

Feeding broiler breeder males - what we have learned

Jeanna L. Wilson



Department of Poultry Science

College of Agricultural & Environmental Sciences

UNIVERSITY OF GEORGIA

How did we manage flocks for fertility 40 years ago?

- The poultry industry did not actively manage roosters. Broiler breeder flocks were managed for maximum egg production. Roosters were fed the same amount of feed as the hens from 1 feeding system.
- Rooster management was limited to keeping them healthy and mobile.
- Fertility in excess of 95% became more difficult to attain in the late 70's and early 80's.

Why the decline in fertility?

- Need to restrict body weight gains to encourage mating activity and reduce leg and foot pad problems (Wilson, et al., 1979 and Hocking and Duff, 1989).
- Altering skeletal conformation with selection for growth (Siegel and Dunnington, 1985).
- Suggestion that increases in breast meat deposition might impede cloacal contact during natural mating (Hocking and Bernard, 1997).
- More recent study, suggests that the dorsal pelvic width negatively impacts semen transfer during copulation (McGary, et al., 2003).





History

- In 1982, Dr. Gaynor McDaniel a professor at Auburn University proposed the use of separate feeding systems for the hens and roosters in the laying house or more commonly known as **sex separate feeding**.
- Today these feeding systems have been refined and this practice has been adopted world-wide.
- And many industry personnel believe that we would be artificially inseminating these birds without the use of this management practice.



A photograph of a group of white chickens with red combs standing on a dirt floor. The chickens are of various breeds, including some with large red combs and others with smaller ones. The background is slightly blurred, focusing attention on the chickens in the foreground.

Goals for the restricted rooster

- Minimize breast fleshing
- Upright posture
- Libido = mating interest
- Good feet and legs

Sex separate feeding systems have given us many options

Restrict dietary intake of the rooster and limit body weight gain and encourage good mating behavior. Novel idea of managing the rooster for his dietary needs.

Allow for the formulation of diets to maximize semen production and quality. Identify feed ingredients that might improve reproductive capability of these birds.





Sex separate feeding systems

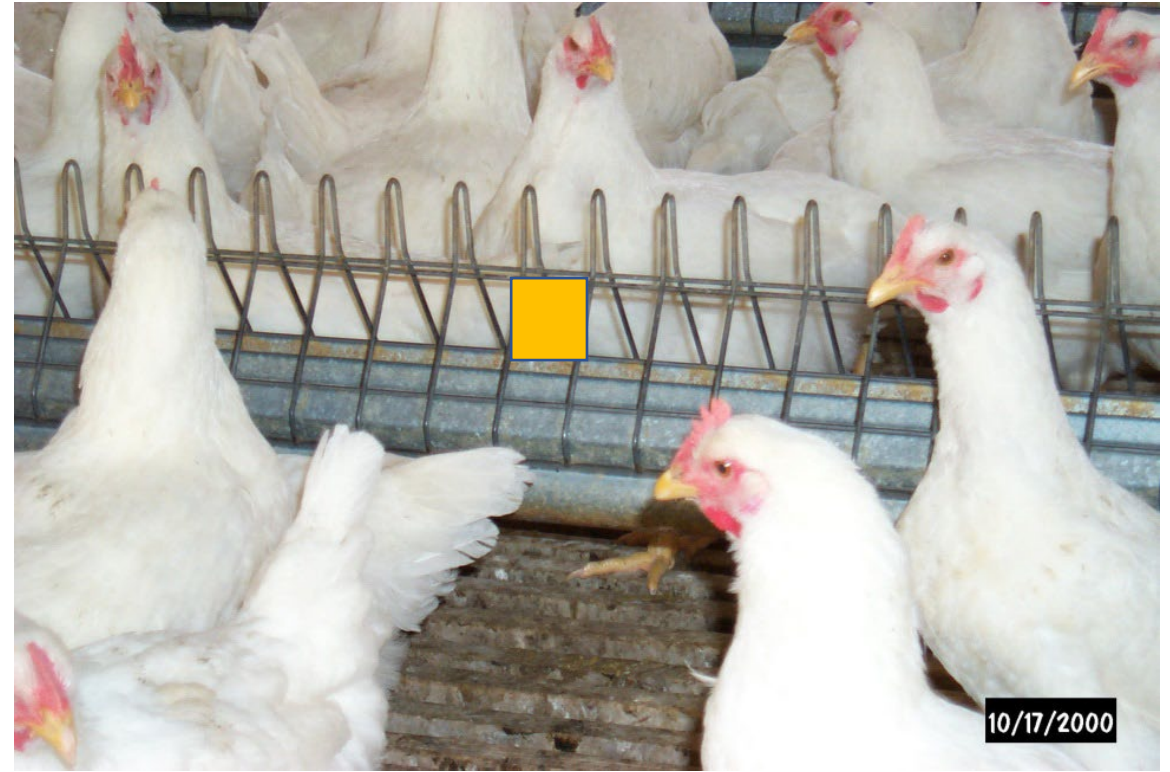
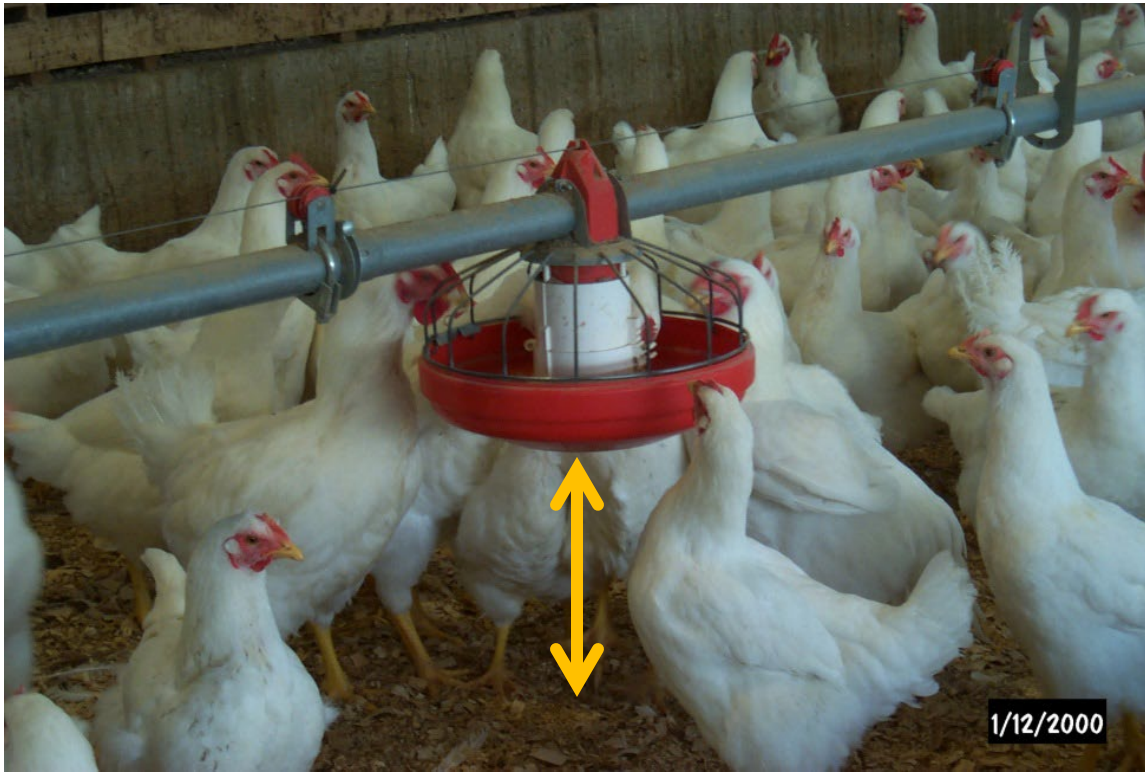
- Depends on the rooster having a larger head than the hen, which is usually achieved by 27-30 weeks of age. There are some breed differences.
- Early 1990's industry stopped dubbing the rooster's comb.
- Hen is discouraged from eating at the rooster feeder by height of the feed line.

Full comb
verses the
dubbed
rooster





Separate rooster feed in the scratch area and hen trough with high profile restriction grill on the slats



Rooster feeder was lower so that hens could not eat from feeder. Opening of the restriction grill on the hen trough prevented rooster access to hen feed.

Rooster feeders

- Breeders are moved to laying house at 20-23 weeks of age and with long day will grow full comb and wattle in about 8-9 weeks.
- Important to manage the male feeder: right height, is the floor level, are the farmers filling the feeder.
- Is the feed evenly distributed? Is the system working properly? Easy to ignore male feeder issue until see male problems.



Rooster conformation, 1980s vs 2022



Sexual behavior at 55 weeks with different feeding methods

	<u>Separated</u>	<u>Combined</u>
Mating attempt	2.05	2.03
Incomplete mating	0.72	0.63
Complete mating	0.92	0.59
Total	3.69	3.25

(Blokhuis and van der Haar, 1989)



Body weight restriction and fertility

- Fontana et al. (1990) showed that fertility was 4.2% higher in floor pens where roosters were fed separately from the hens.
- This difference was attributed to significantly lower body weight of the roosters in the separately fed pens.



Body weight management

- Classic roosters of the 1980 and early 1990 did not have the gain or yield of the modern yield rooster
- Today controlling nutrients is critical to managing the flock for fertility
- Lower density diets for roosters will allow a greater volume of feed that improves body weight uniformity
- Generally, we can restrict body weight gain and achieve a more uniform group of roosters.



Specific male diet formulation

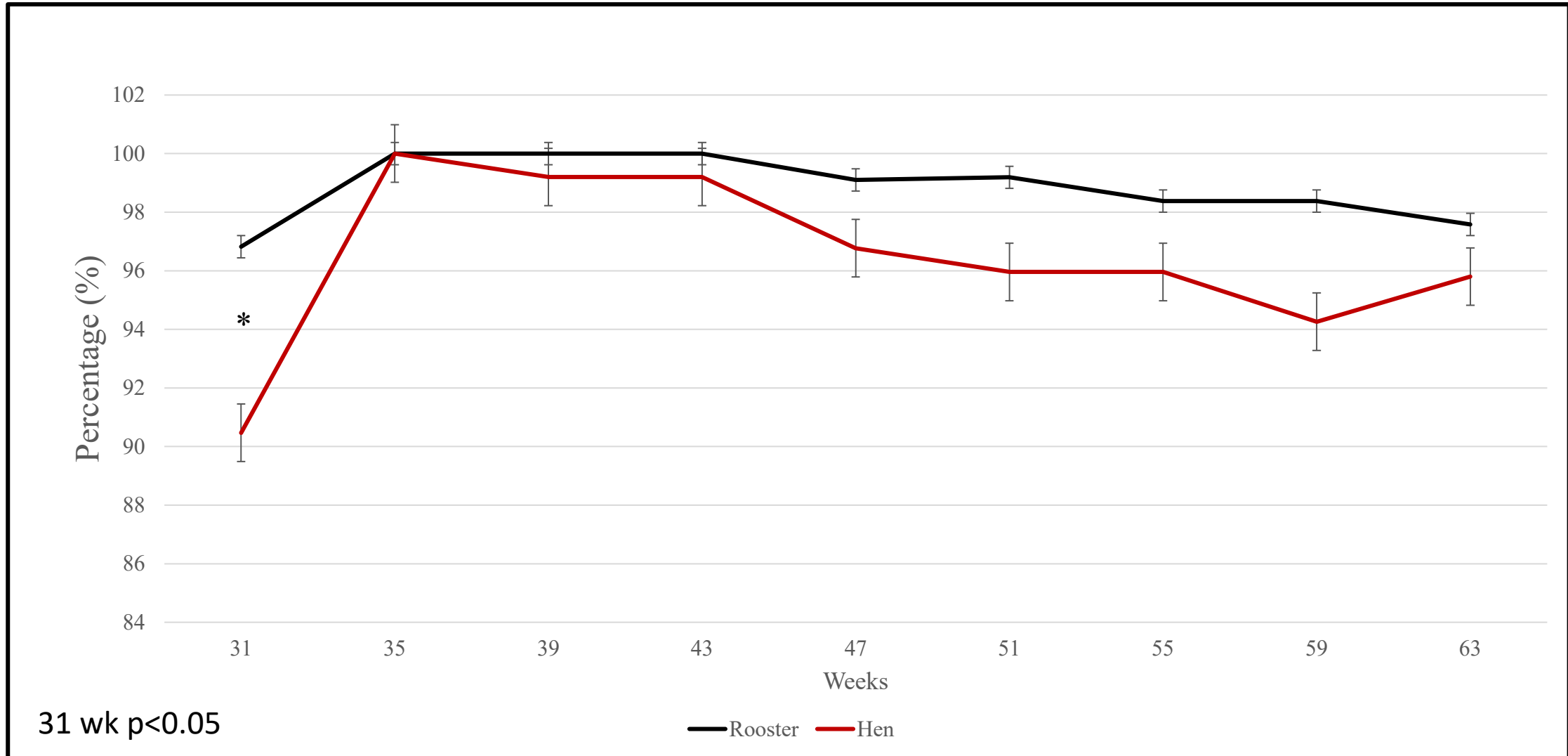
- Roosters don't need the high calcium of a hen diet, formulate for 0.8 to 1.0% calcium instead of the 3-3.5% of the hen diet.
- If fed lower crude protein (12%), then a greater volume of feed can be fed to the roosters more uniform distribution of feed.
- What other nutrients would improve reproduction in males?
 - Omega 3 fatty acids
 - Organic minerals
 - Other nutrients?



Lower crude protein – reduce the density of nutrients

- Early studies (8 or 12% crude protein vs 14 or 16%) had little impact on body weight when roosters were fed lower protein feeds and no differences in semen quality – however, there were more males in semen production when fed lower protein (Wilson, et al. 1987, Revington, et al. 1991).
- From a practical perspective, more males in semen production increases the opportunity for more natural mating and improved fertility.

Percentage of Males in Semen Production



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Table 1 Lesion scores in kidneys of roosters fed a male diet verses those fed a hen diet

Group	Mean ± SD lesion scores in kidneys				
	Tubular Necrosis	Tubular Nephrosis	Tubular Mineralization	Interstitial Inflammation	Total lesion score
Male diet (n=61)	0.049 ± 0.218	0.147 ± 0.357 ^a	0.147 ± 0.357	0.836 ± 0.373 ^a	1.180 ± 0.866 ^a
Hen diet (n=58)	0.051 ± 0.223	0.931 ± 0.413 ^b	0.206 ± 0.408	1.017 ± 0.295 ^b	2.206 ± 0.789 ^b

*Different letters denote statistically significant differences between groups

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Scratch area of broiler breeder lay house



Rooster diets – increasing omega 3 fatty acid intake

Increase the polyunsaturated fatty acid content of avian semen by consuming fish oil (Christensen et al, 1998; Blesbois et al., 1997; Cerolini et al., 1997; Kelso et al., 1997. Thought to alter the physical properties of the spermatozoa membrane reducing peroxidation damage.

While others attributed improvement in fertility to increased motility (Salem et al., 1986; Stubbs and Smith, 1984; and Darin-Bennett et al., 1974).

Diets – Menhaden oil replacement of poultry fat

Broiler breeder males were fed diets with one of two fat sources, 3% poultry fat (PF) or 3% Menhaden oil (MO) in rearing and 2% during the lay period.

Hens were inseminated from pooled semen samples within dietary treatment at 47, 50, 53, 56, 59, 62 and 65 weeks of age.

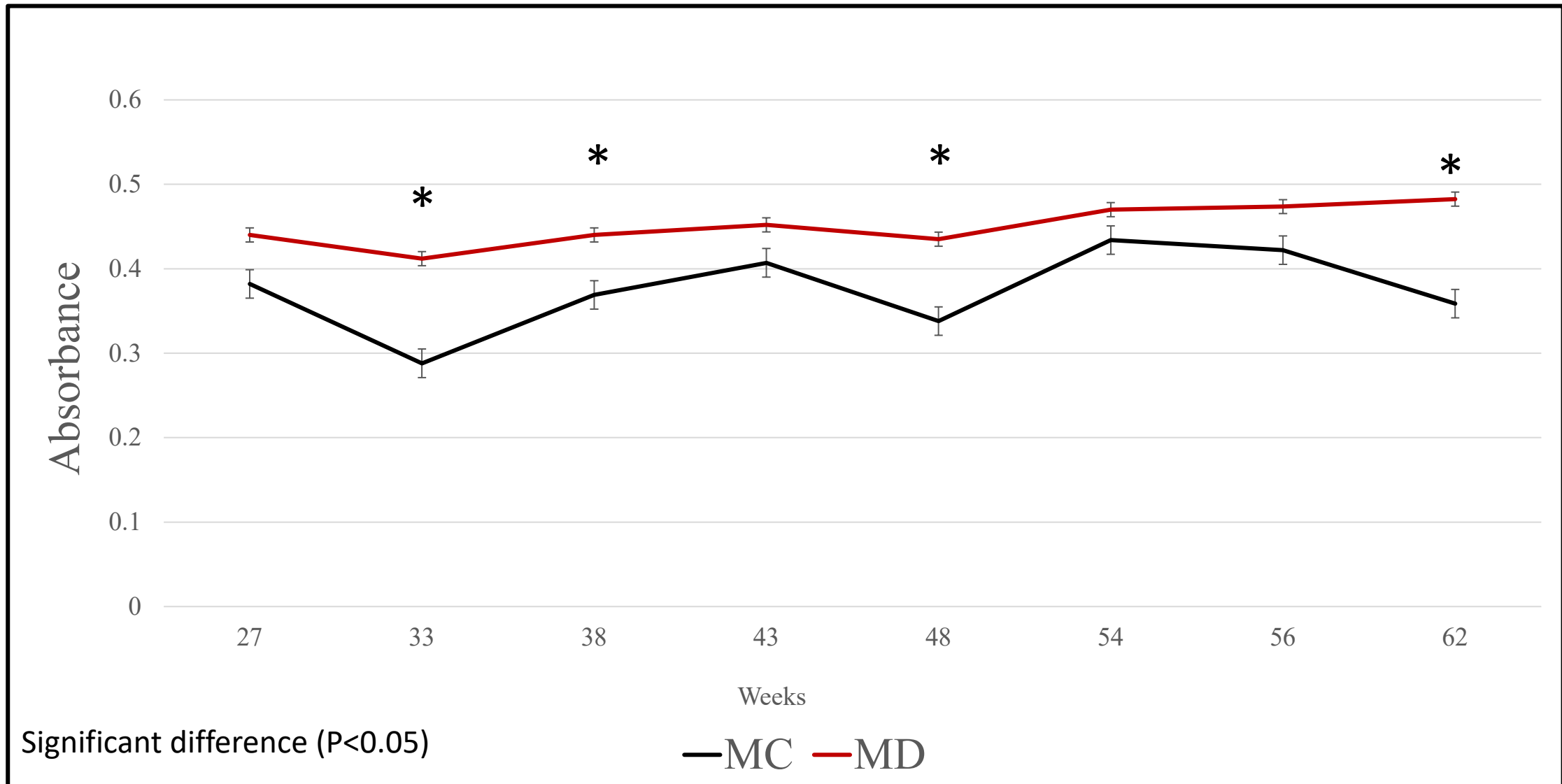
Low insemination dose (50 μ L diluted semen, 7.5×10^7 sperm) so as not to mask potential sperm quality differences.

Consistently improved fertility, with most coming in the last portion of the lay cycle. Thought to be associated with better mobility. Not adopted by poultry nutritionist.

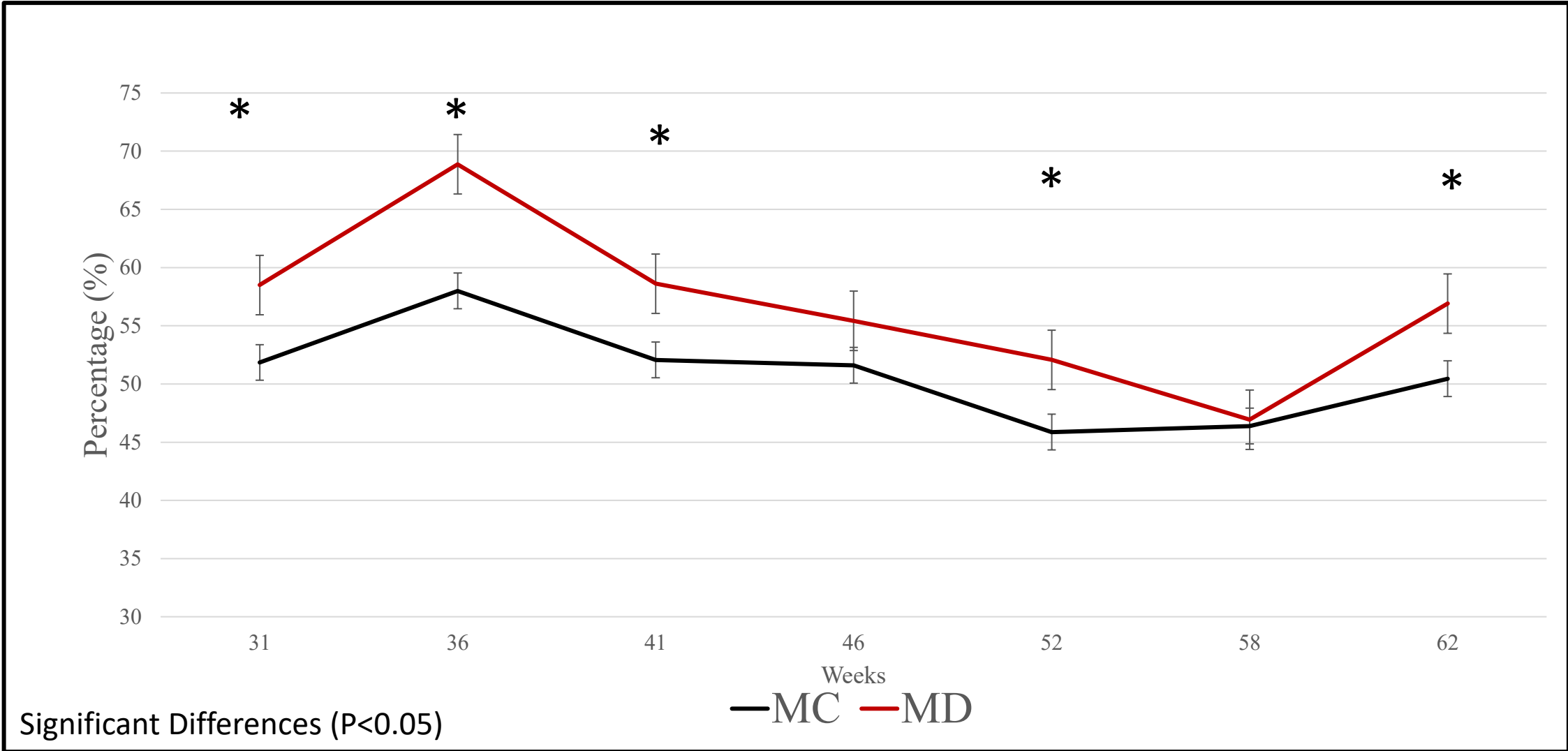
Why we continued feeding hen diets to roosters

- Reasons not adopted in the 2000s
- Fish oil is difficult to handle and has a short shelf life or is somewhat unstable
- Integrators, fed roosters separately, but continued to feed a hen diet because they did not want to add a separate feed bin on the farm, did not want one more feed in the feed mill or to transport another feed
- In the last decade working with high yielding breeders, hatch over 82% has become more difficult to achieve
- Managers are looking to increase fertility especially after 45 weeks of age

Semen Mobility (docosahexaenoic acid, DHA)



Fertility at 2-14 days (docosahexaenoic acid, DHA)

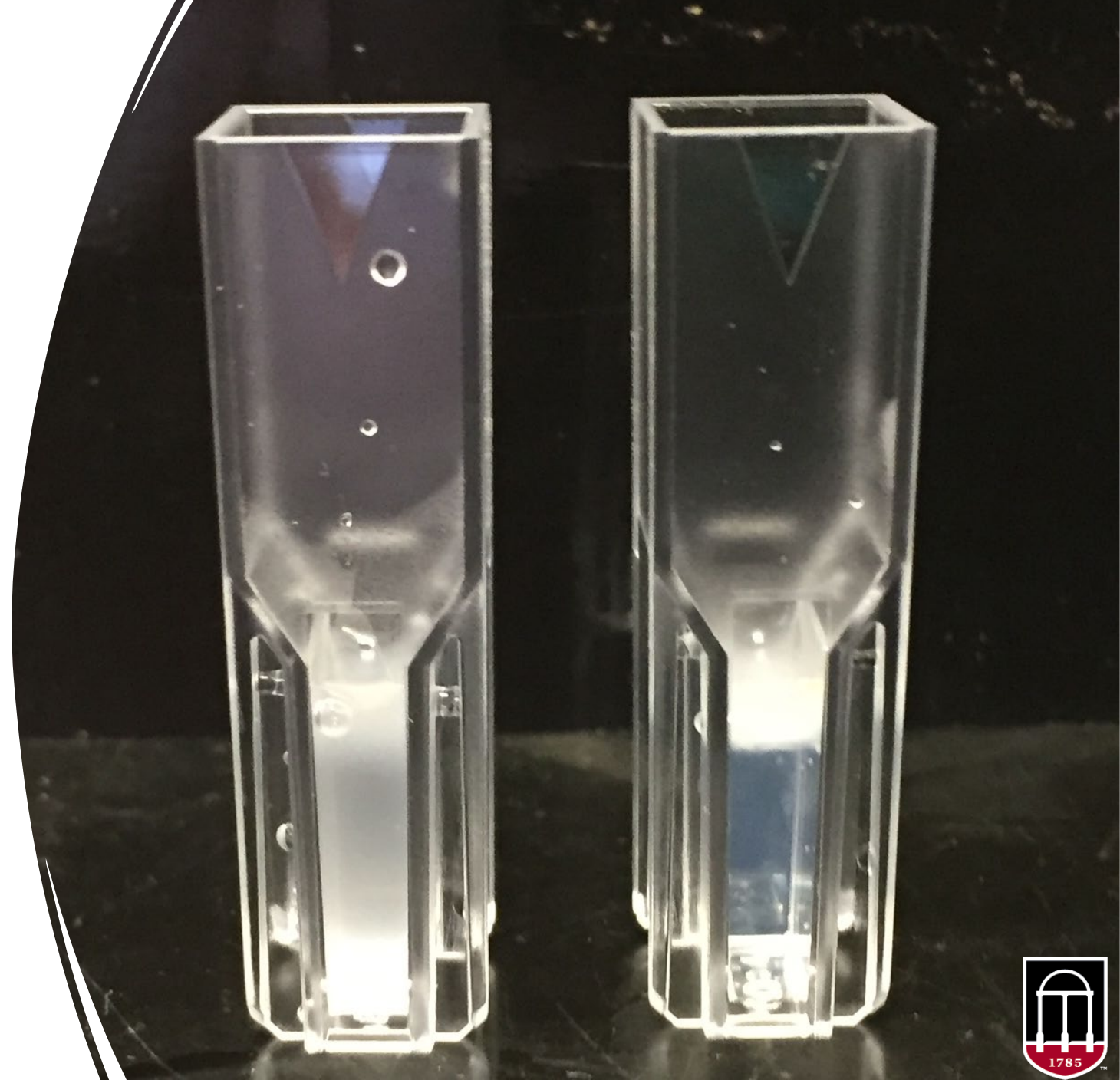


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Will this supplement be adopted for roosters?

- Too early to know if this dry DHA product will be used in rooster diets to increase fertility
- Good opportunity to increase the movement or mobility of the spermatozoa against resistance
- Sperm can stay on the top of the gel if they have abnormalities, or move to the bottom of the tube if highly mobile increasing fertility in the hen

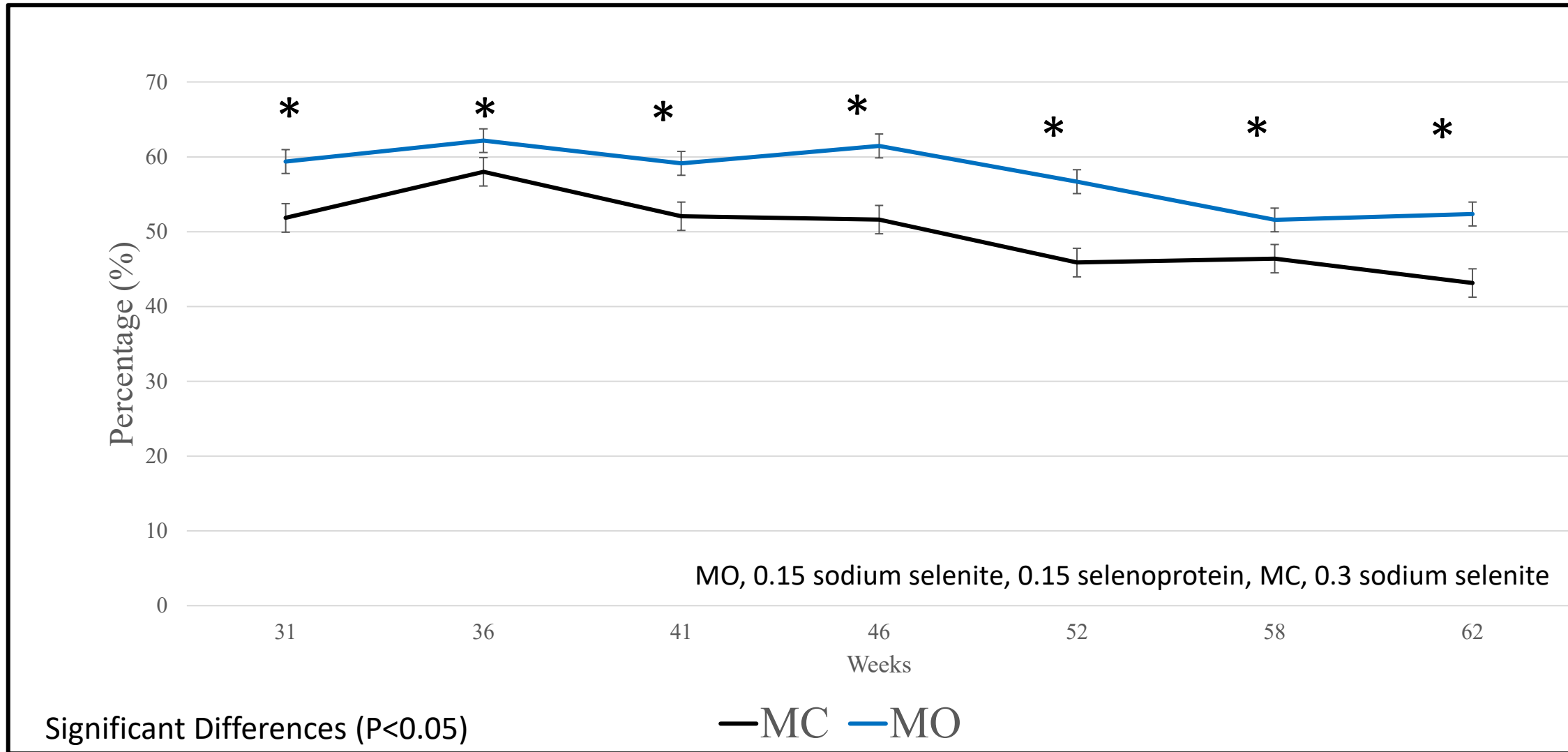


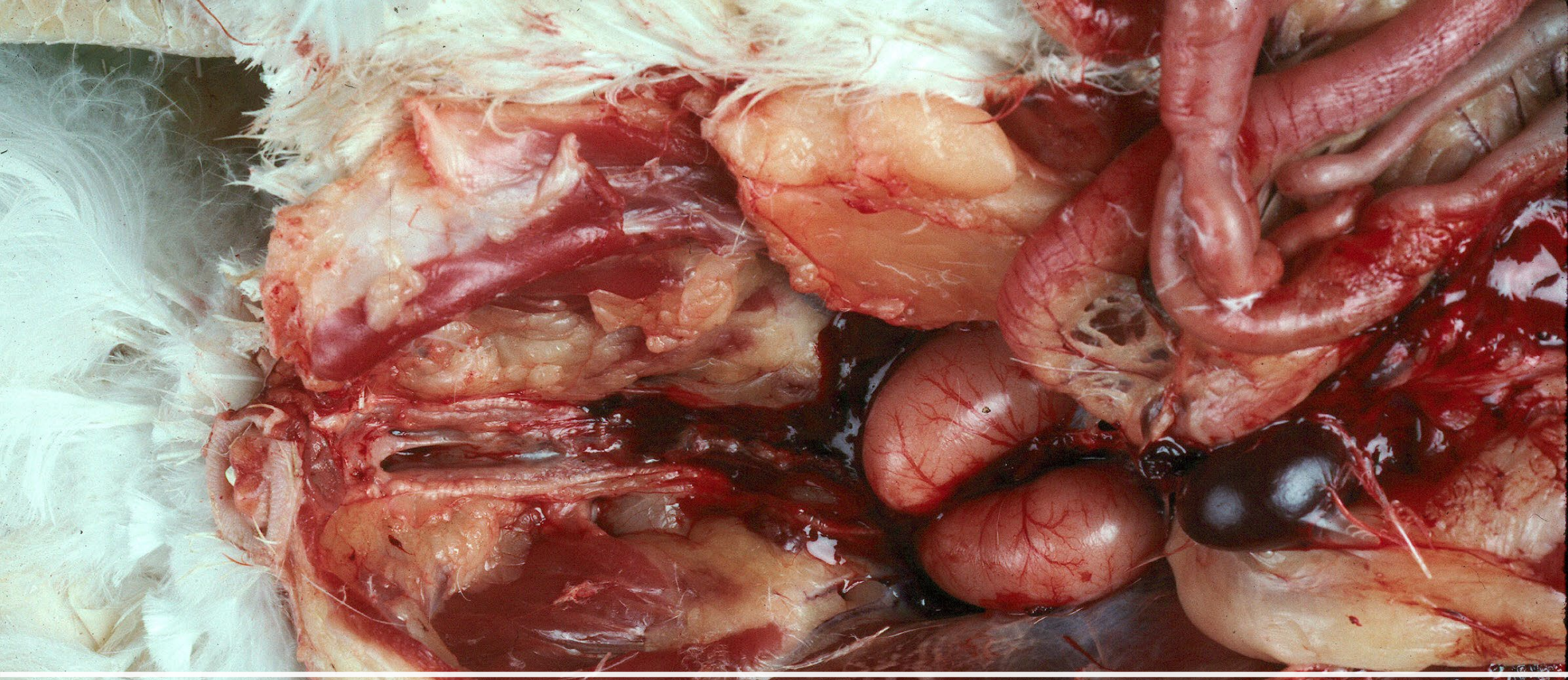
Selenium source in rooster diets

- In the US we are restricted to no more than 3% added selenium in poultry diets. Whatever you add the birds need to utilize.
- Over the years nutritionist have used inorganic sources (sodium selenite) because of lower cost.
- Today, the indication is that birds utilize the organic form of selenium better than the inorganic form.
- Also, that selenoprotein form plays a role in sperm maturation and as an antioxidant (Ursini, et al., 1999; Wang, et al., 2017).

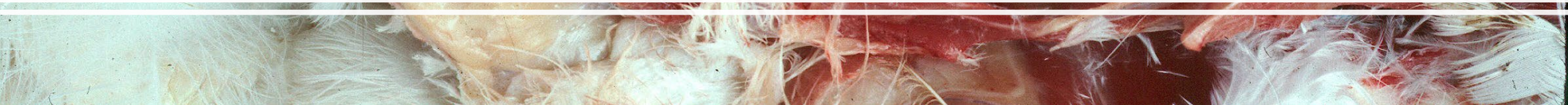


Fertility 2-14 days with organic vs inorganic Se





Critical to develop maximum testicular size by 30 weeks of age



Best sperm
quality
possible



Summary

- Sex separate feeding of hens and roosters during lay – same diet but better control over intake of the roosters. Allow for more moderate gains in body weight. Male feeders can be problematic.
- Some integrators also use a male formulated diet even with additional complications of 2 feeds on the lay farm, milling/storage/transport issues with separate feed. Opportunity to reduce protein, calcium and formulate specific to the rooster's dietary needs. Reduces breast fleshing and kidney issues, while improving body weight uniformity.
- New ingredients and ingredient levels that improve semen quality and longevity of semen production.
- Goal is to keep roosters mating and improve semen quality through 65 weeks of age.



Questions

Jeanna L. Wilson

jeannaw@uga.edu

