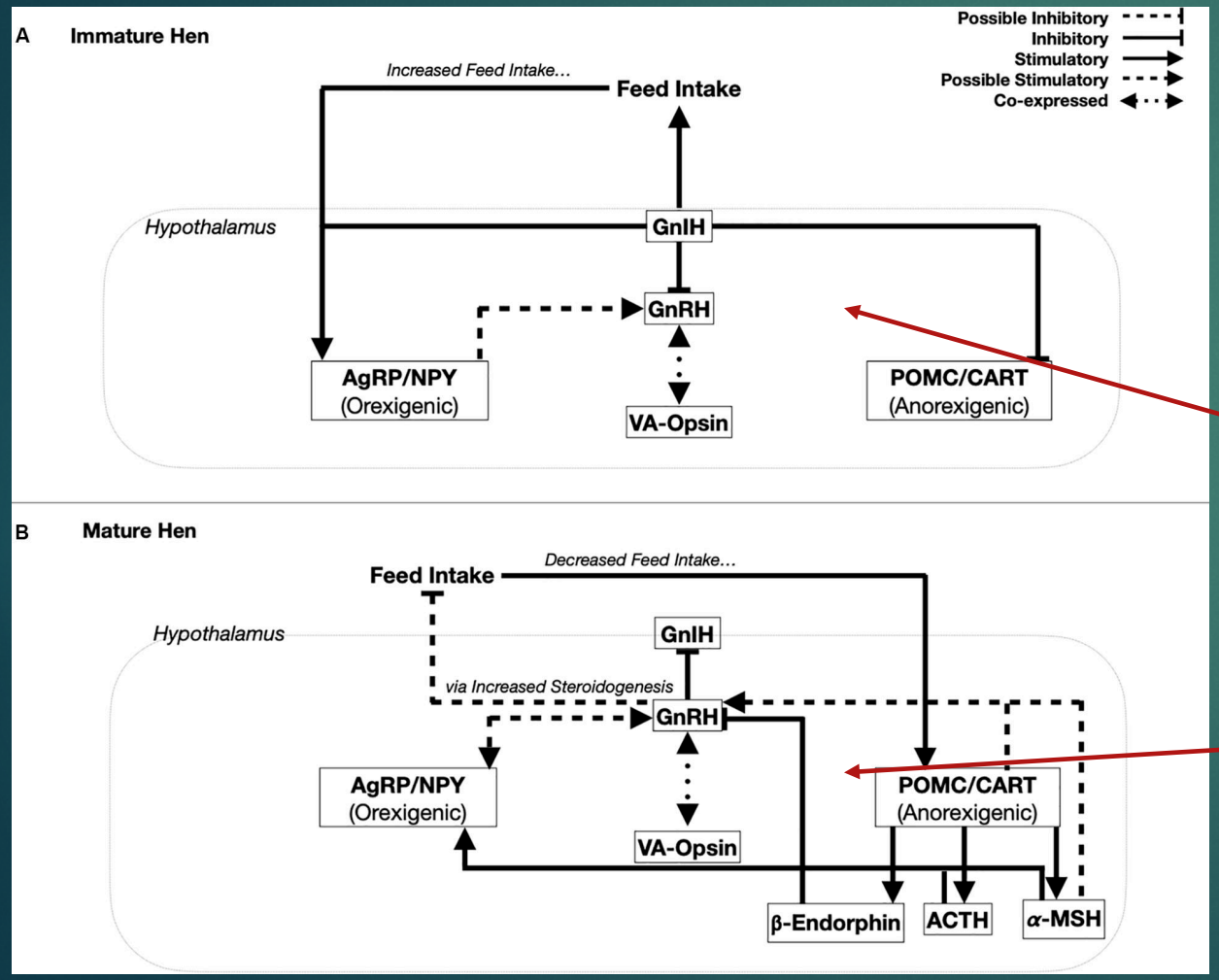


What about rearing environment?

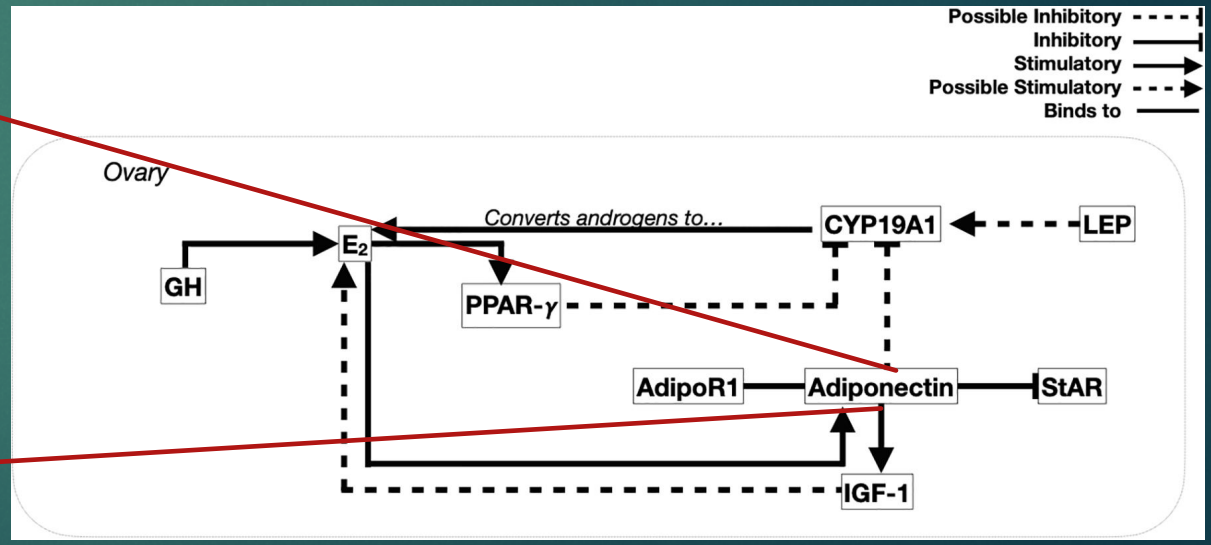
- Different environments = level of physical activity = different energy requirements and nutrient partitioning
- Could this impact the sexual maturation of pullets?
- Trial underway to compare the impact of rearing in colony cages and various aviary systems

How we think it works?

Hanlon et al., 2020. Front. Physiol., 26 June. https://doi.org/10.3389/fphys.2020.00707



Regulation of glucose metabolism?



So what should you/we do?

- Monitor body weight to ensure birds are on target
  - Gaining weight too fast will lead to entry in lay in the pullet barn
  - Growing to slow will delay entry in lay in he adult barn
- If possible adjust feeding / diet to match expected trajectory
- Guidelines need to be revised to account for evolving requirements
  - Changing genetics
  - Housing environment

What about broiler breeders?

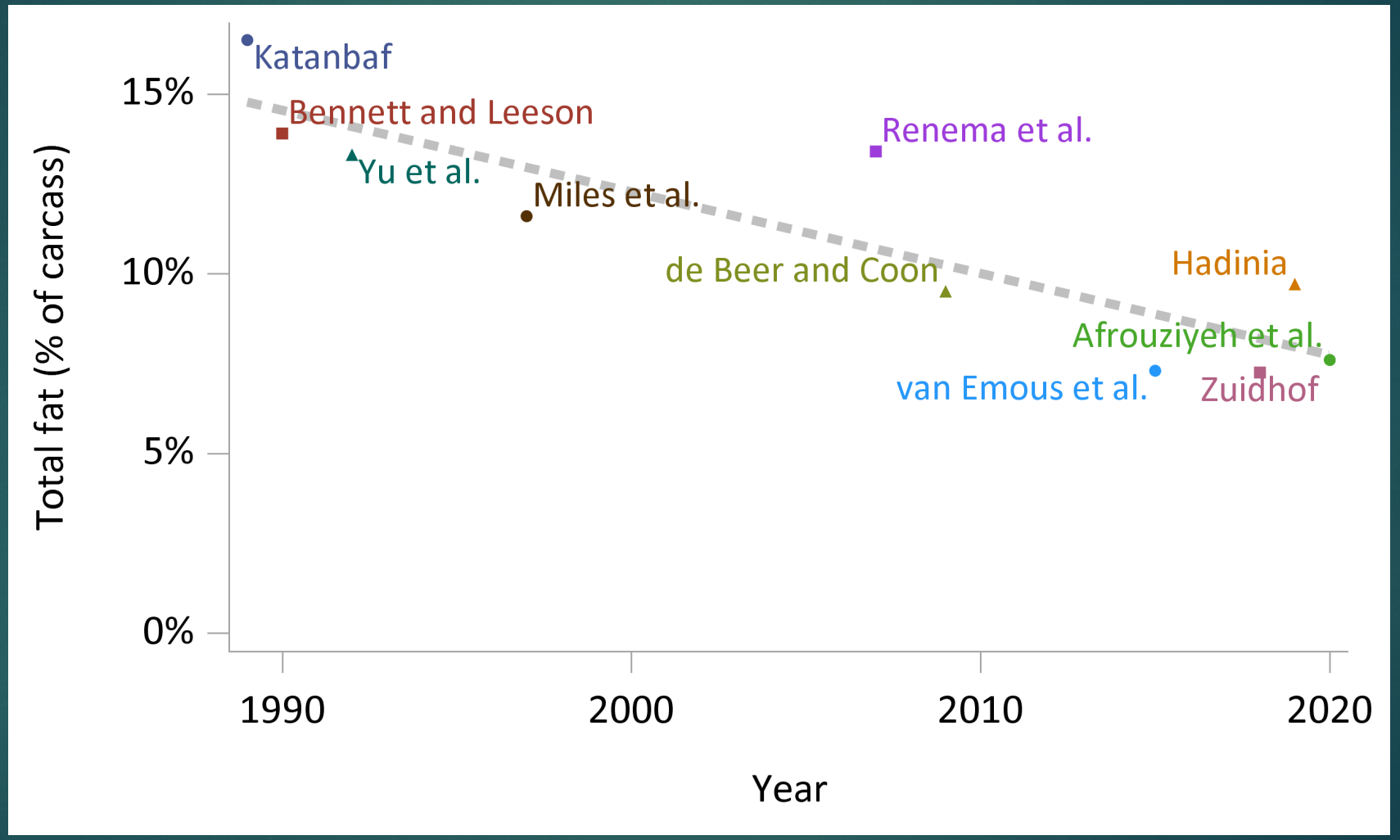
- Broiler breeders carry huge genetic potential for lean growth
- For decades, growth potential has been suppressed to prevent obesity-related problems
  - Reproductive efficiency
  - Welfare
- Body weight control and photoperiod management were a primary focus of breeder research from 1980s to 2000s
- More recently, the birds have been telling a different story

Images: Robinson, 2003

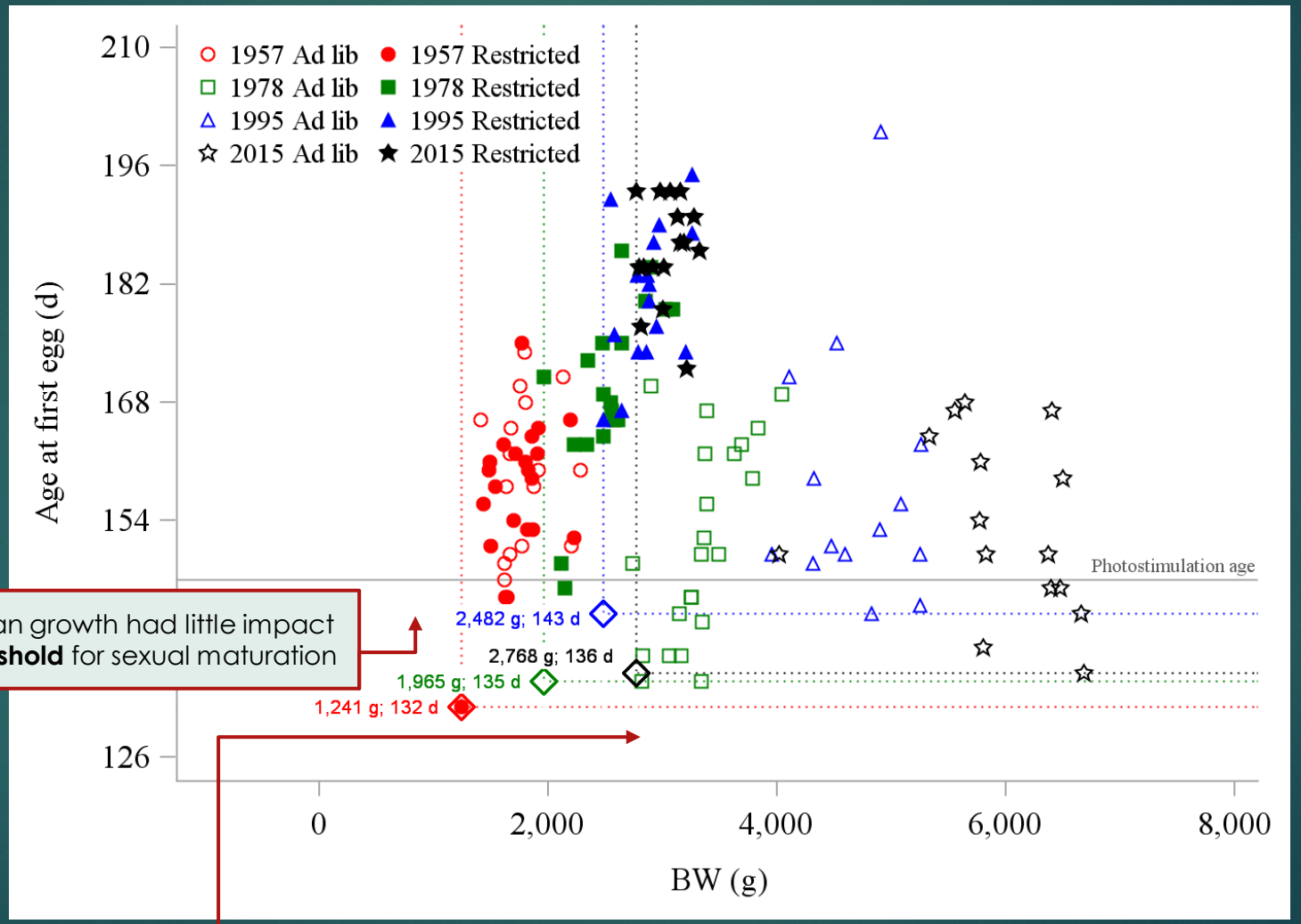
What are broiler breeders telling us now?

- Birds were no longer too fat
- Photostimulation was not the only trigger of sexual maturation
  - Full fed breeders (which is rarely done any more) came into lay without photostimulation
  - Some feed restricted broiler breeders on the target BW did not come into lay at all

Broiler breeders are no longer too fat



Full-fed broiler breeders came into lay prior to photostimulation

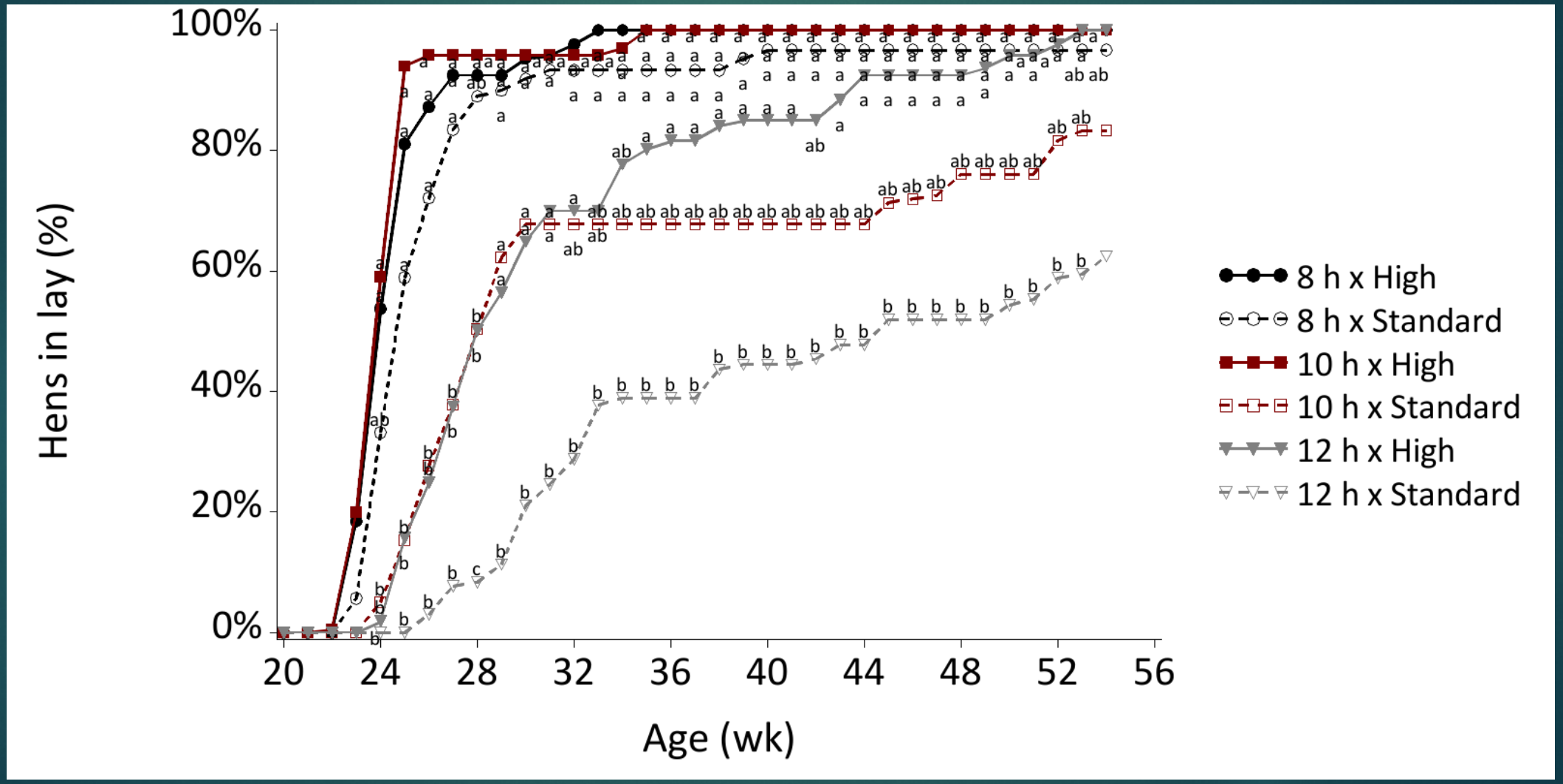


Selection for lean growth had little impact on the **age threshold** for sexual maturation

Selection for lean growth appears to have increased the **BW threshold** for sexual maturation

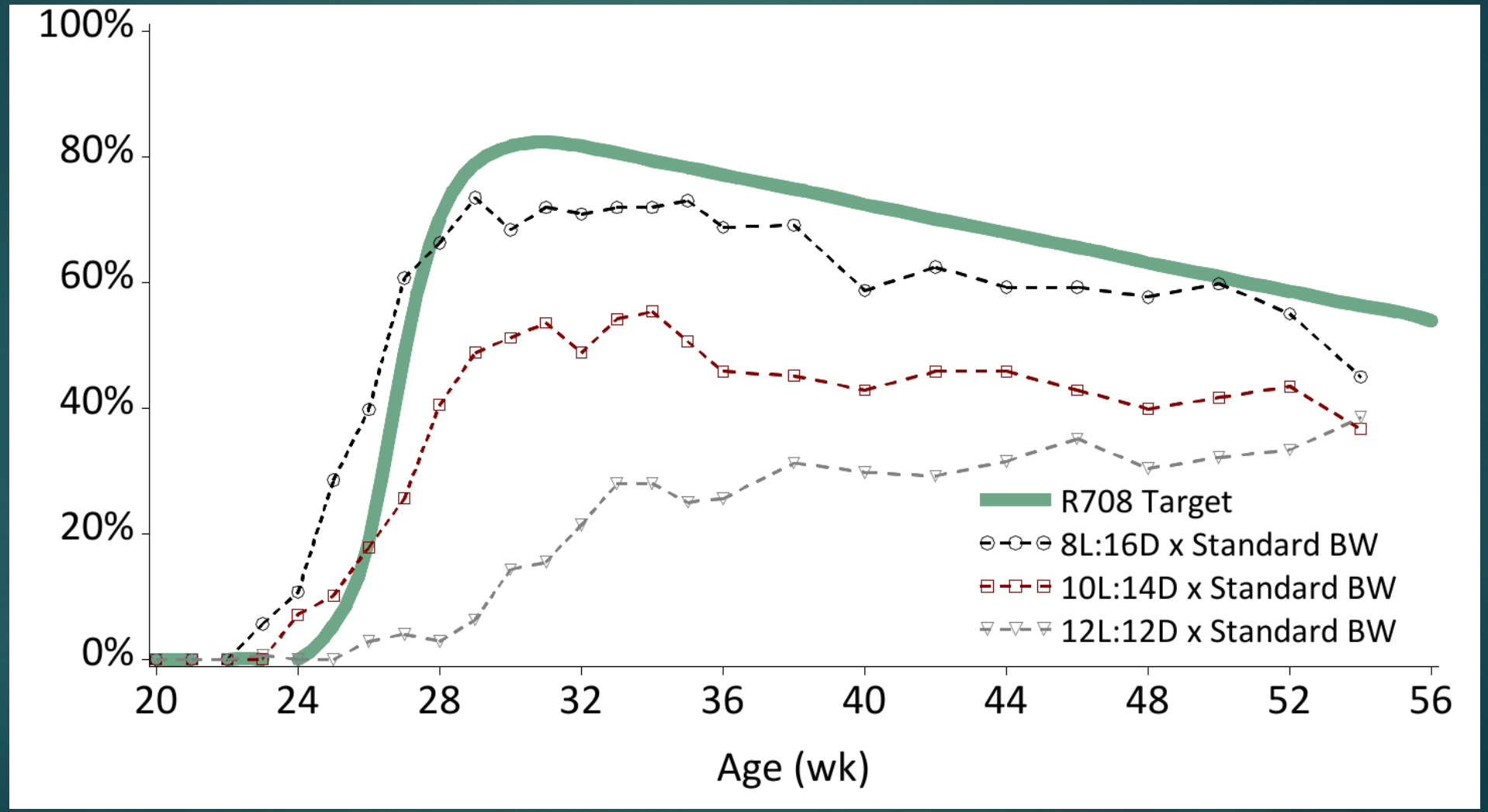
Carney et al., submitted for publication

Some feed restricted broiler breeders on the target BW did not come into lay at all



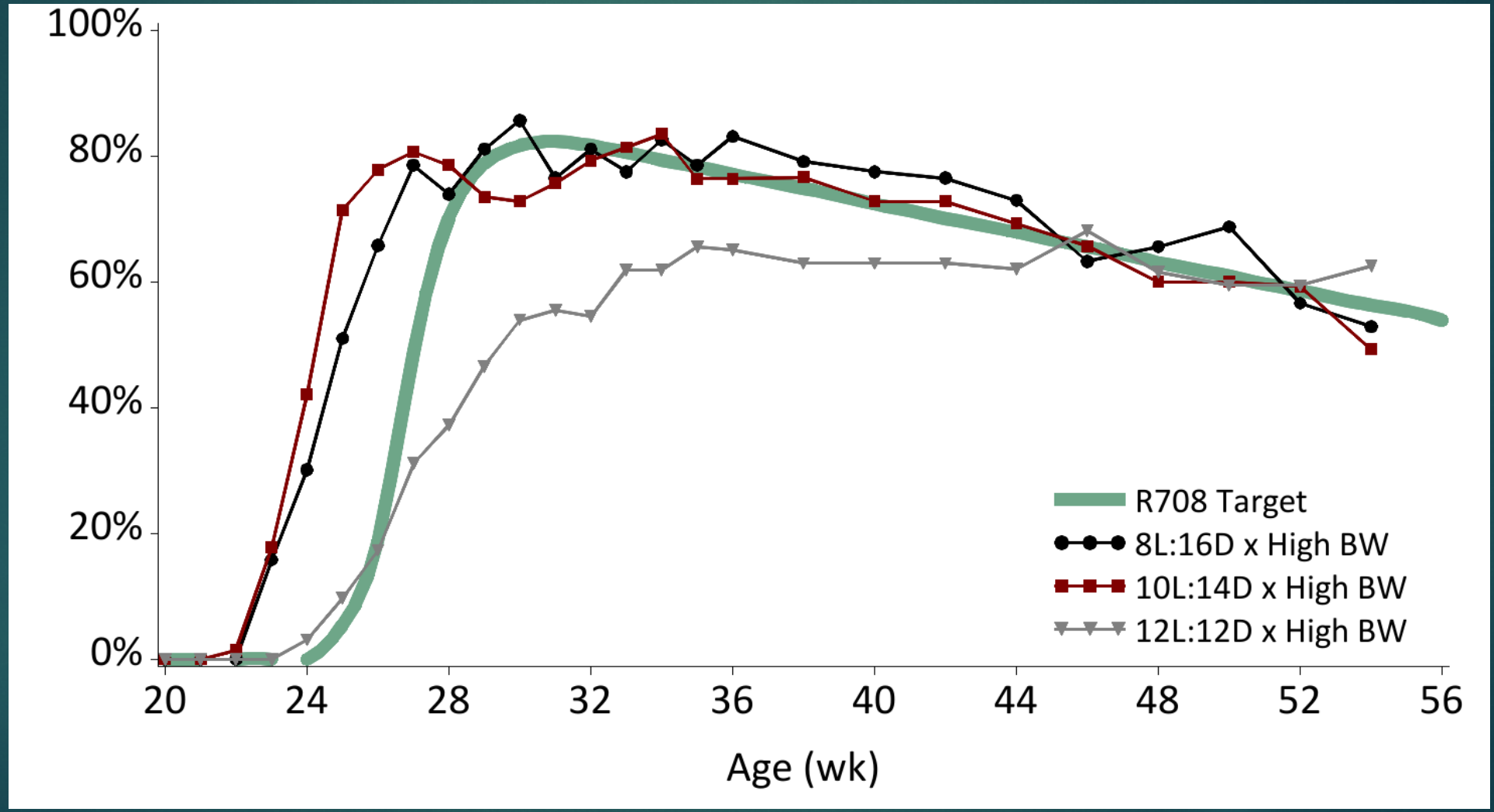
van der Klein et al., 2018

On target BW, breeders did not achieve performance standard



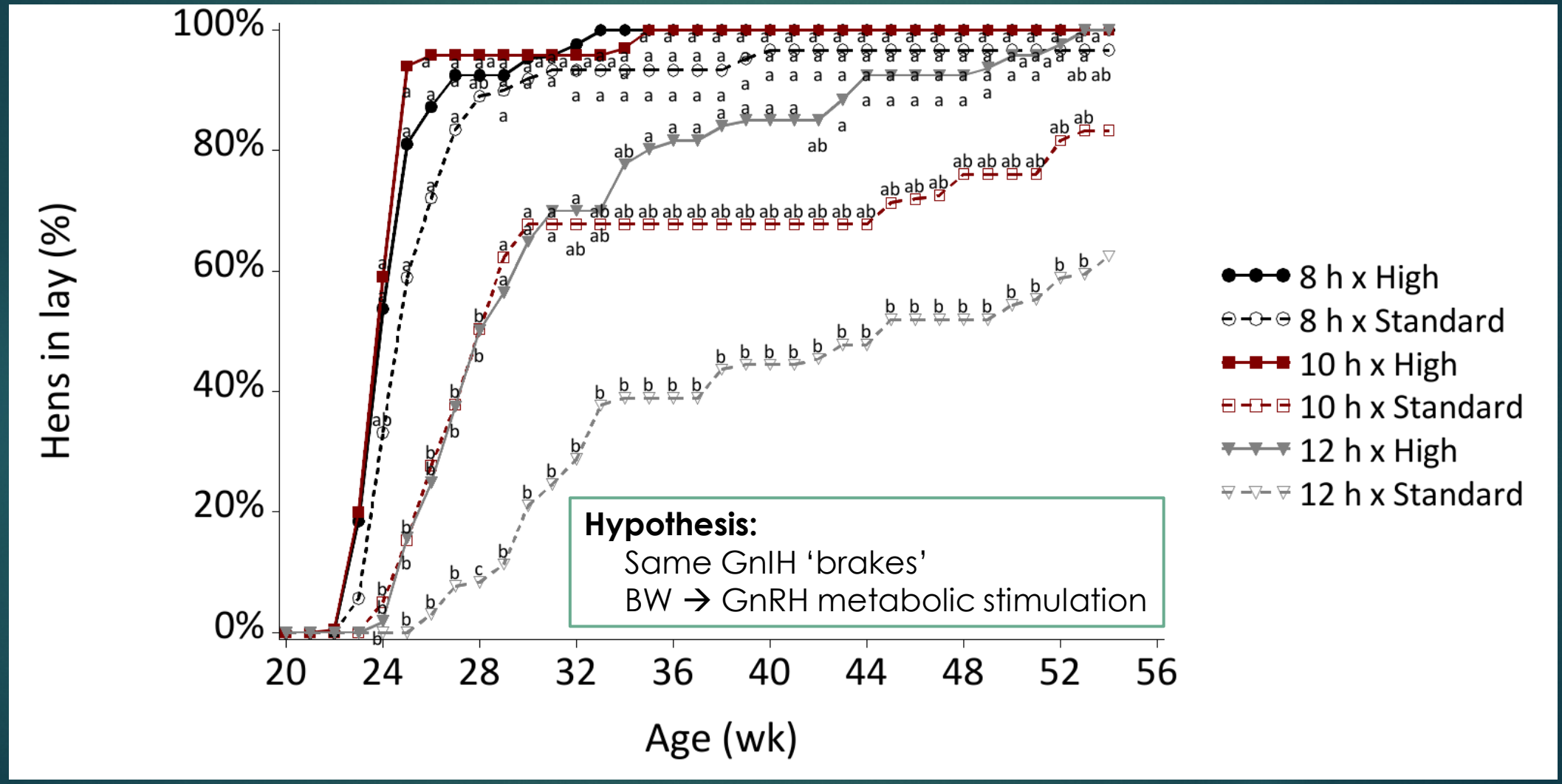
van der Klein et al., 2018

On higher BW, breeders did performed better



van der Klein et al., 2018

High BW and short rearing daylength permitted sexual maturation



van der Klein et al., 2018

A tale of 3 rats

Fed ad libitum

- Normal growth
- Normal sexual maturation

Fed 80% of ad libitum

- Slower growth
- Delayed sexual maturation
- Leptin-treated rats had normal sexual maturation

Fed 70% of ad libitum

- Still slower growth
- Delayed sexual maturation
- Leptin-treated rats had faster sexual maturation, but slower than normal

A hormonal signal originating from adipose tissue at least partially permitted sexual maturation to occur.
This directly suggests that body condition plays a role in sexual maturation.
Additionally, adequate nutrient intake likely triggers other metabolic factors that stimulate sexual maturation.

Cheung et al., 1997

What should you/we do?

- Reconsider our targets to maximize production (and welfare?)
  - Body weight
  - Body condition (especially fat)
  - Feed intake
- Feed diets that limit lean growth and facilitate fat deposition
  - Low lys diets
  - Higher dietary energy:lys ratios
    - Be sure to consider requirements for non-muscle growth
- Minimize any inhibition of sexual maturation
  - Sub-optimal lighting programs
  - Stressors?

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