Effect of hCG treatment on d7 or d7 and 13 of the estrous cycle on luteal and follicular dynamics in non-inseminated Holstein cows

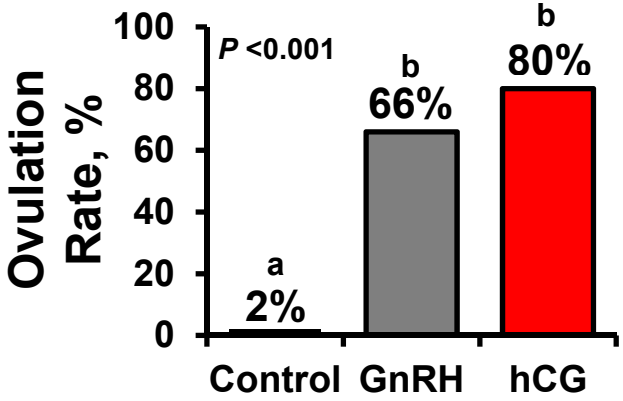
ANIMAL & DAIRY SCIENCES
University of Wisconsin-Madison a

School of Veterinary Medicine
UNIVERSITY OF WISCONSIN–MADISON b

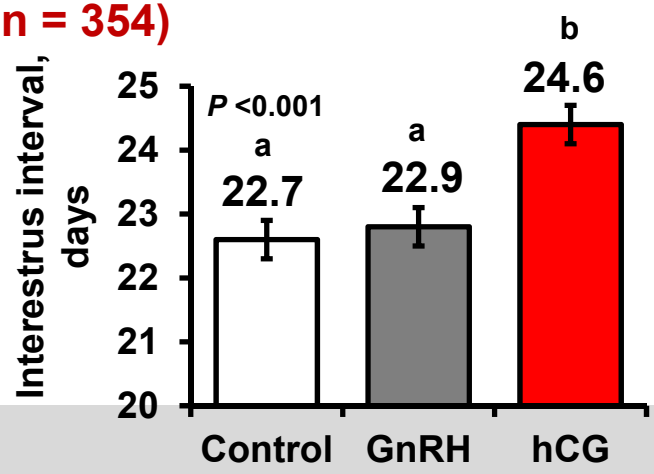
Thiago Cunha[ab] / **L.R. Statz[b], J.P.N. Andrade, R.R[a]. Domingues[a], M.C. Wiltbank[a], J.P.N. Martins[ab]**

Preliminary data results

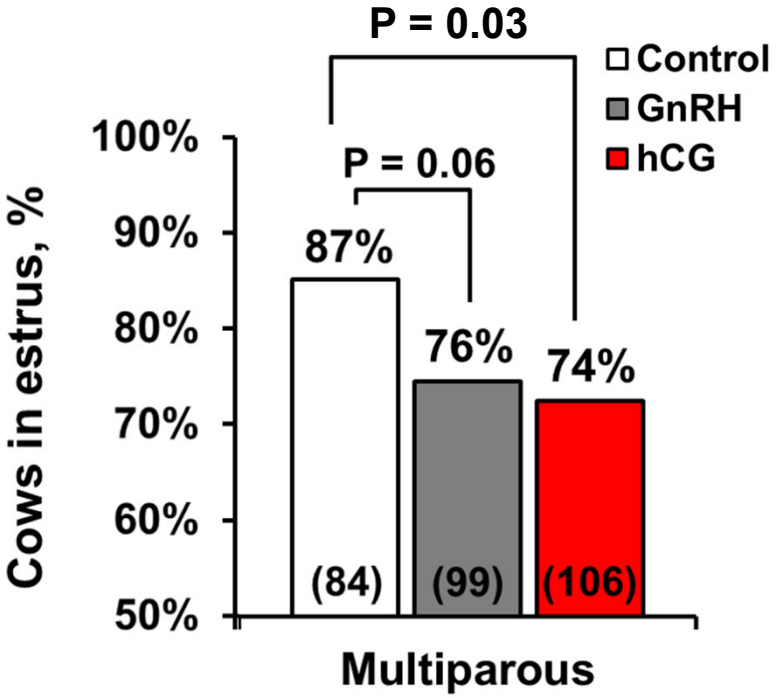
Ovulation rate (n=142)



hCG ↑ estrous cycle length (n = 354)



hCG ↓ % of multiparous returning in estrus



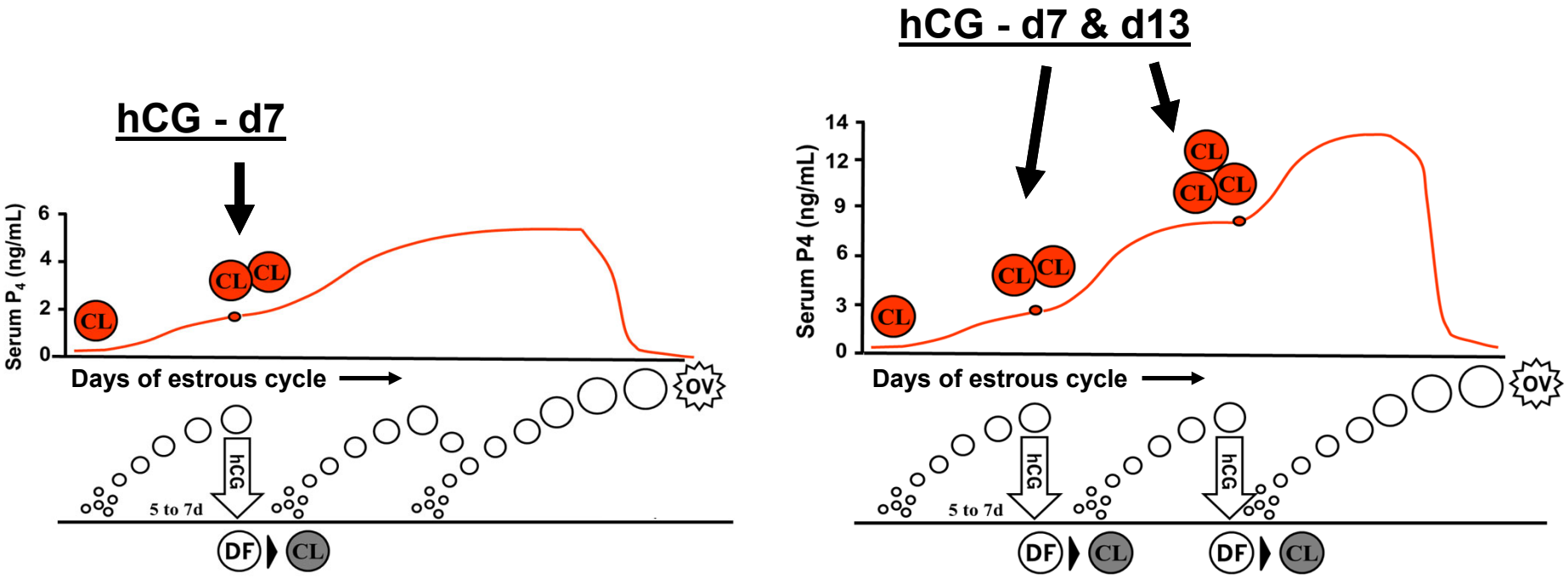
Questions from previous study

- Why did hCG reduce the proportion of multiparous cows returning in estrus following treatment?

- Why did hCG increased estrous cycle length?
  - Was the number of follicular waves altered?
  - Did dynamics of luteolysis change?

New study objective

- To determine the effect of hCG treatments (3,300 IU i.m.) on d7 or d7 and 13 of the estrous cycle on ovarian function in non-inseminated lactating Holstein cows



Hypothesis

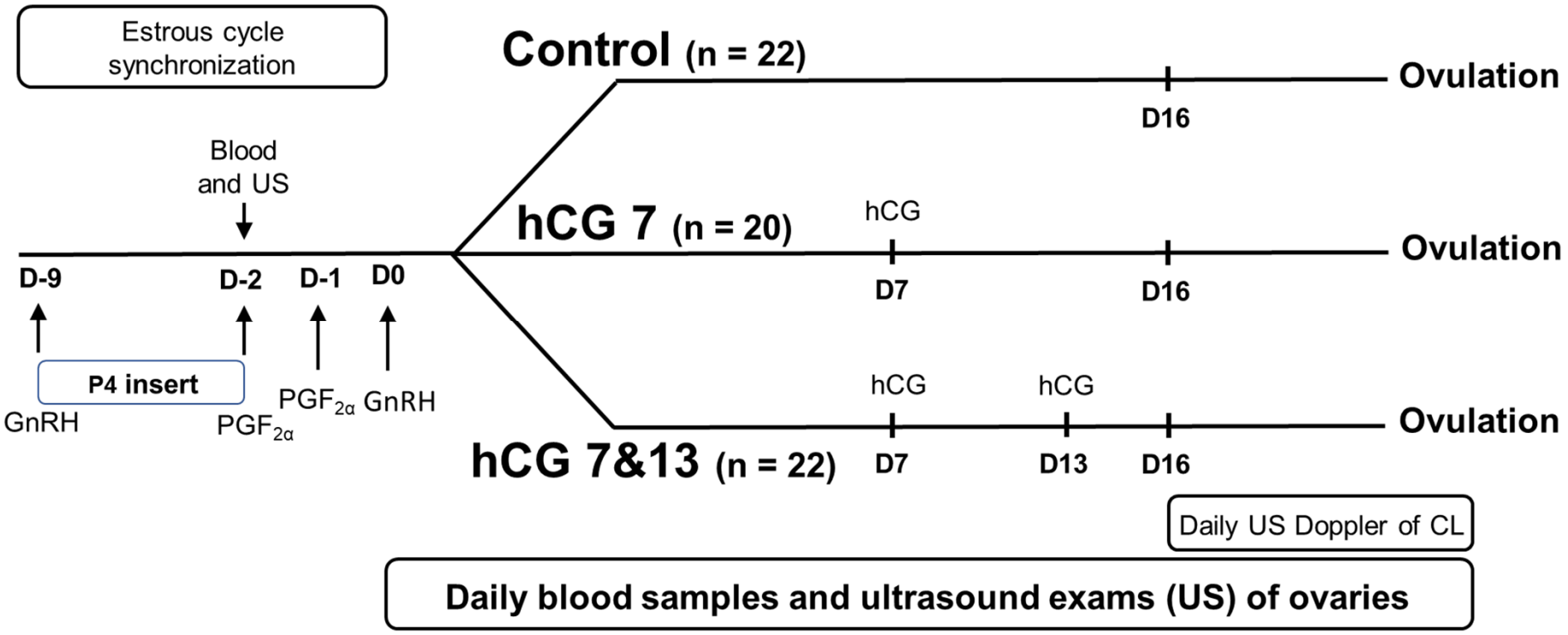
- hCG treatment on day 7 will increase the proportion of cows with 3 or more follicular waves compared to cows that did not receive treatment (control)

- Cows treated with hCG on days 7 and 13 will have follicles from the third wave growing in such synchrony that will reduce duration of functional luteolysis process

Experimental design

- 64 cows from two UW-Madison research farms
  - 23 primiparous
  - 41 multiparous
- Average milk yield during the trial: 45.5 ± 2.4 Kg / d
- Average BCS: 3.1 ± 0.04
- DIM at enrollment: 44.2 ± 0.6
- From June to August of 2019 (Avg. THI: 63.5 ± 0.3)

Experimental design



Data analysis

- Cows with atypical cycles were removed from data analysis after d14 of cycle if:
  - Dominant follicle (DF) or future DF at the time of functional luteolysis did not ovulate (Control, n = 2; hCG 7, n = 4, hCG 7&13, n = 3)
  - Short cycle (1 long follicular wave - 16 days; Control, n = 1)
  - Delayed luteolysis (32 and 33 days; Control, n = 2)
  - Incomplete luteolysis (Control, n = 1; hCG 7, n = 4; hCG 7&13, n = 5)
- Removed by not responding to hCG treatment (n = 2)
- Onset of fuctional luteolysis day= One day before that P4 level dropped > 2 SD of the mean for the 4 highest P4 consecutive levels in late diestrus
- The P4 cut-off for complete luteolysis = ≤ 1.0 ng/mL

Results

Effect of treatment on estrous cycle and follicular waves

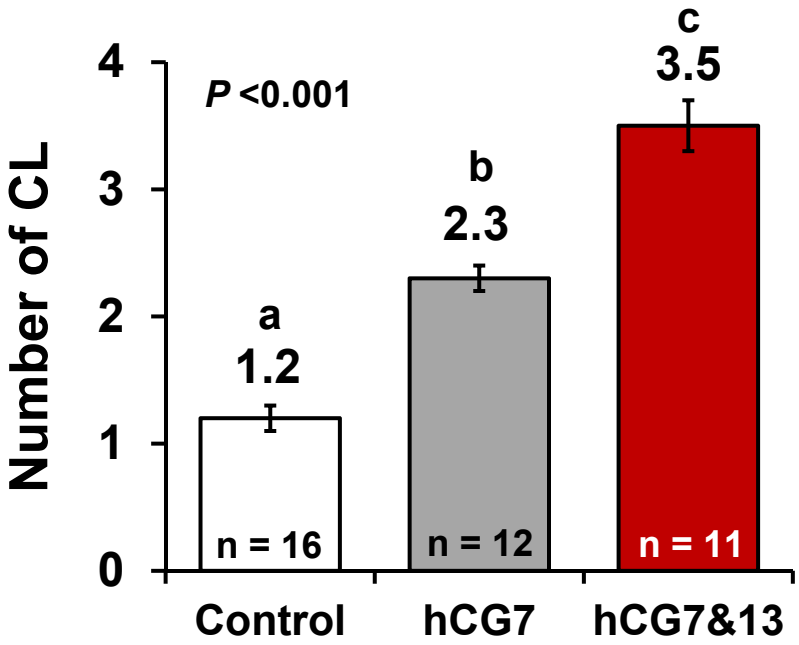
- hCG treatments
  - Reduced the proportion of cows with typical estrous cycles
  - Increased the proportion of cows with 3 follicular waves

	Control	hCG d7	hCG d7 & d13	*P*-value
Cows with typical cycle	**16/22[a]**	**12/20[b]**	**11/20[b]**	***P* < 0.01**
Proportion of cows with 3 waves / cows with typical cycles	**4 / 16[a]**	**11 / 12[b]**	**11 / 11[b]**	***P* < 0.01**

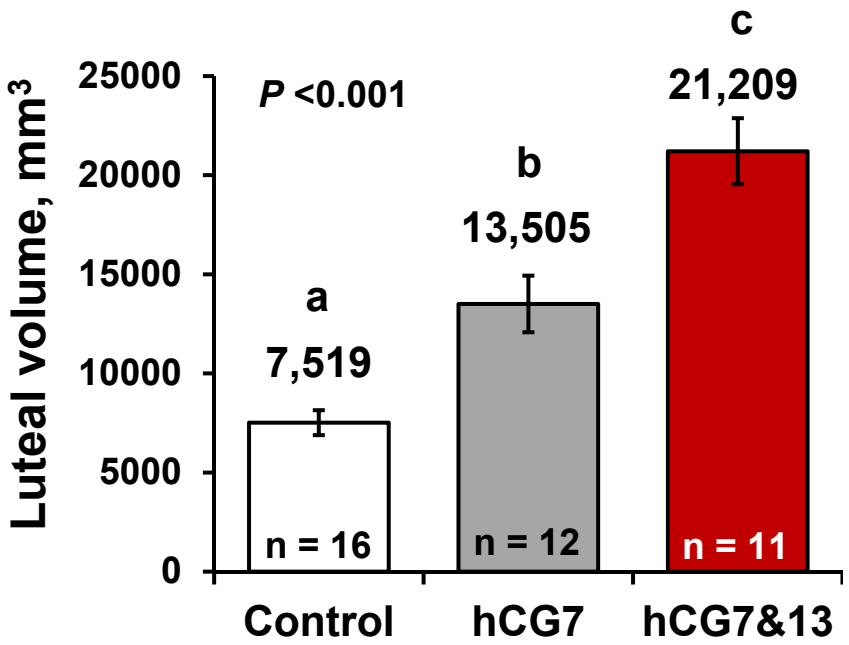
Results of cows with typical estrous cycle

Effect of treatment on the number of CL and total luteal volume prior to functional luteolysis

Average number of CL



Luteal tissue volume



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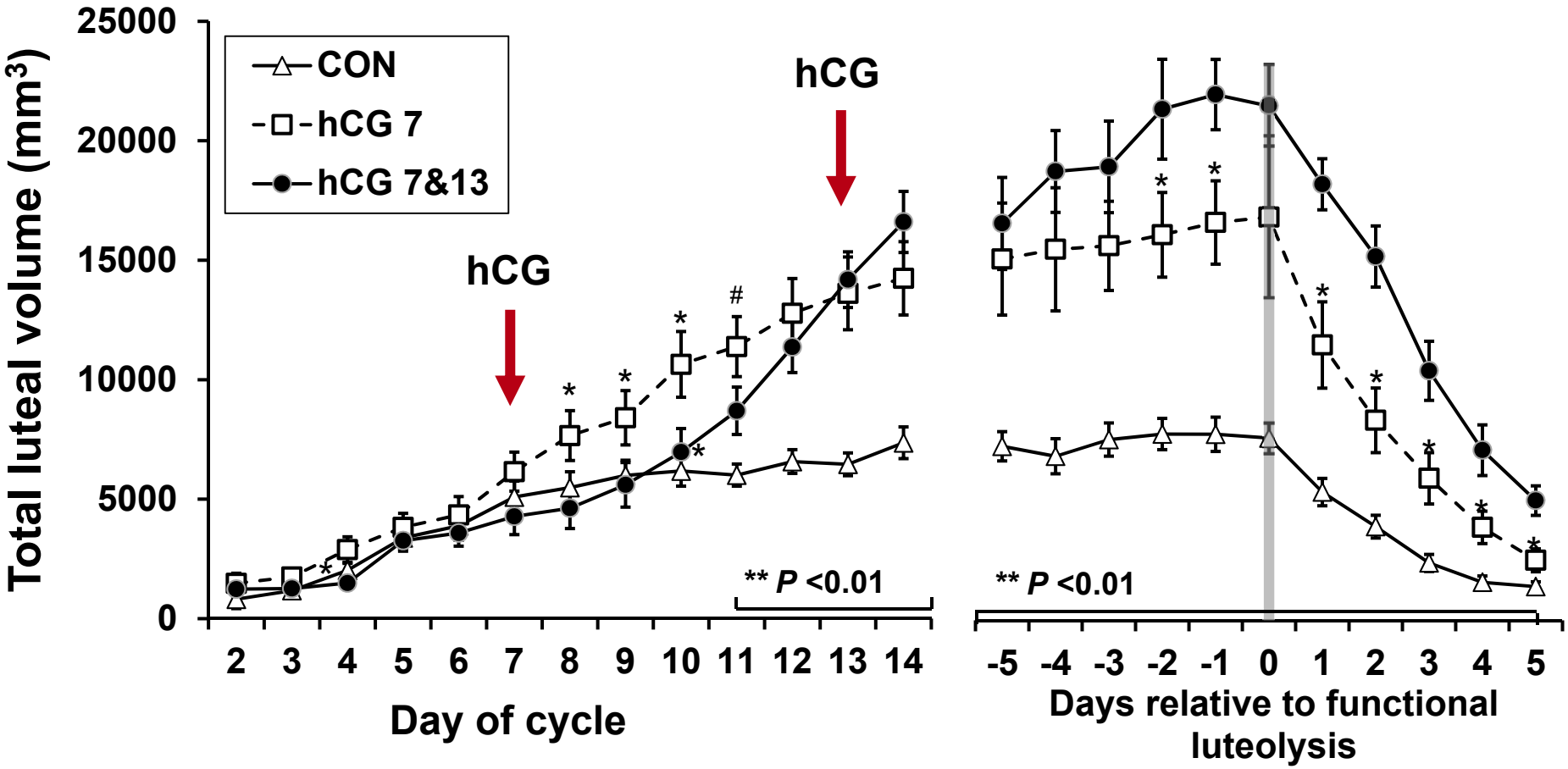
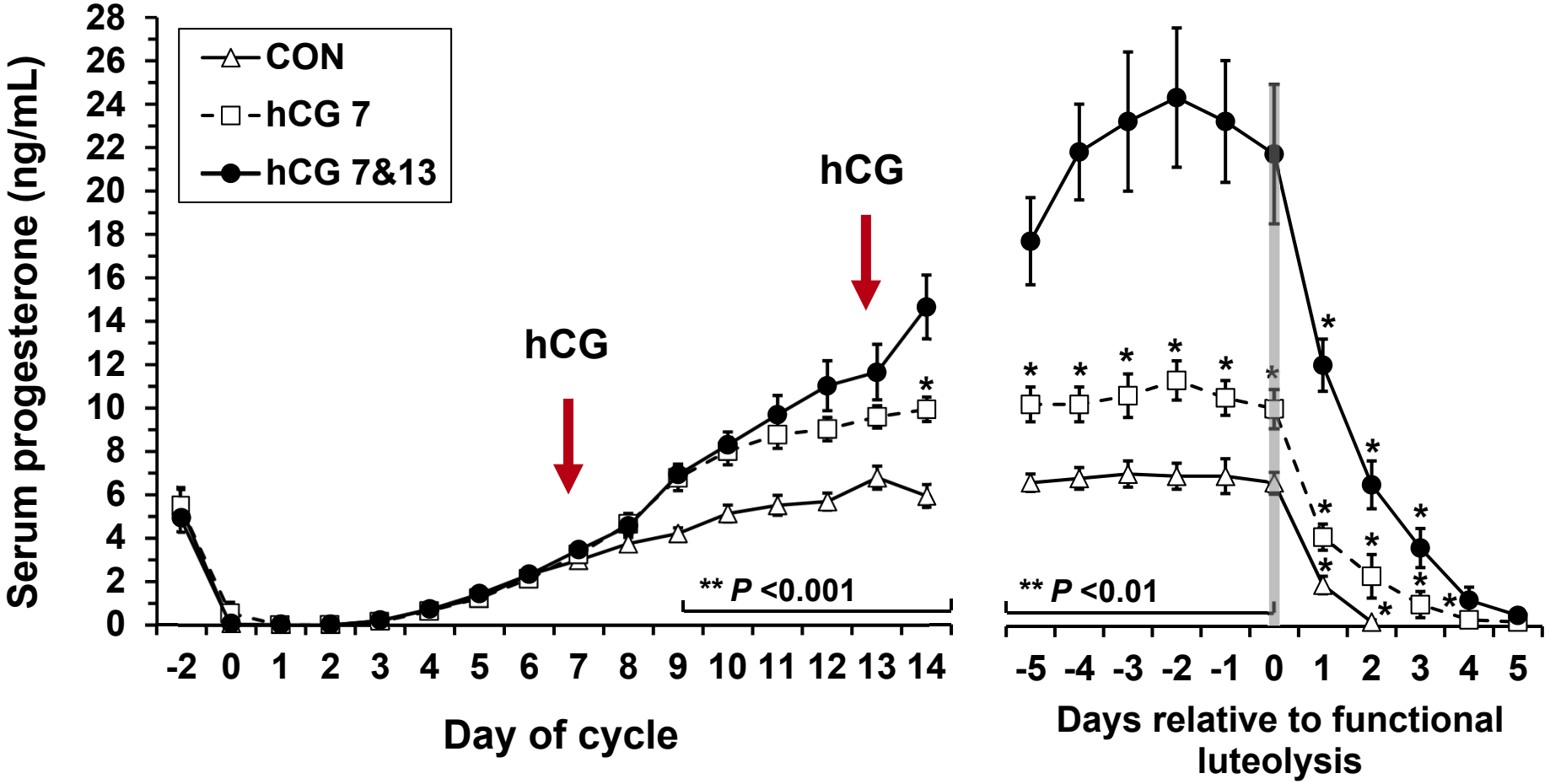
Effect of treatment on total luteal volume during the estrous cycle



* $P < 0.05$; # $0.05 < P < 0.1$ ** Comparisons between CON and hCG 7&13. Comparisons between CON and hCG 7 within days

Effect of treatment on serum concentrations of progesterone



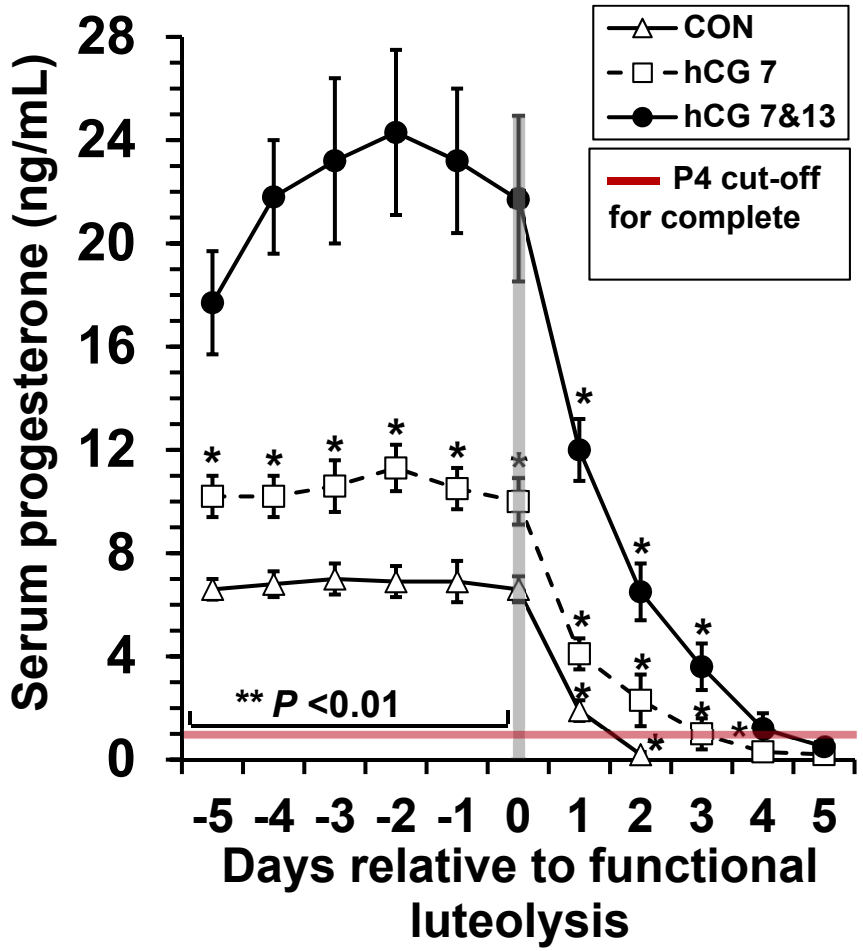
* $P < 0.05$; ** Comparisons between CON and hCG 7&13. Comparisons between CON and hCG 7 within days

Effect of treatment on luteolysis onset day and duration

- hCG treatments:
  - Delayed the onset of luteolysis
  - Increased the duration of luteolysis

	Control (n = 16)	hCG d7 (n = 12)	hCG d7 & d13 (n = 11)	*P*-value
Onset of luteolysis, d ± SEM	18.0^{aA} ± 0.5	19.5^{b} ± 0.3	19.0^{bB} ± 0.3	<0.01
Duration of luteolysis, d ± SEM	1.6^{a} ± 0.2	2.5^{b} ± 0.3	4.2^{c} ± 0.4	<0.01

A,B (P = 0.08)



* *P* < 0.05; ** Comparisons between CON and hCG 7&13. Comparisons between CON and hCG 7 within days

Effect of treatment on inter-ovulatory interval

- hCG treatments increased the inter-ovulatory interval:
  - Greater proportion of cows with 3 follicular waves
  - Later onset of functional luteolysis
  - Longer duration of functional luteolysis

	Control (n = 16)	hCG d7 (n = 12)	hCG d7 & d13 (n = 11)	*P*-value
Inter-ovulatory interval, d (±SEM)	**22.0^{a} ± 0.5**	**24.9^{b} ± 0.4**	**25.8^{b} ± 0.7**	**P < 0.01**

Summary

- Cows treated with hCG on d 7 or d 7 and 13 had:
  - Greater proportion of cows with atypical estrous cycle
  - Greater proportion of cows with 3 follicular waves, later onset of functional luteolysis and longer duration of functional luteolysis, increasing the inter-ovulatory interval

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Questions?

Thiago Cunha, DVM

thiago.cunha@wisc.edu