



CHOLINE NUTRITION ON DAIRY FARMS: FROM SCIENCE TO FARM

Bram Pauwelyn
Kemin Europe

Lantmännen, 19/05/2026





CHOLINE AS AN ESSENTIAL NUTRIENT FOR TRANSITION COWS



WHAT IS CHOLINE?

"A problem solver"

"Nice to put on the label"

"Expensive"

"Protects the liver if fresh cows fails to start up well"

"Something needed if you don't manage your dry cows well"

"Not needed"

"To treat ketotic cows"

WHAT IS CHOLINE?

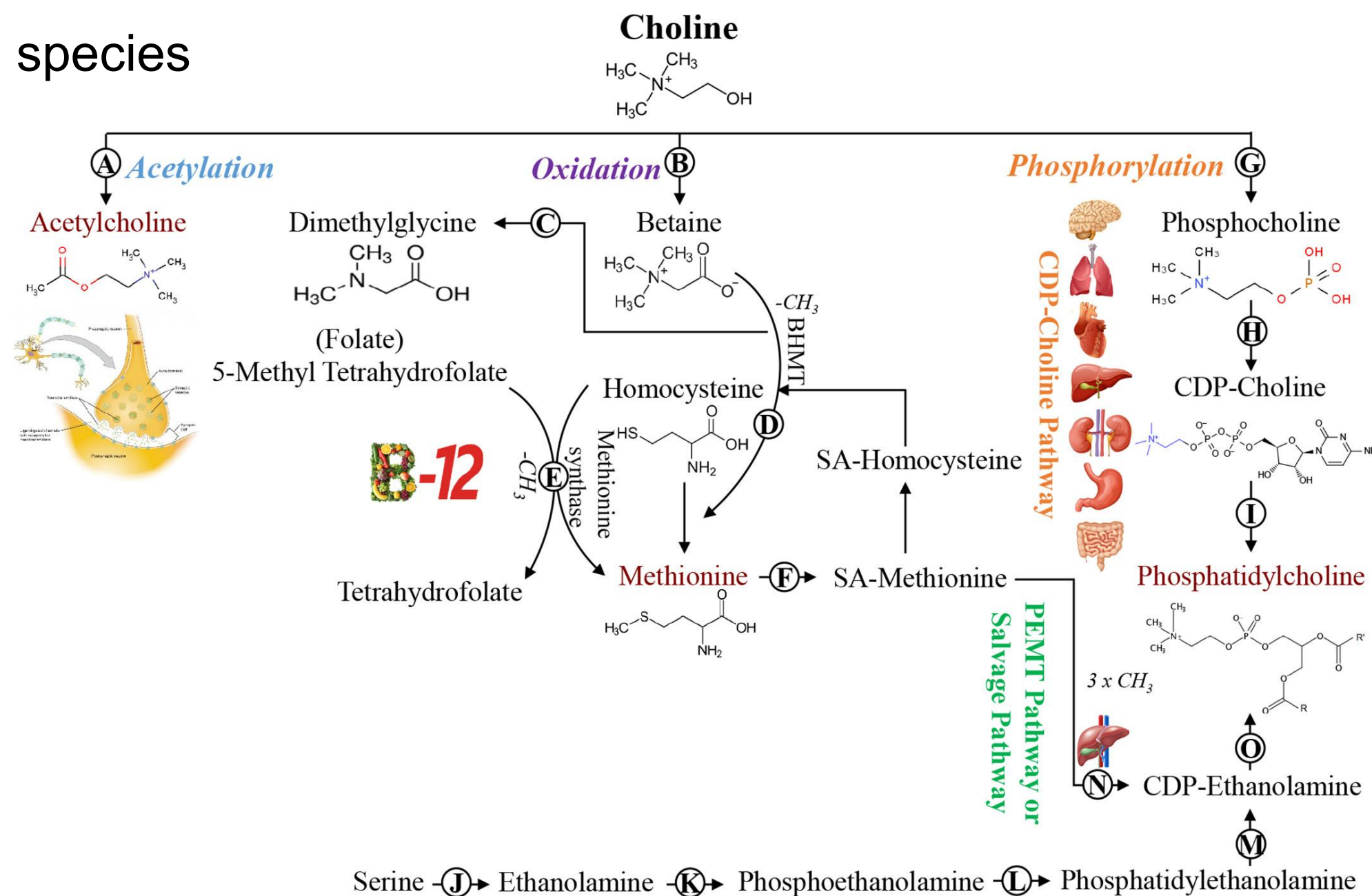
- Choline: vitamin-like essential nutrient in all species

A. Source of acetylcholine: neural transmitter

B. Methyl donor: DNA methylation, ...

C. Source of phosphatidyl choline: part of cell membranes & supports synthesis of VLDL in the liver

- Choline chloride: feed additive (3a890)

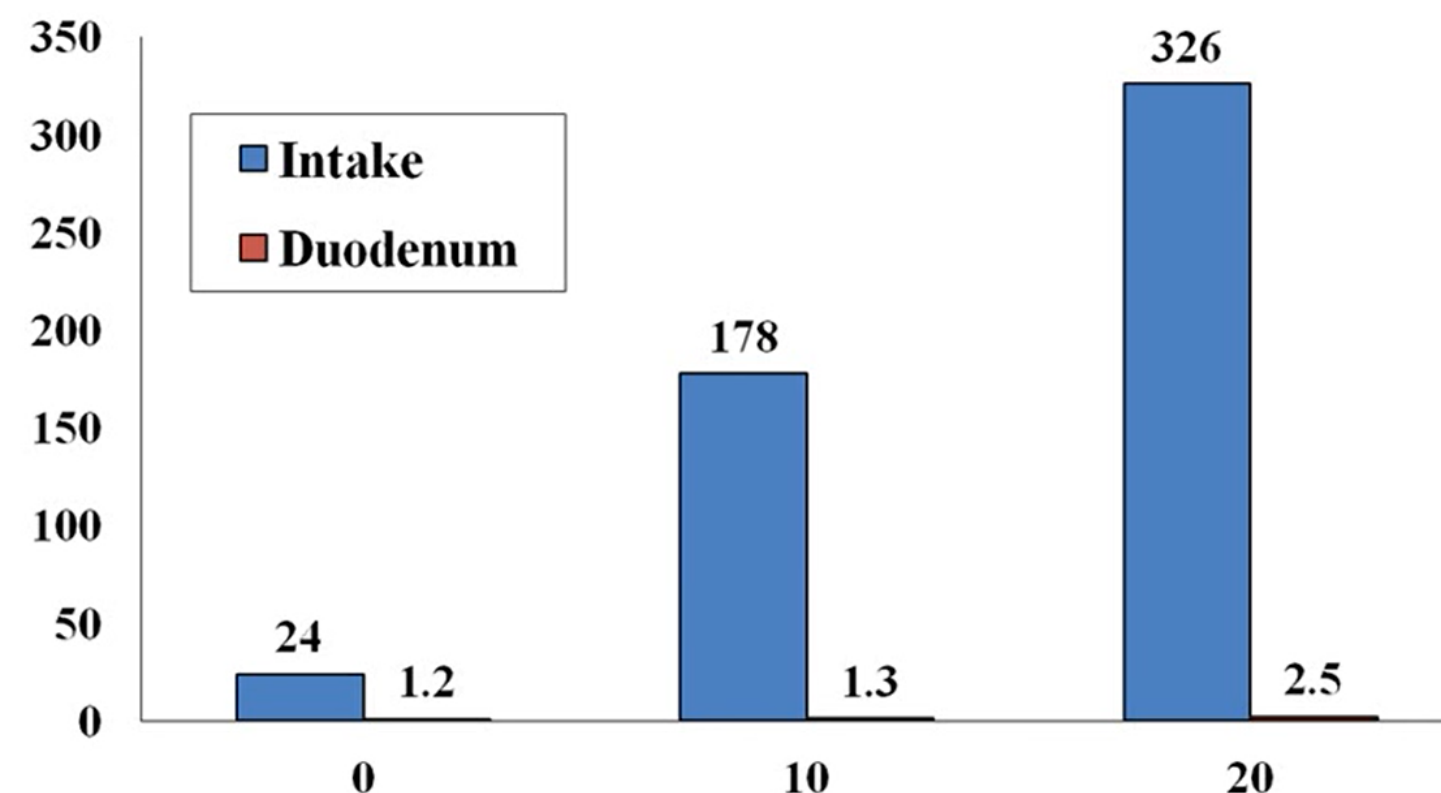


Adapted from Artegoitia et al. (2014) and Zenobi et al. (2018a)

WHAT IS CHOLINE?

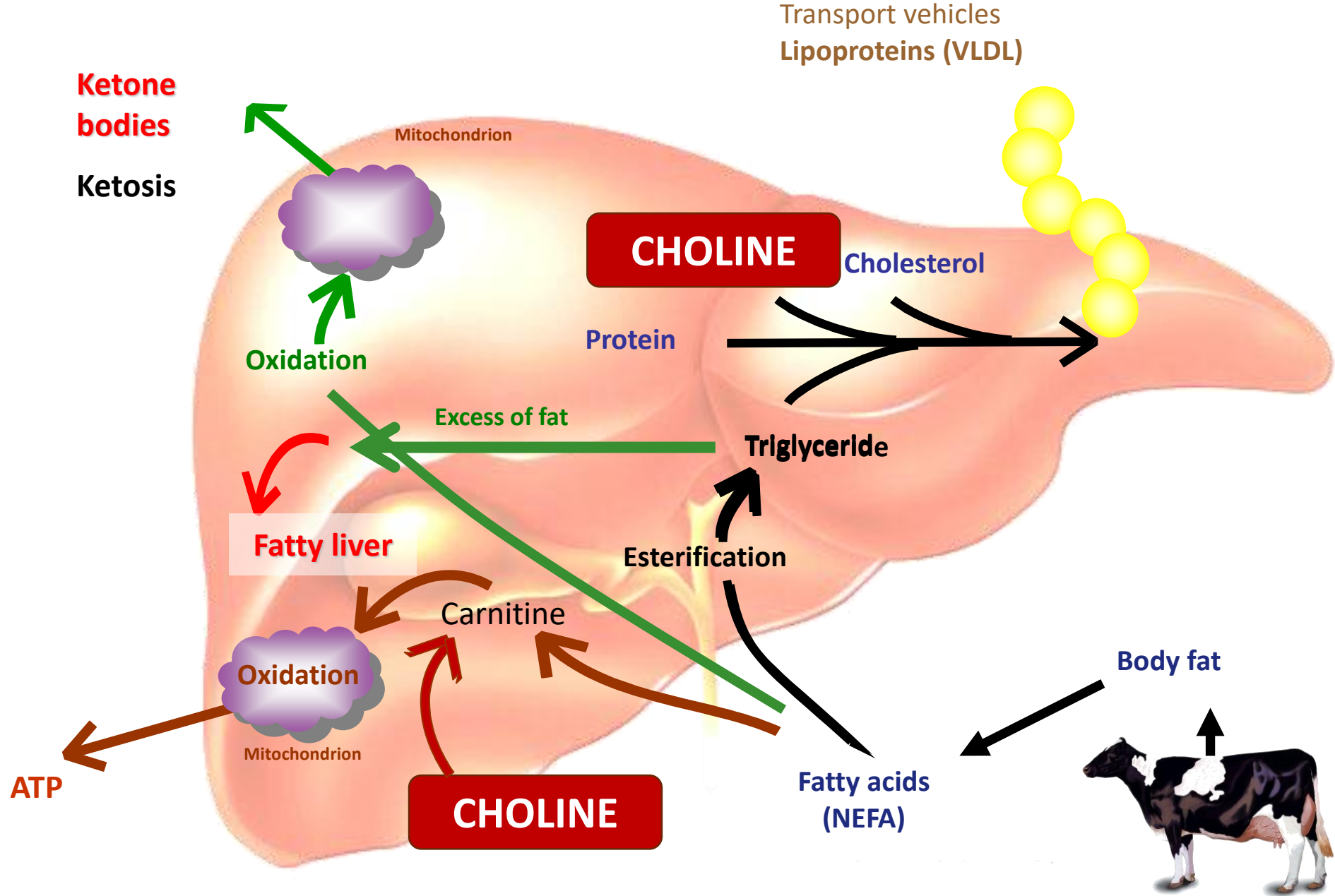
- Nearly 100% degraded in the rumen by the rumen microbes

Feeds	Rumen degradability (%)
Barley	79.4
Cottonseed meal	84.7
Fish meal	82.9
Soybean meal	83.8
Choline stearate	98.0
Choline chloride	98.6

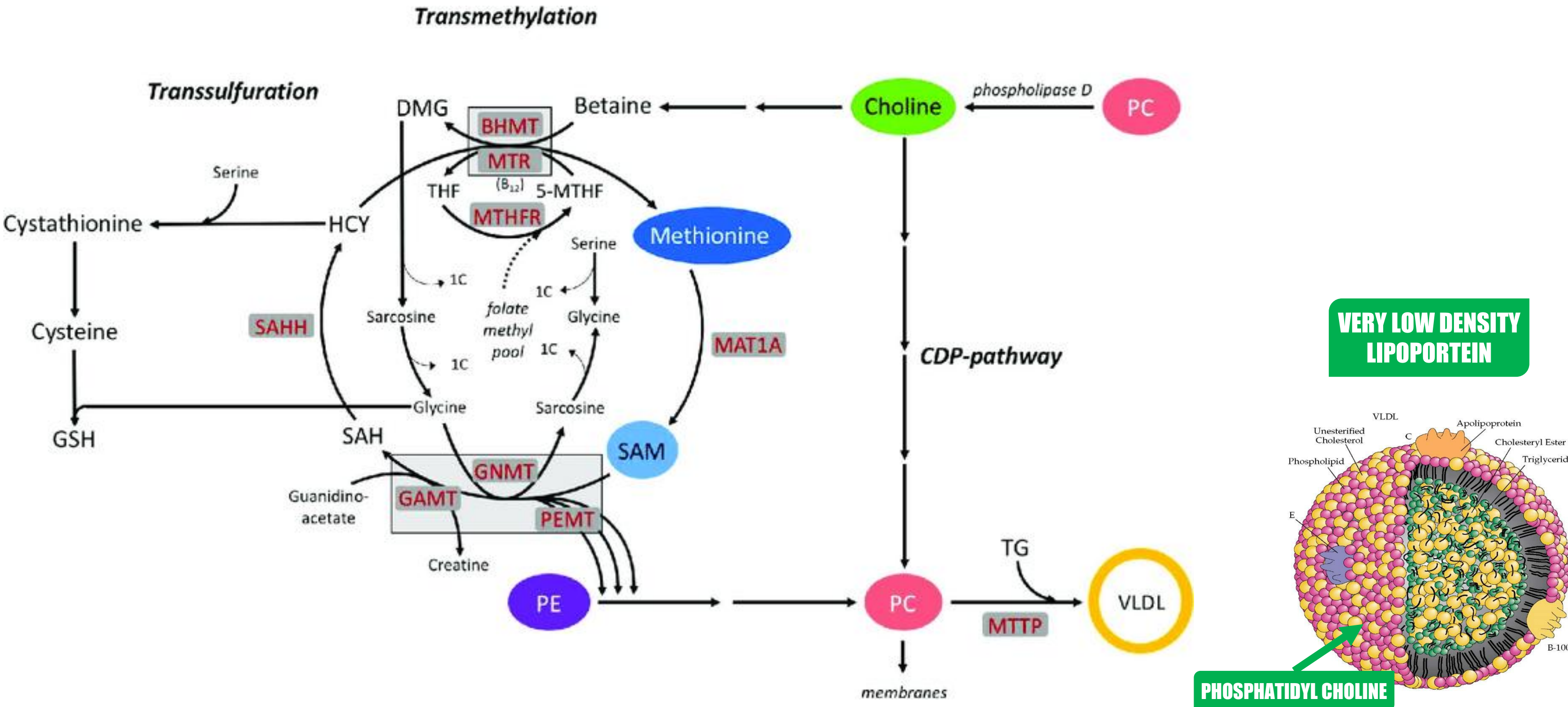


Need for a source of reliable and cost-effective rumen-protected choline!

HOW DOES CHOLINE WORK?



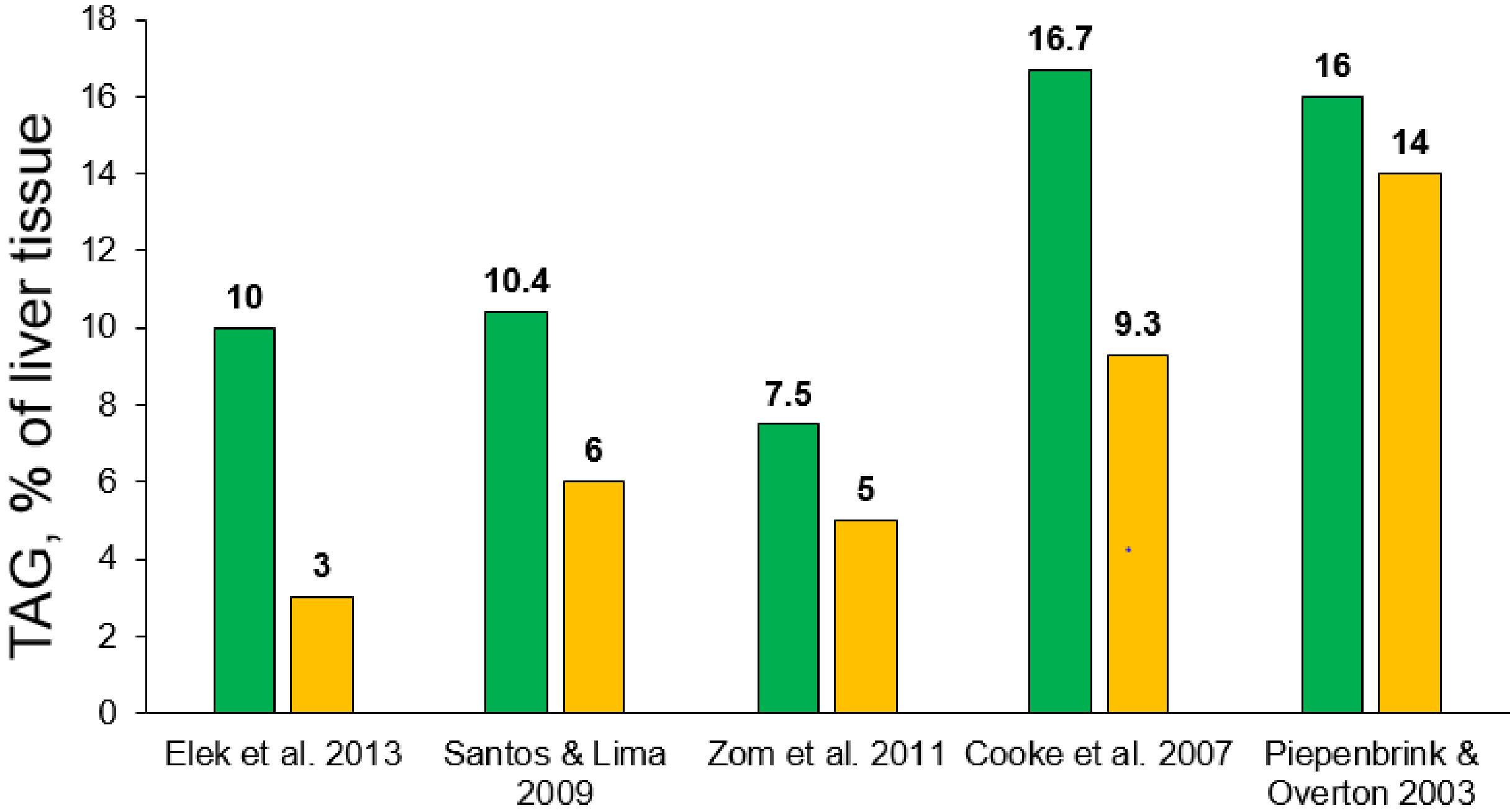
HOW DOES CHOLINE WORK?



Chandler & White, 2017



HOW DOES CHOLINE WORK?





BENEFITS OF CHOLINE NUTRITION



CHOLINE EFFECTS IN DAIRY COWS

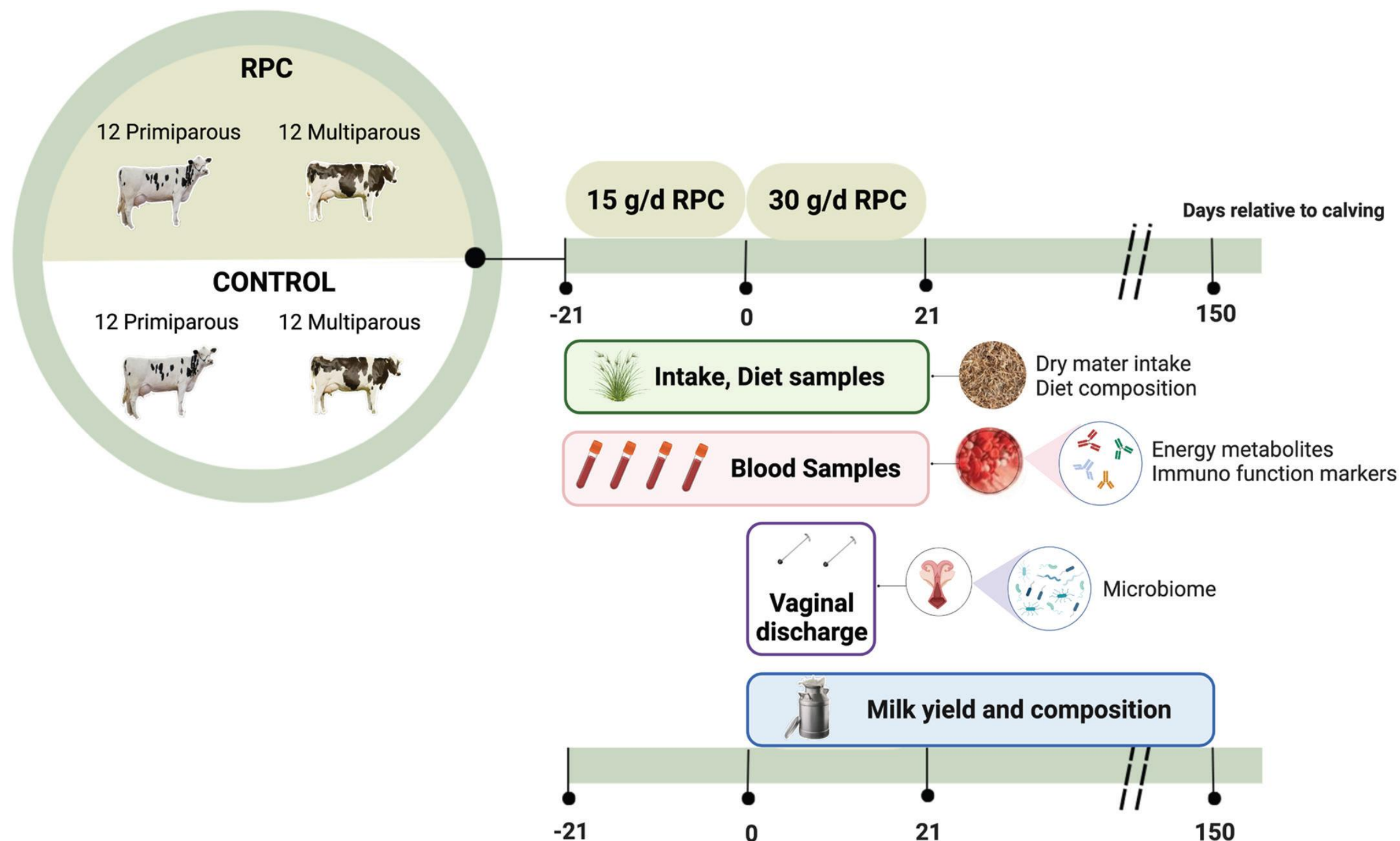
Milk production



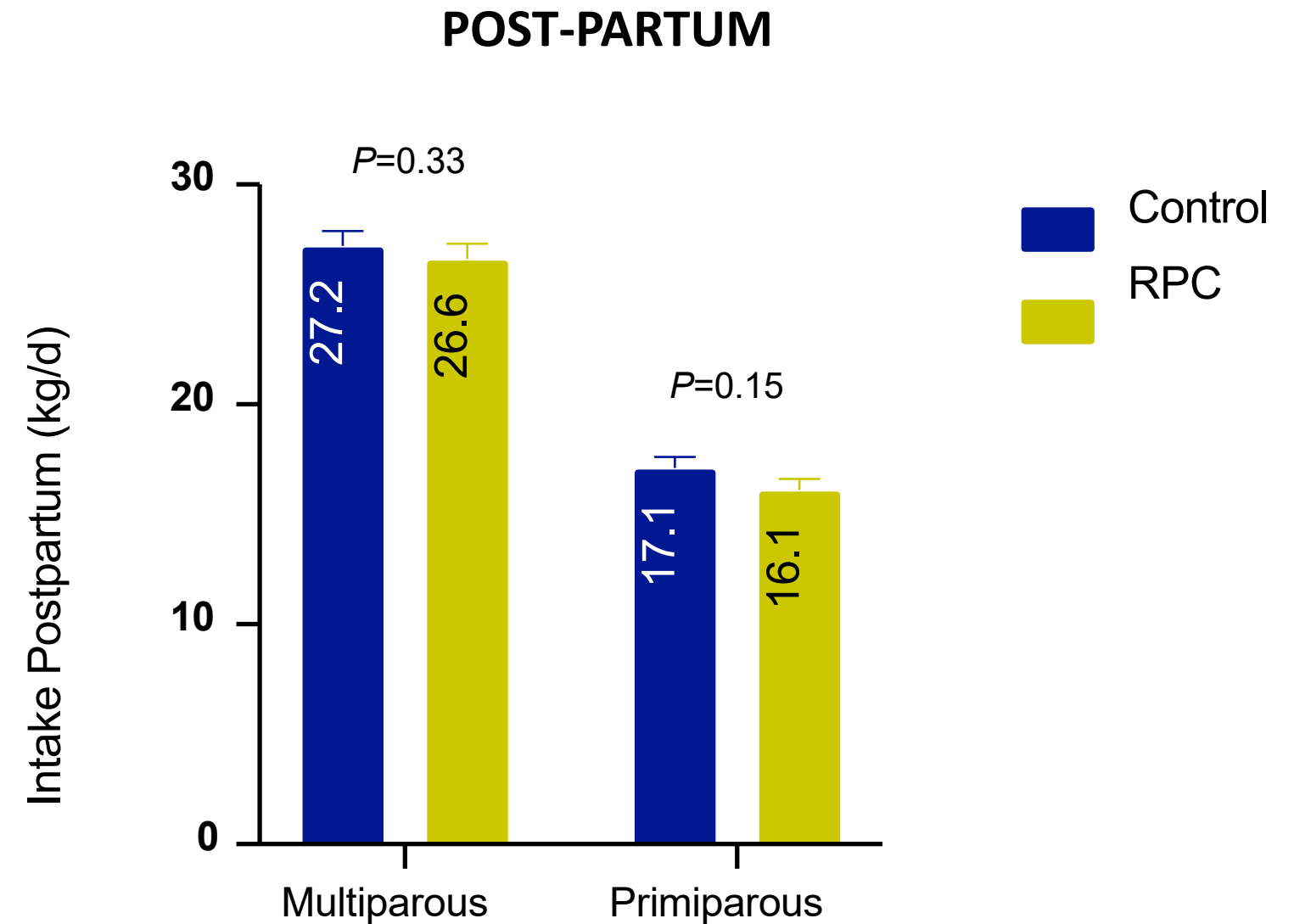
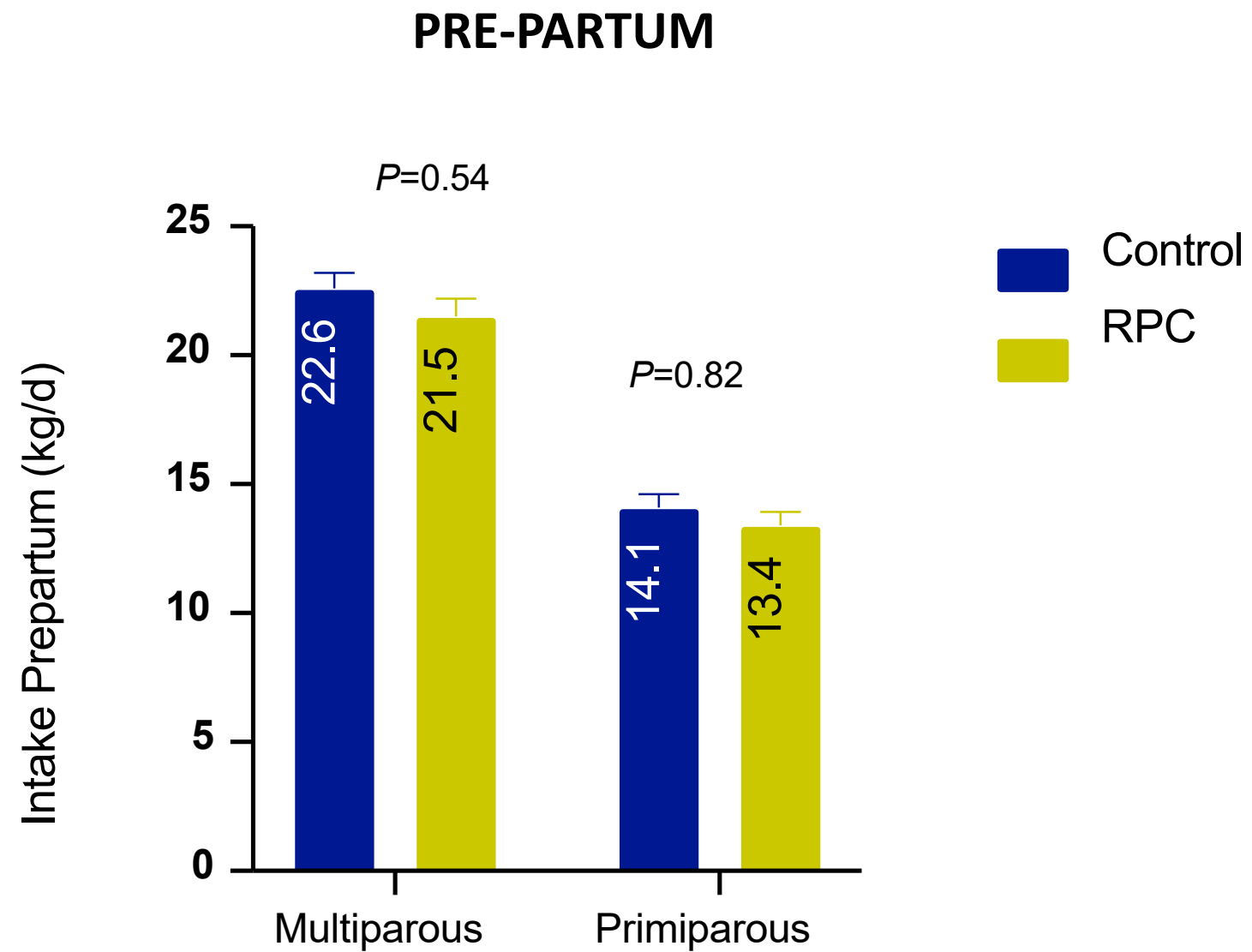
Effect of rumen-protected choline on dairy cow metabolism, immunity, lactation performance, and vaginal discharge microbiome

T. C. Marques,^{1,2} H. F. Monteiro,¹ D. B. Melo,¹ W. M. Coelho Jr.,¹ S. Salman,¹ L. R. Marques,² K. M. Leão,² V. S. Machado,³ P. Menta,³ D. Dubey,⁴ F. Sun,⁵ and F. S. Lima^{1*}

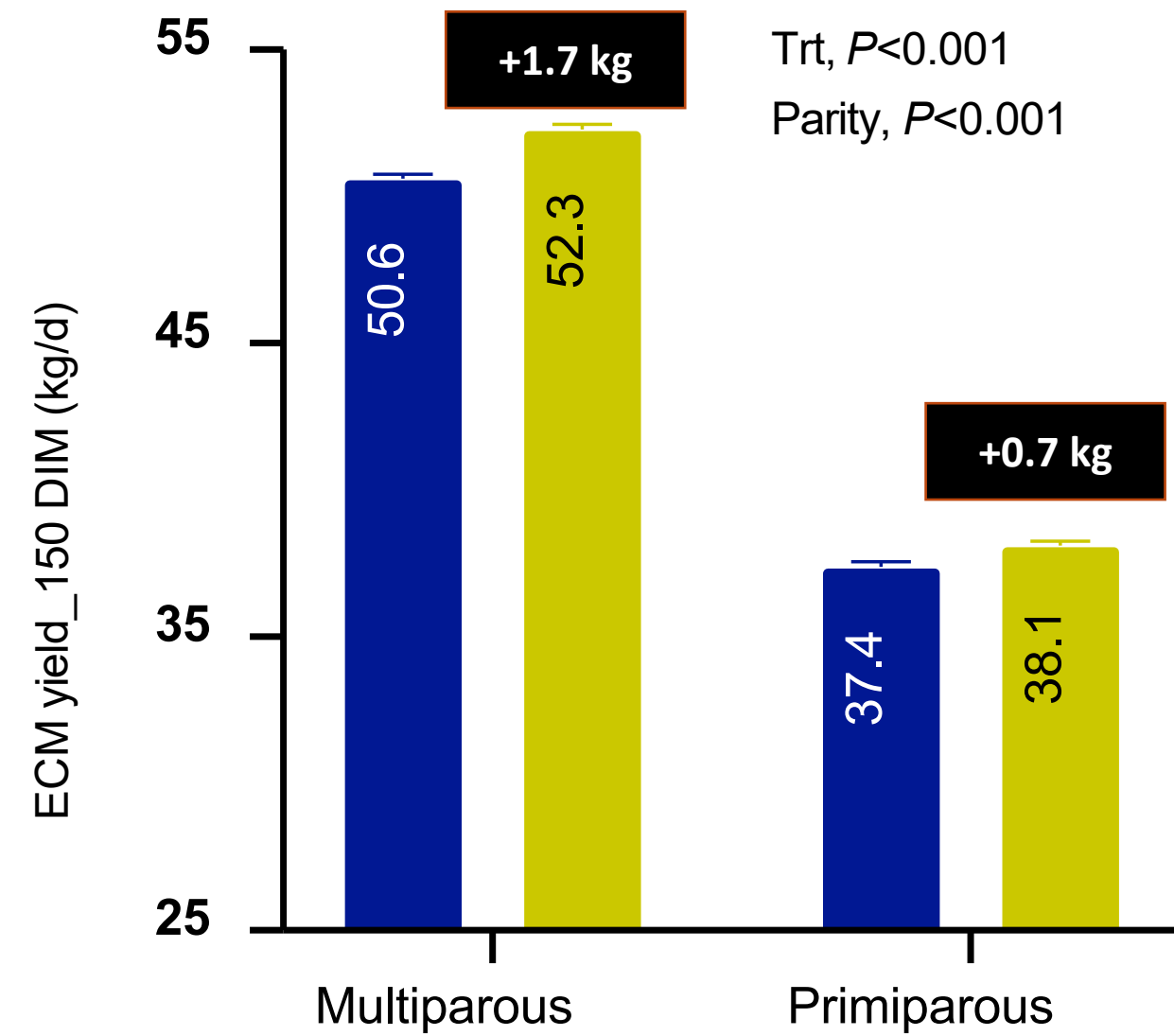
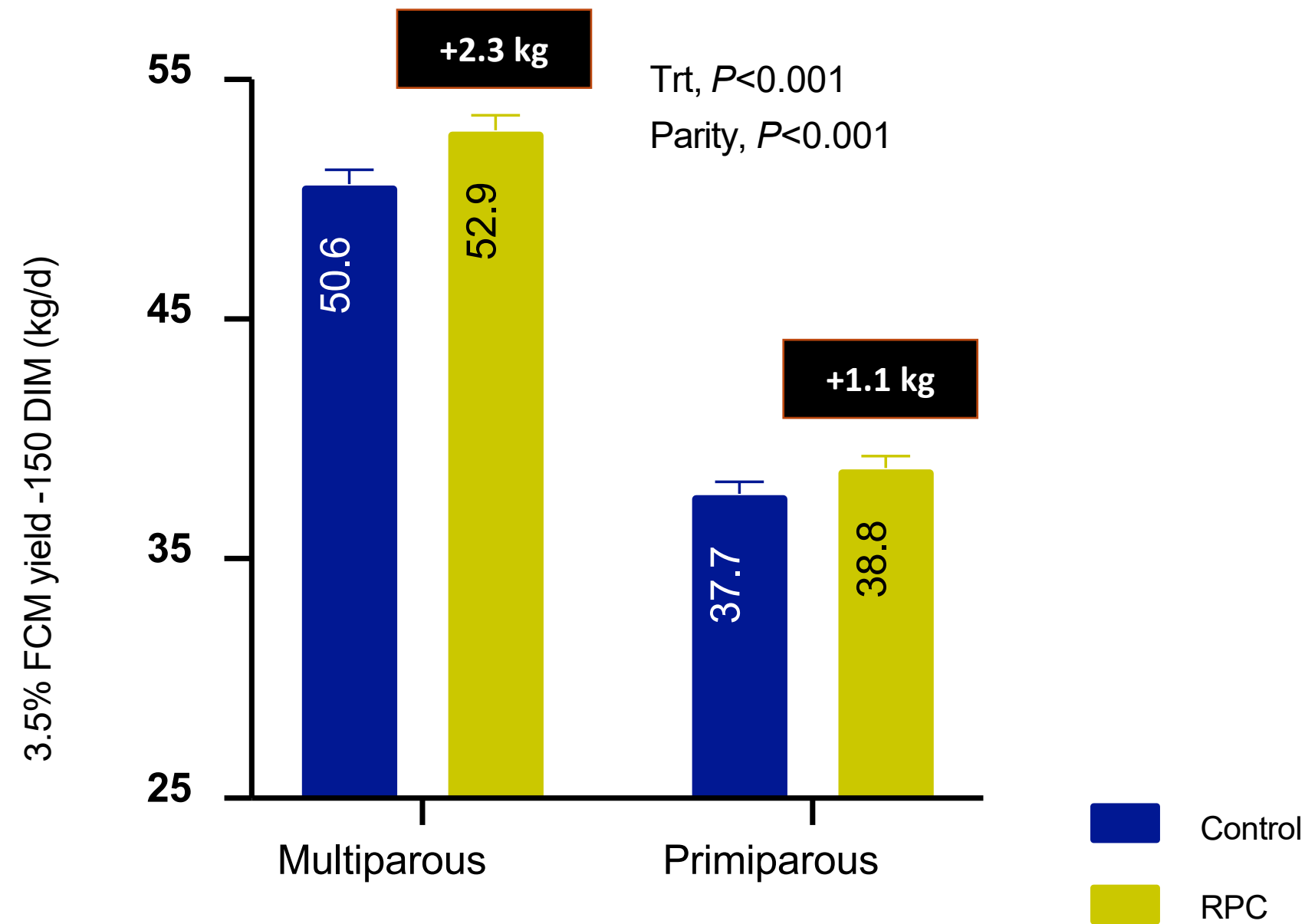
1/ MILK PRODUCTION



1/ MILK PRODUCTION

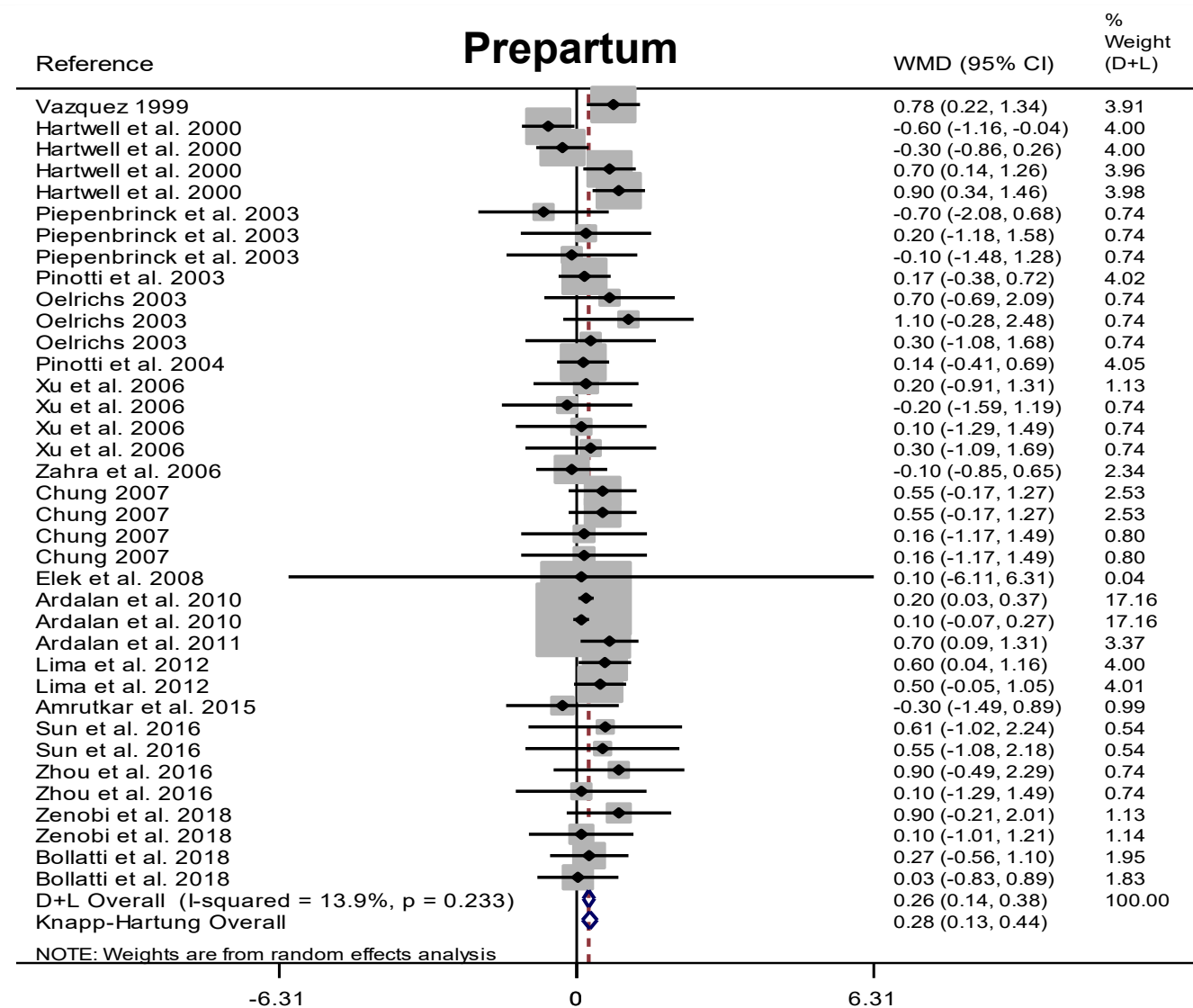


1/ MILK PRODUCTION

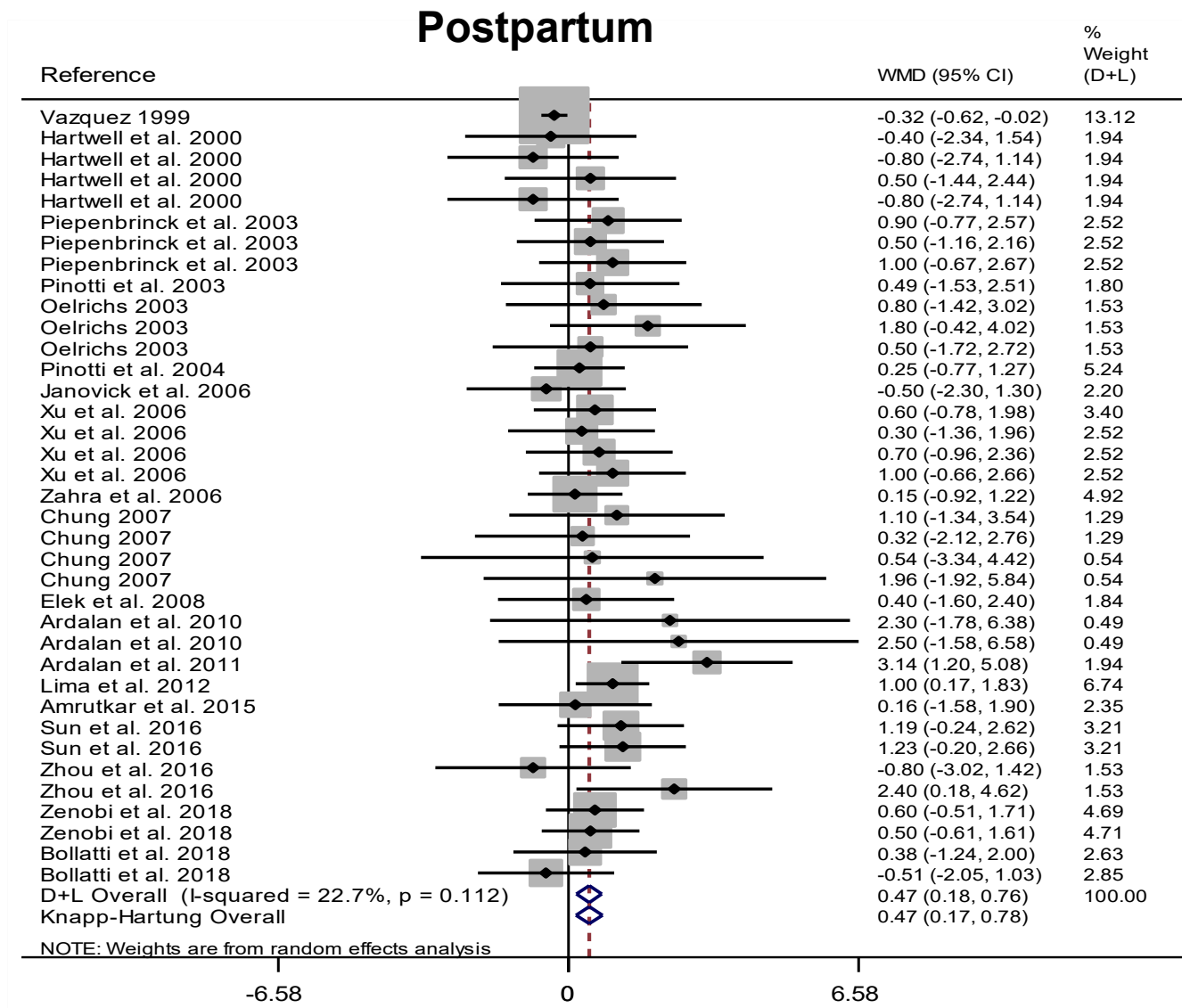


1/ MILK PRODUCTION

Meta-analyses shows consistent effect on milk yield:



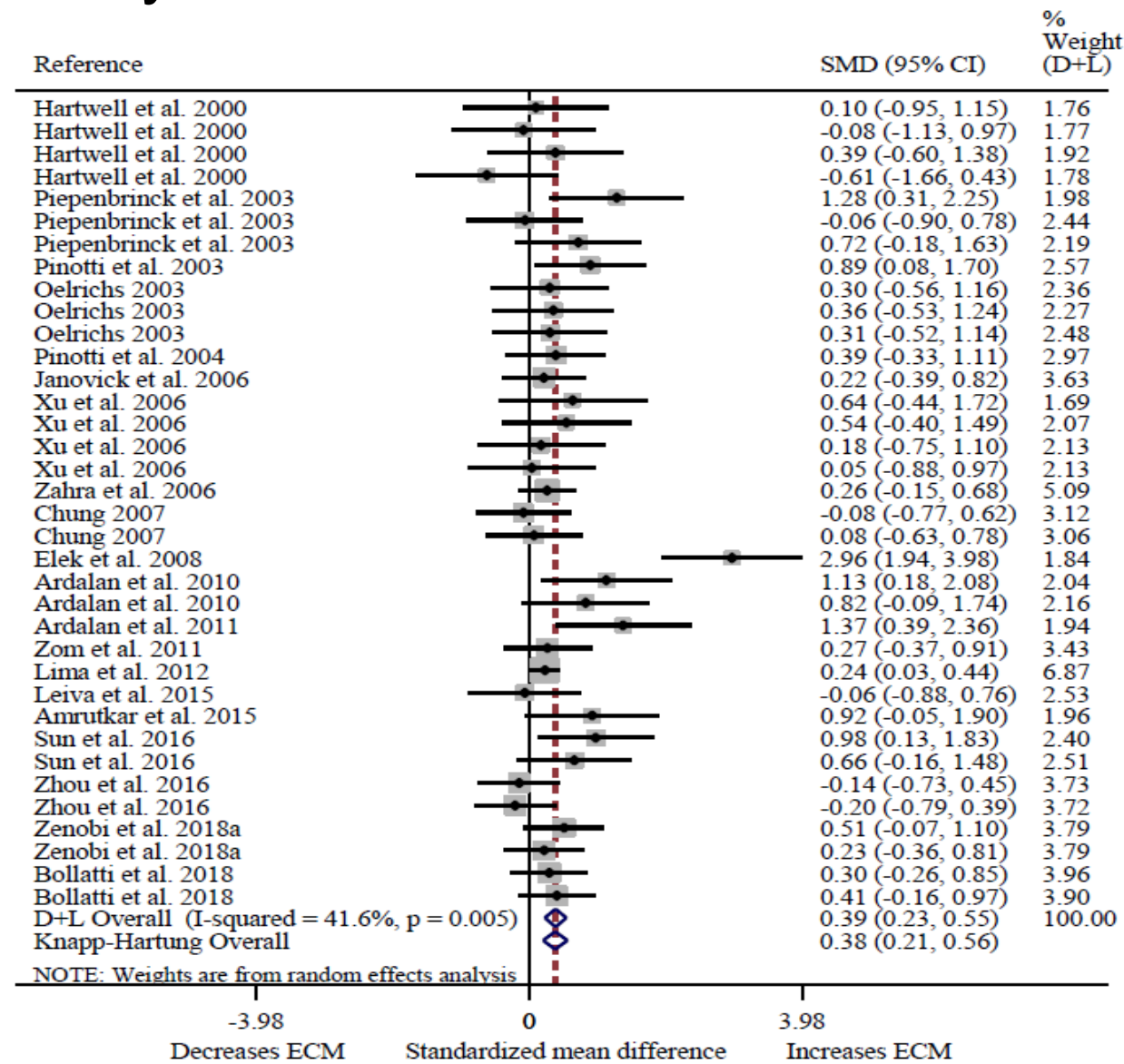
**Increased DMI
pre-partum = 0.2 kg**



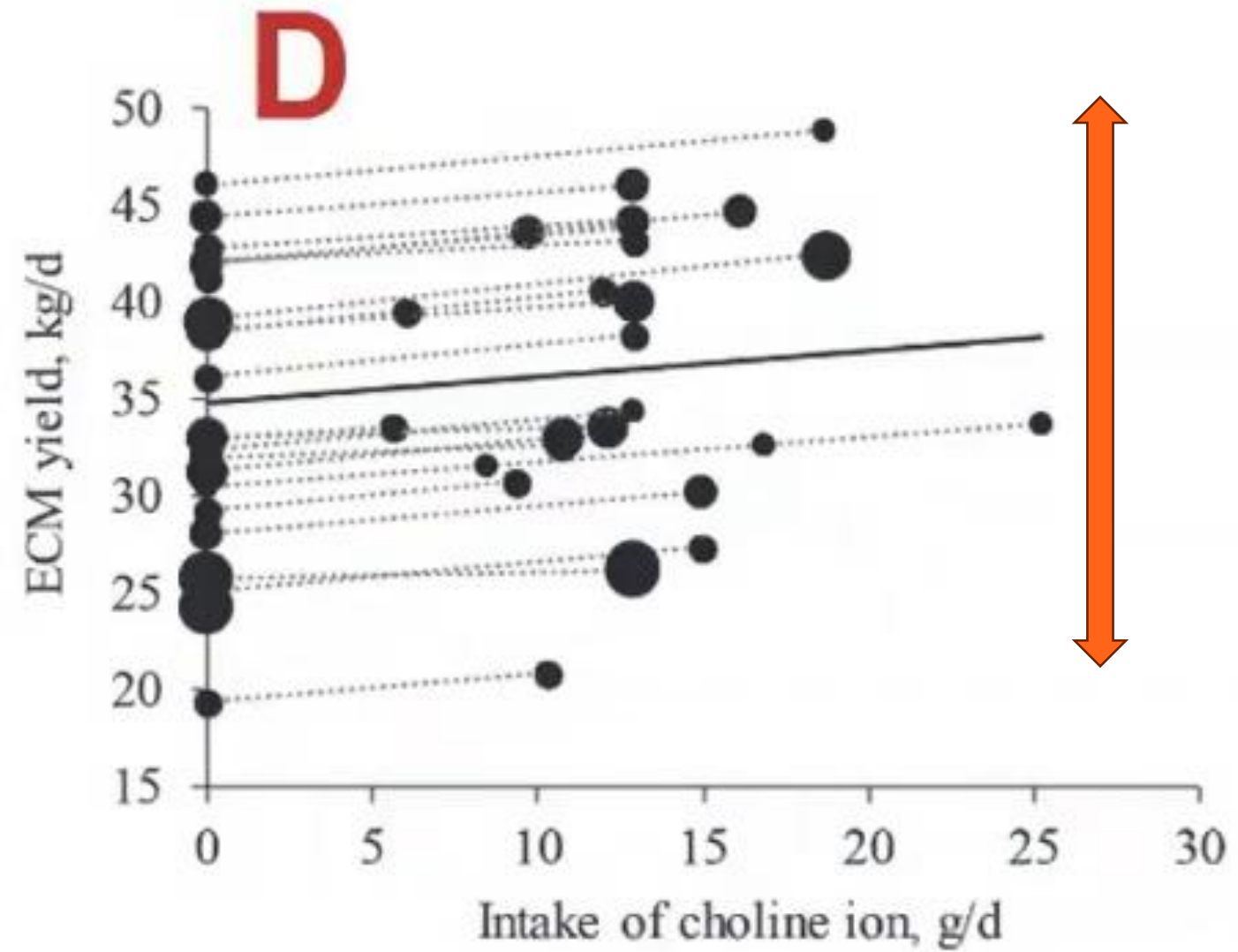
**Increased DMI
post-partum = 0.5 kg**

1/ MILK PRODUCTION

Meta-analyses shows consistent effect on milk yield:



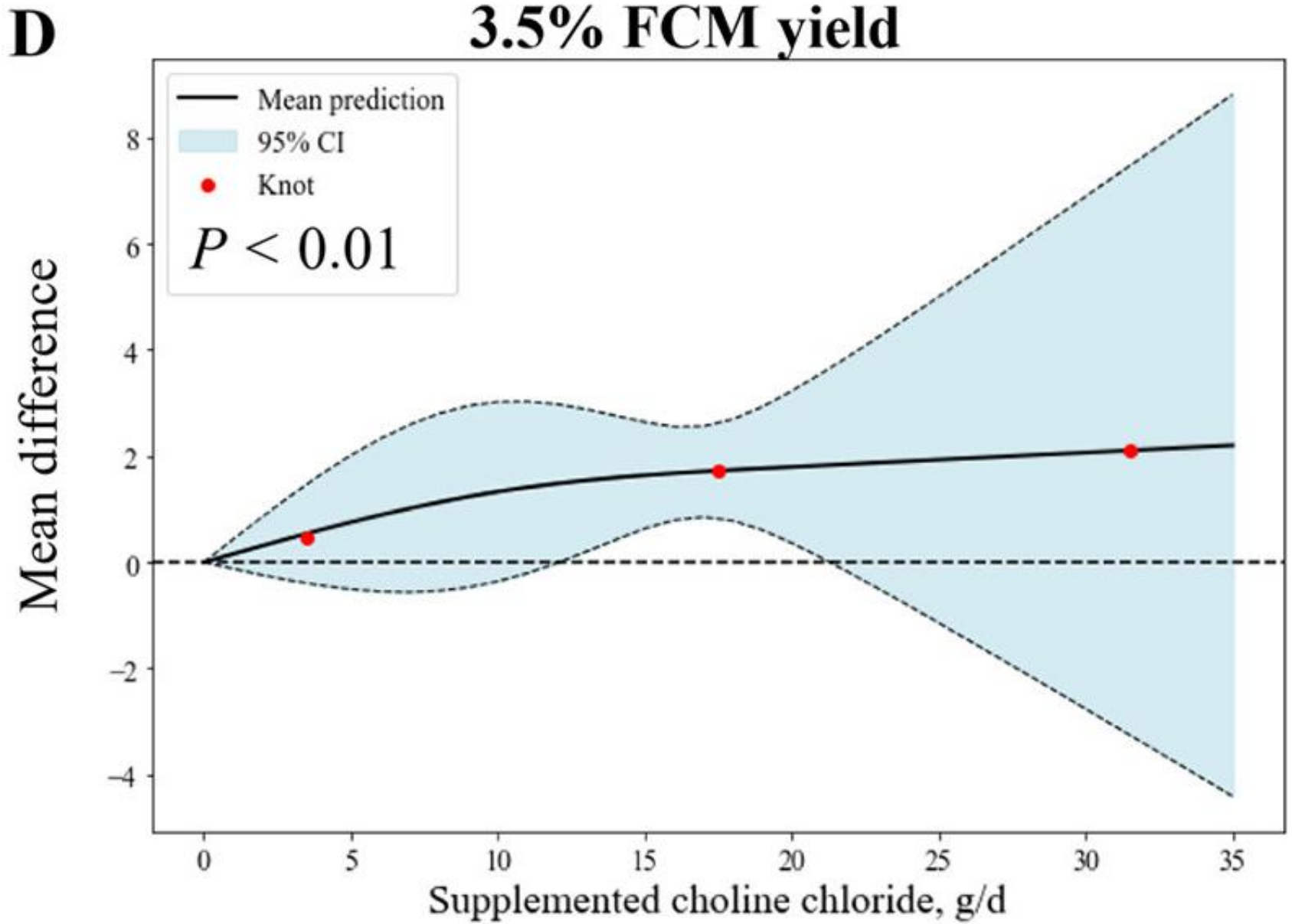
Increased ECM production = +1,61 kg



At any production level

1/ MILK PRODUCTION

Meta-analyses shows consistent effect on milk yield:



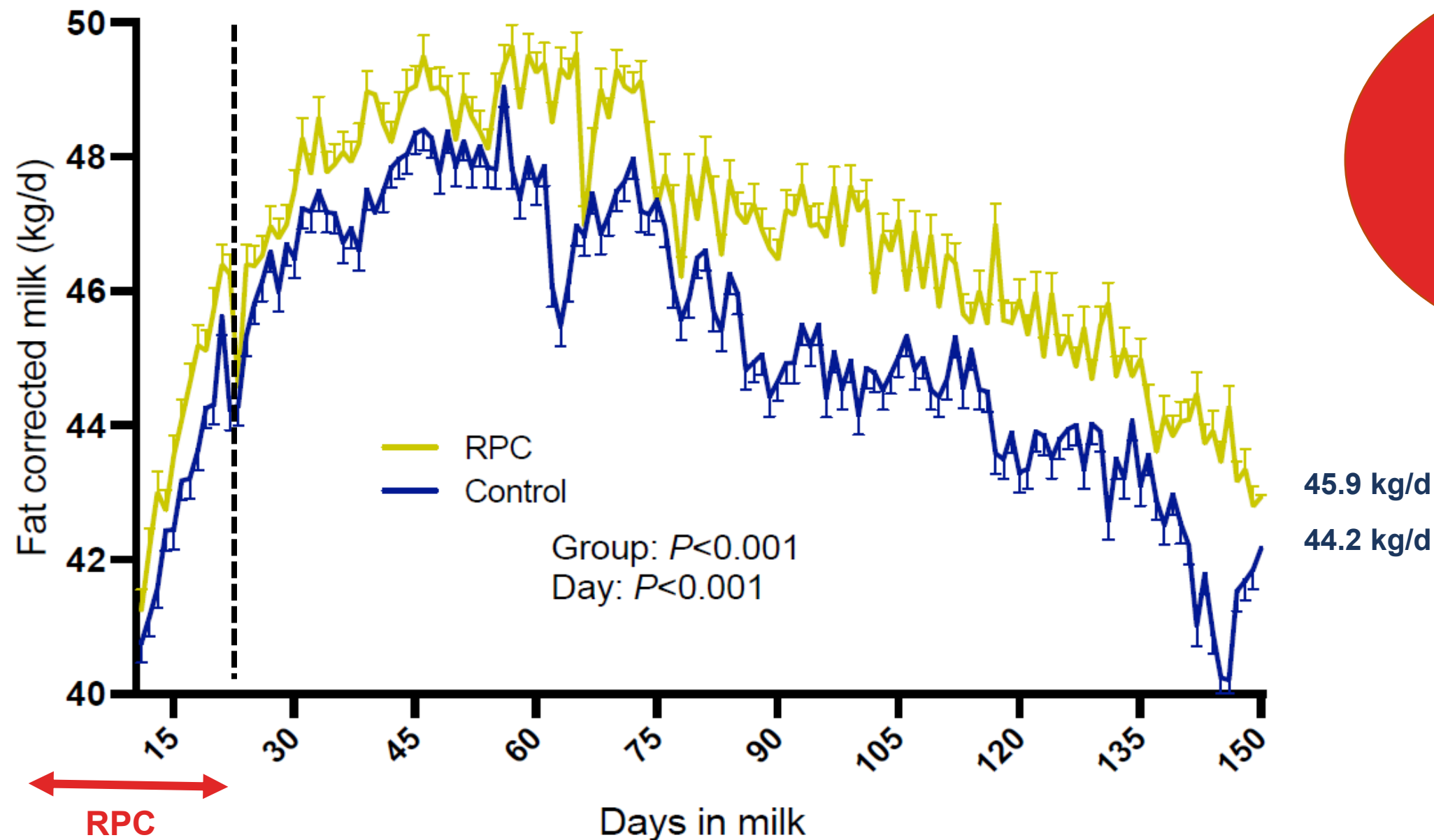
Ghaffari et al., 2025

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1/ MILK PRODUCTION

Carry-over effect: choline shows a long-lasting effect beyond supplementation.



**+1.7 kg milk for
150 days = 255
kg more milk**

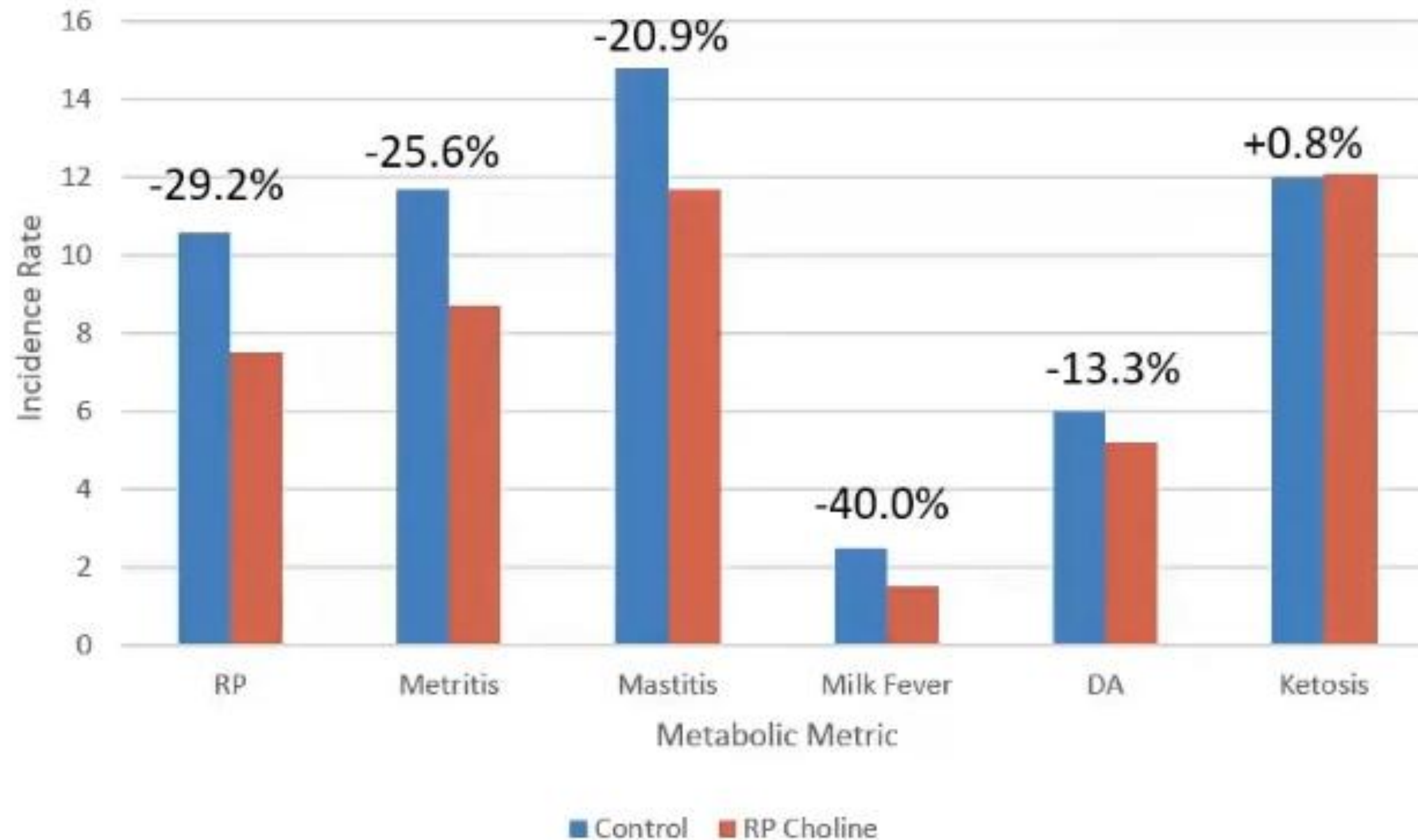
2/ TRANSITION HEALTH

Meta-analysis shows consistent effect on transition health:

Parameters	Choline ion (g/d)		Difference	p-value
	0	12.9		
Glucose, mM	3.24	3.28	0.04	0.04
BHB, mM	0.80	0.76	0.04	0.05
Fatty acids, mM	0.59	0.51	0.08	0.03

2/ TRANSITION HEALTH

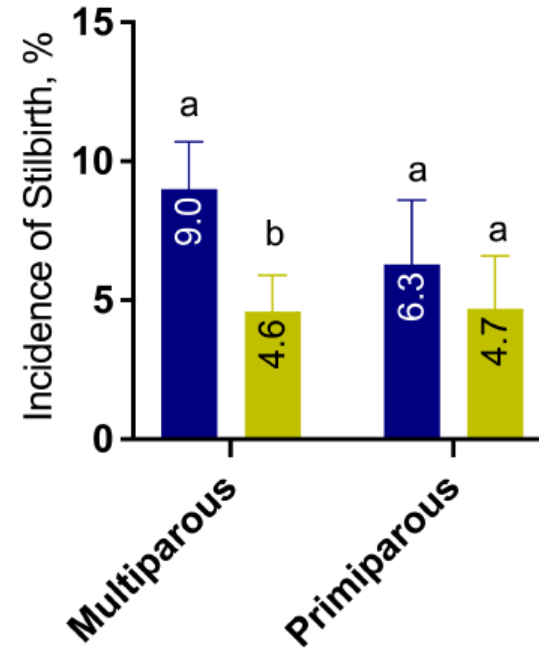
Meta-analysis shows consistent effect on transition health:



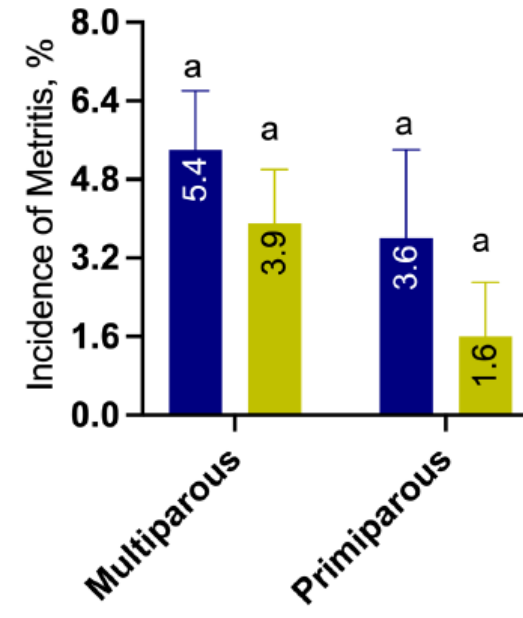
2/ TRANSITION HEALTH

N = 774
 30 g/d CholiGEM™
 21d pre-partum until
 100d post-partum

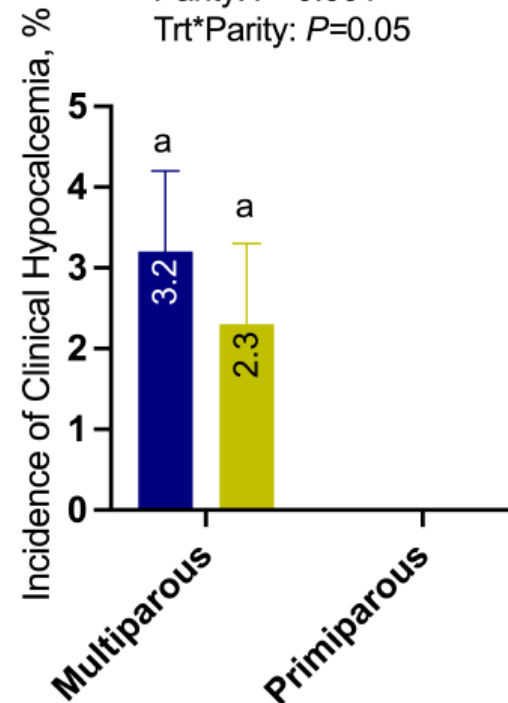
Trt: $P=0.10$
 Parity: $P=0.33$
 Trt*Parity: $P=0.48$



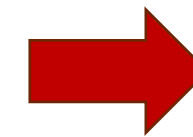
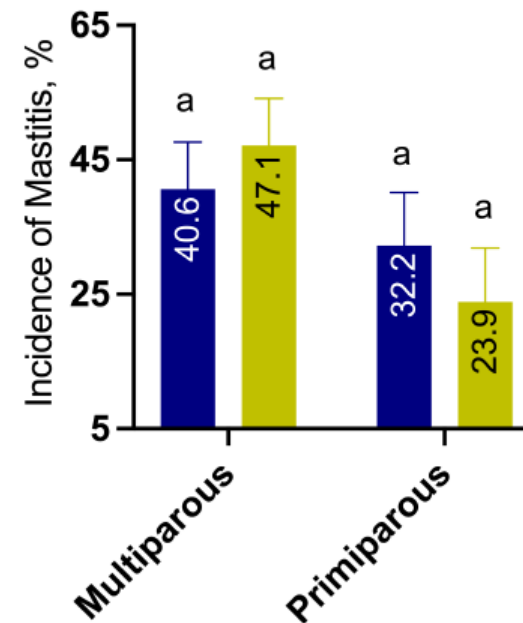
Trt: $P=0.25$
 Parity: $P=0.18$
 Trt*Parity: $P=0.87$



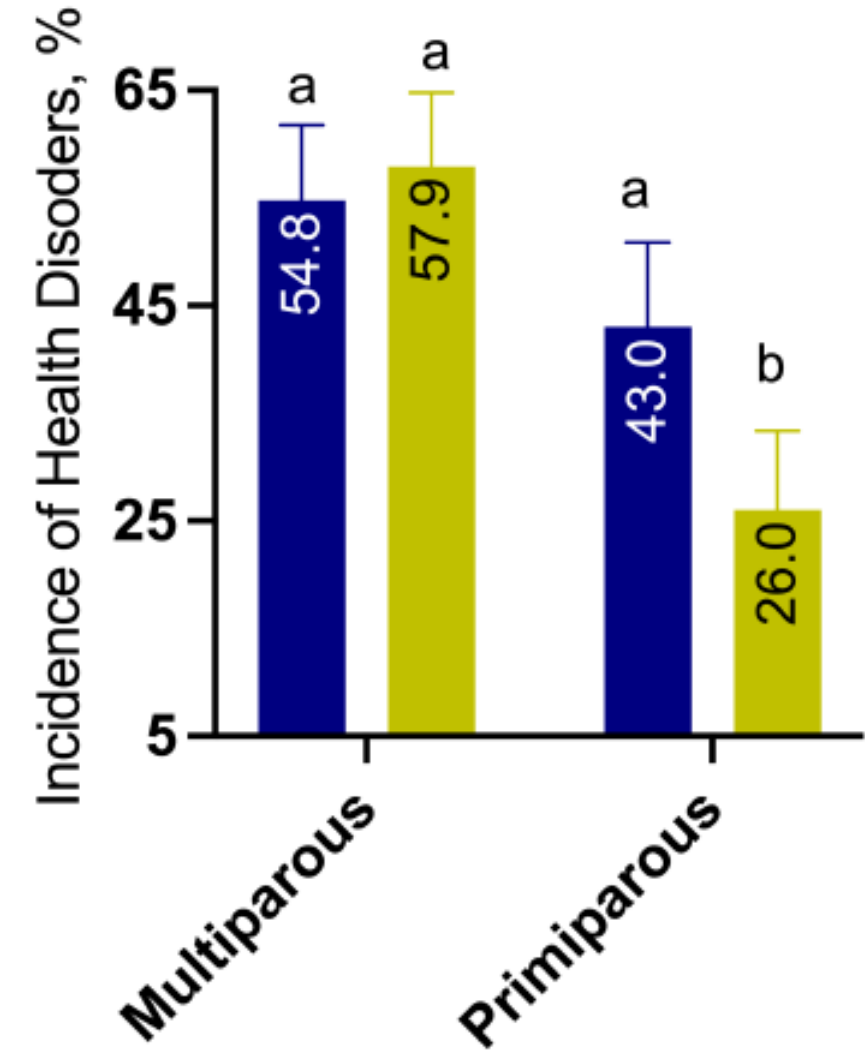
Trt: $P=0.82$
 Parity: $P<0.001$
 Trt*Parity: $P=0.05$



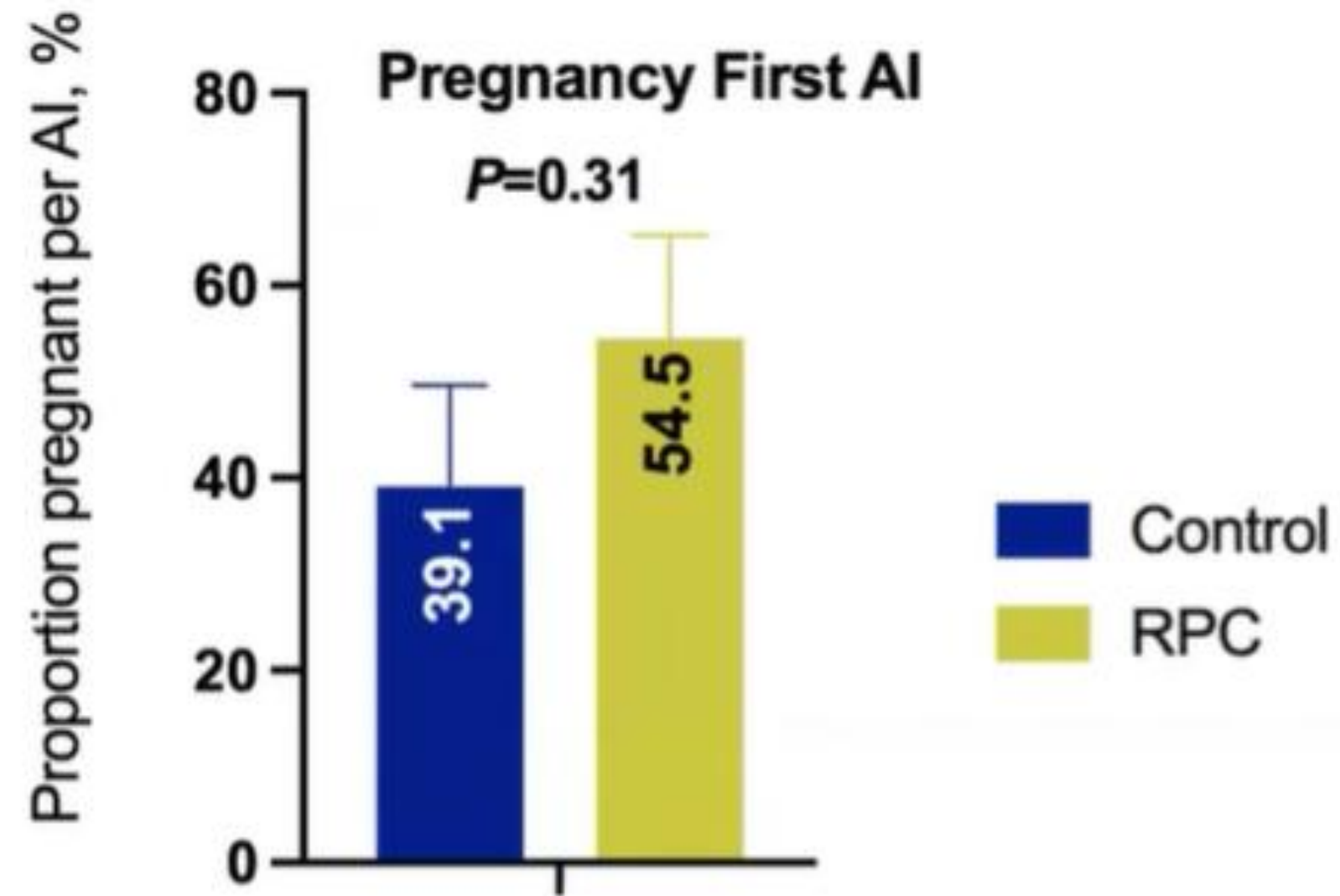
Trt: $P=0.82$
 Parity: $P<0.001$
 Trt*Parity: $P=0.05$



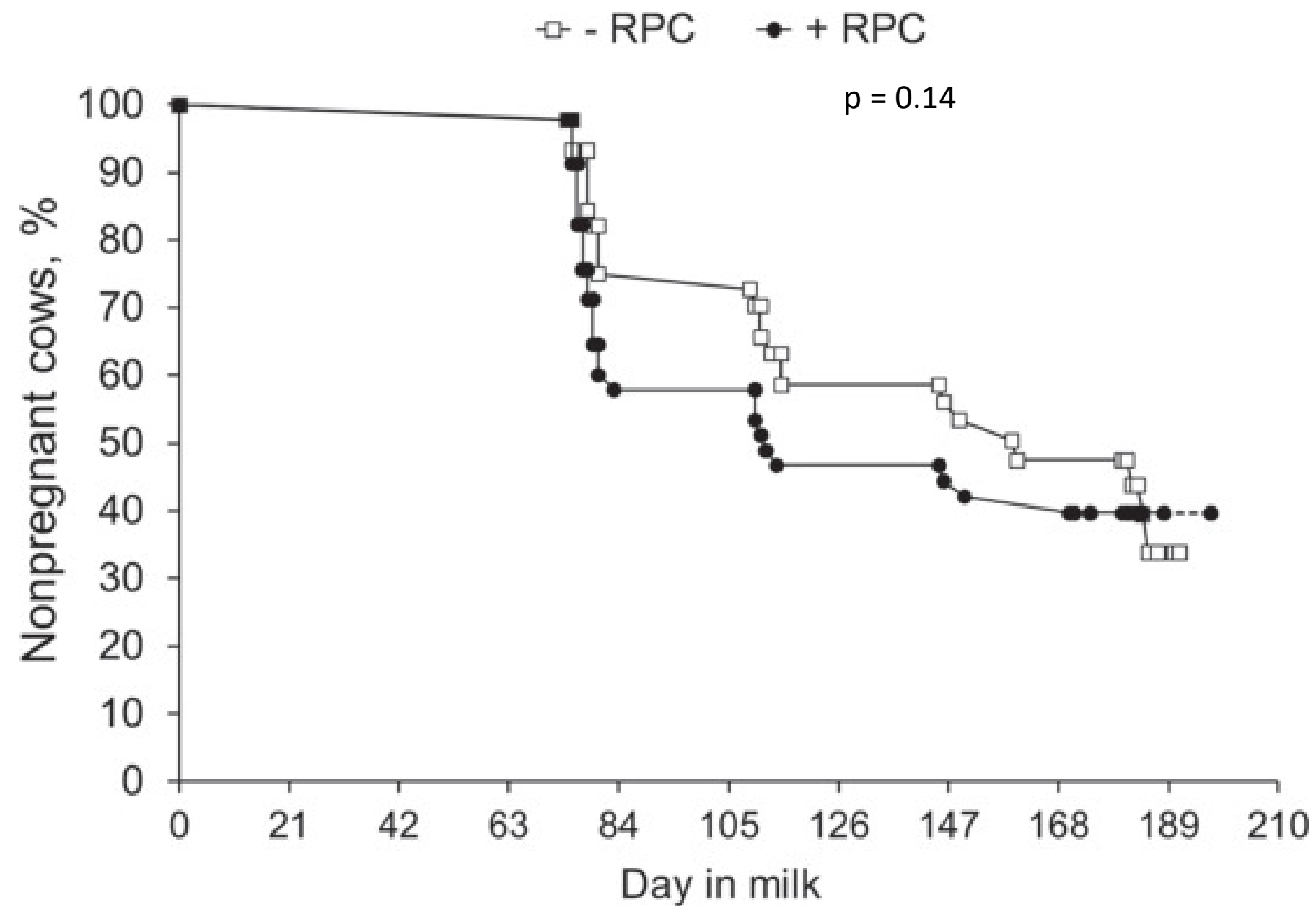
Trt: $P=0.07$
 Parity: $P<0.001$
 Trt*Parity: $P=0.009$



3/ REPRODUCTION



3/ REPRODUCTION

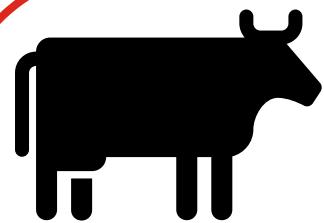


	-RPC	+RPC	P value
Proportion of cows pregnant at first AI	23.6%	41.3%	0.09
Median open days	160	112	

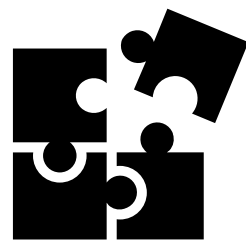
3/ REPRODUCTION

Effects of feeding rumen-protected choline 21 days prepartum to 100 days postpartum on lactation, health, reproduction, and culling of Holstein dairy cows.

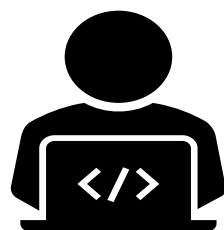
M. J. Wollentarski^{*1}, T. C. Marques¹, D. Melo¹, W. M. Coelho¹, H. F. Monteiro¹, R. Profeta¹, M. C. G. M. Silva¹, A. Ueda¹, E. Raffrenato², D. K. Dubey³, and F. S. Lima¹, ¹Department of Population Health and Reproduction, University of California, Davis, Davis, CA, ²Kemin Industries Inc, Des Moines, IA, ³Kemin Europa NV, Herentals, Belgium.



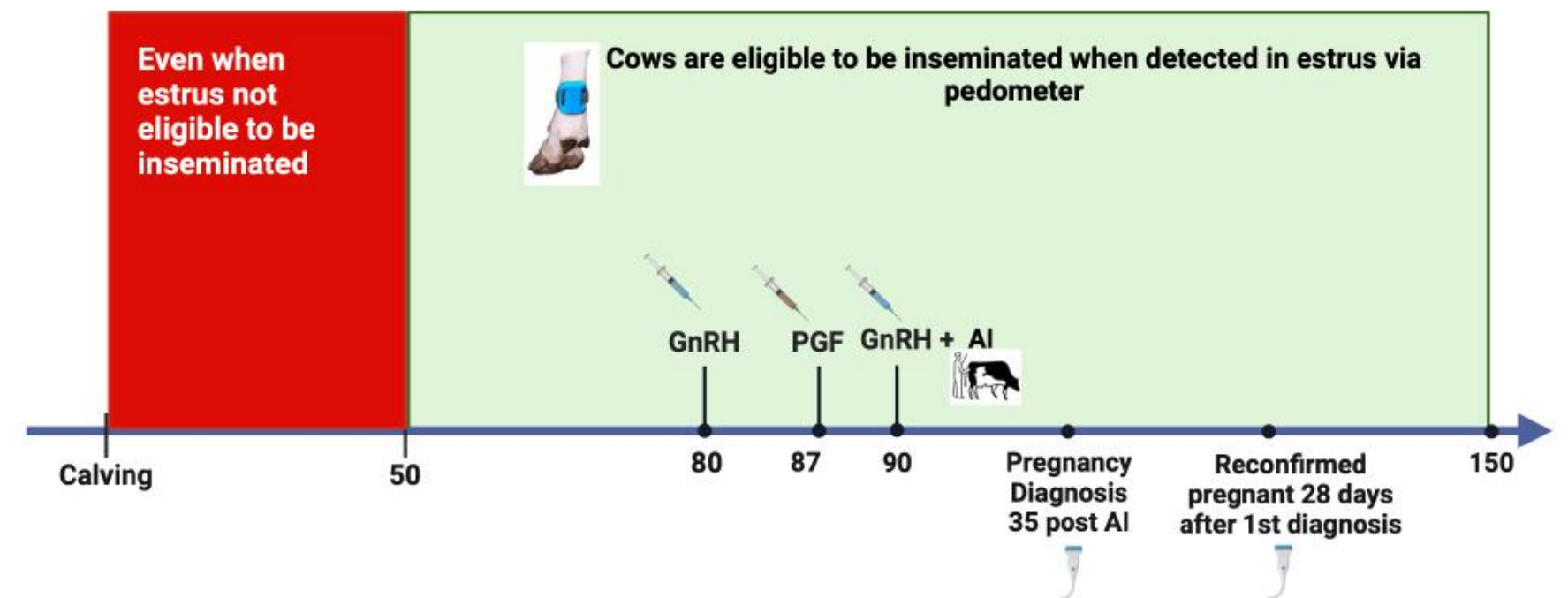
774 Holstein cows (30% primiparous)



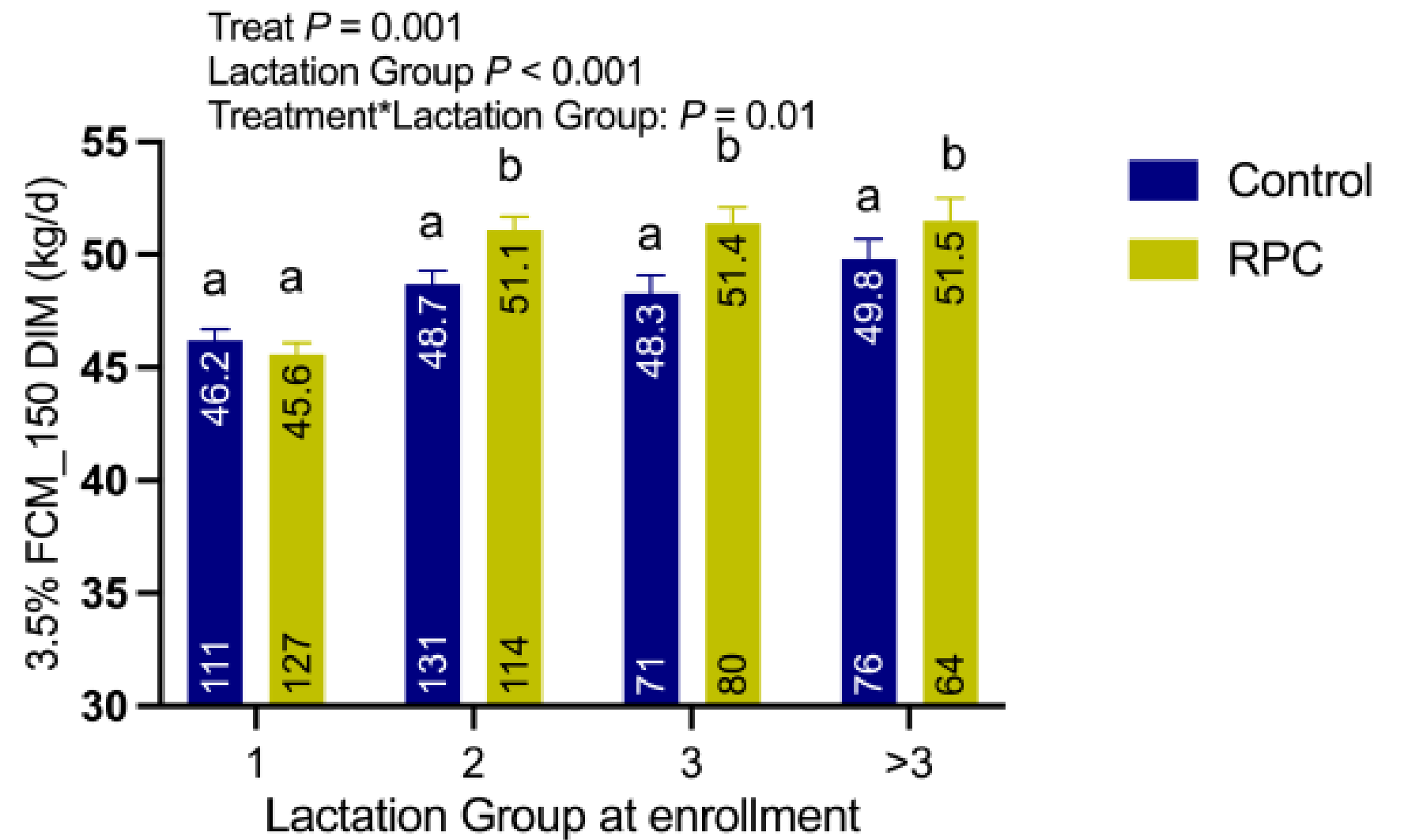
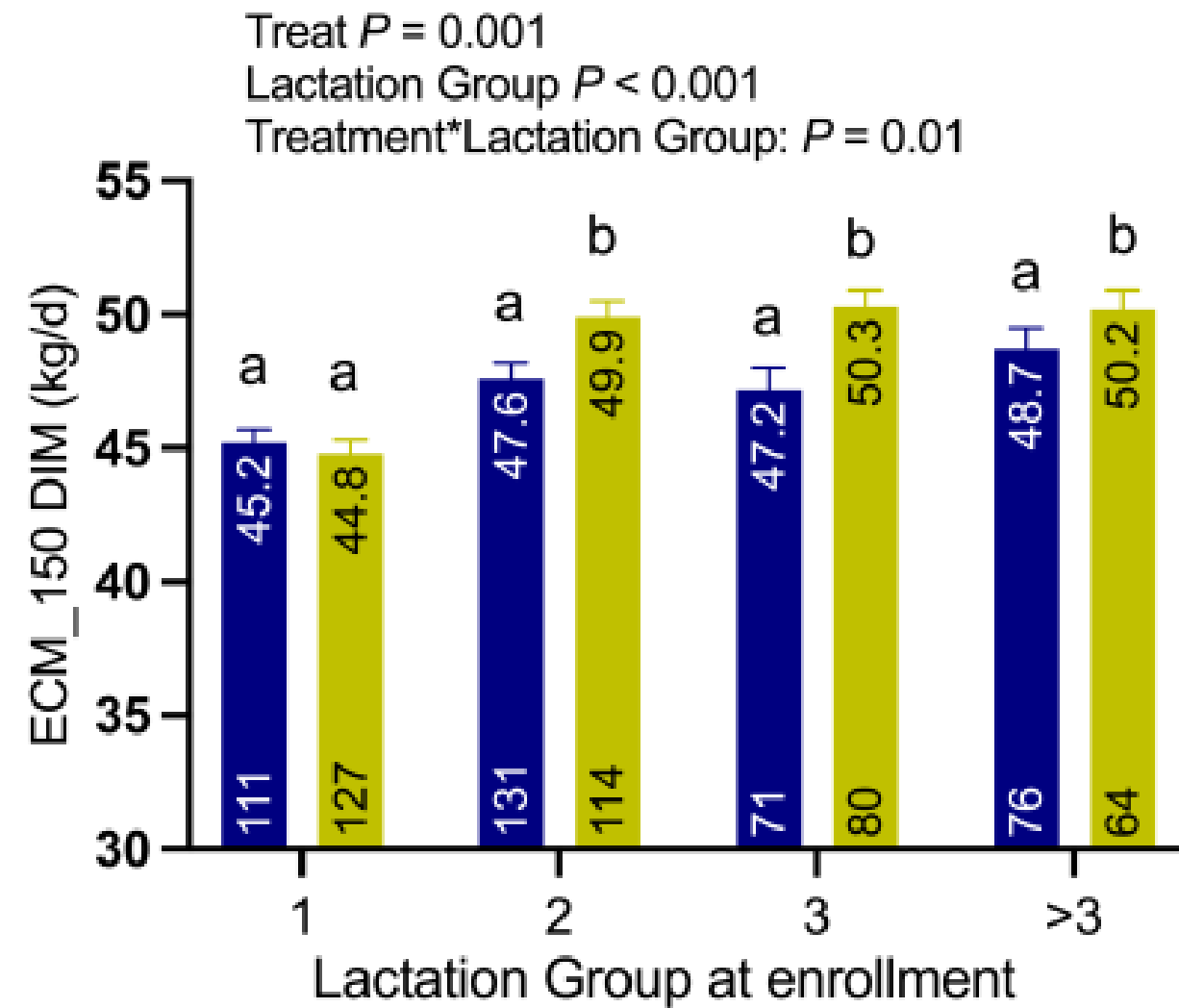
Cows were blocked by parity and randomly assigned to a block (n = 28/ cohort/pen)



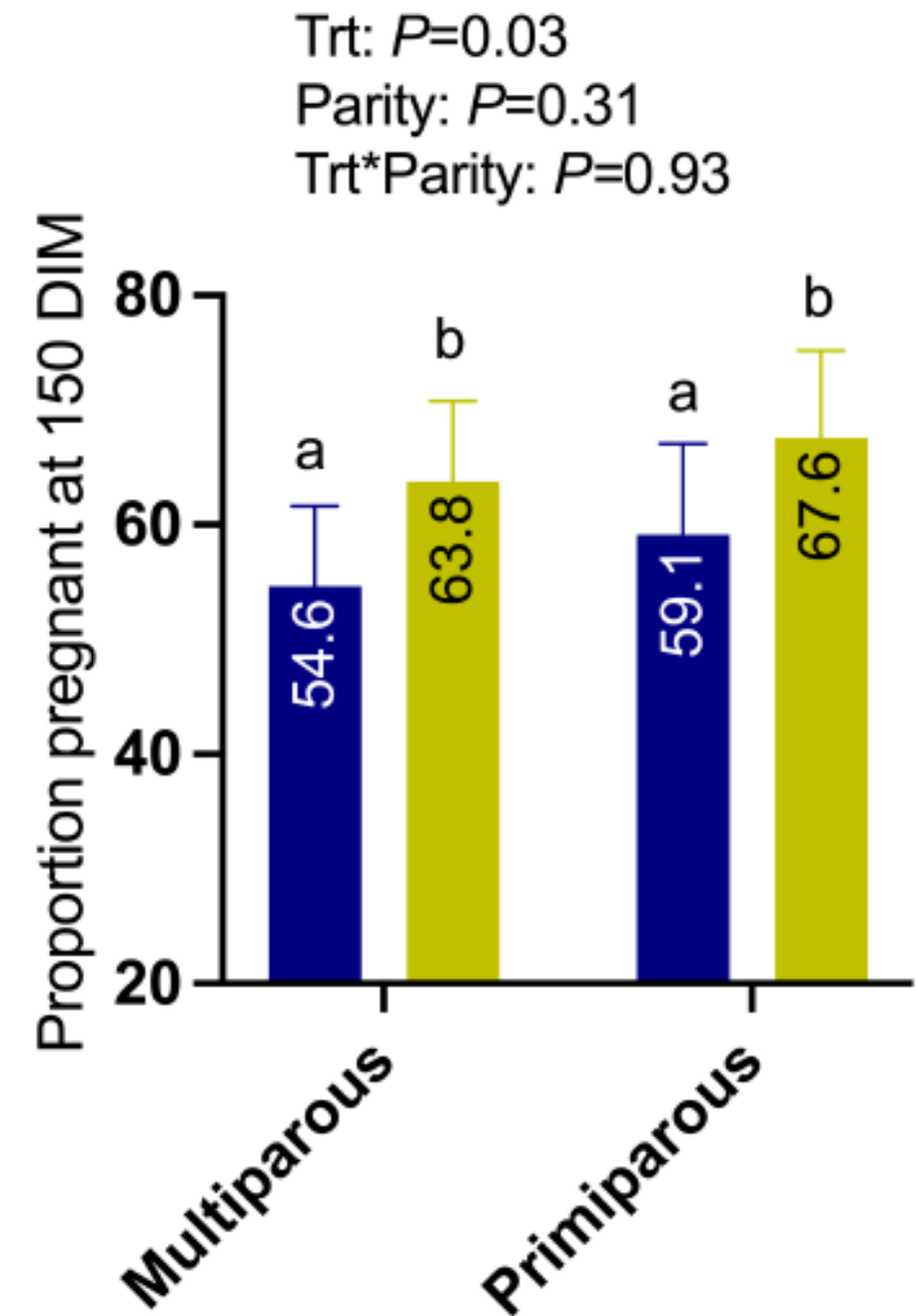
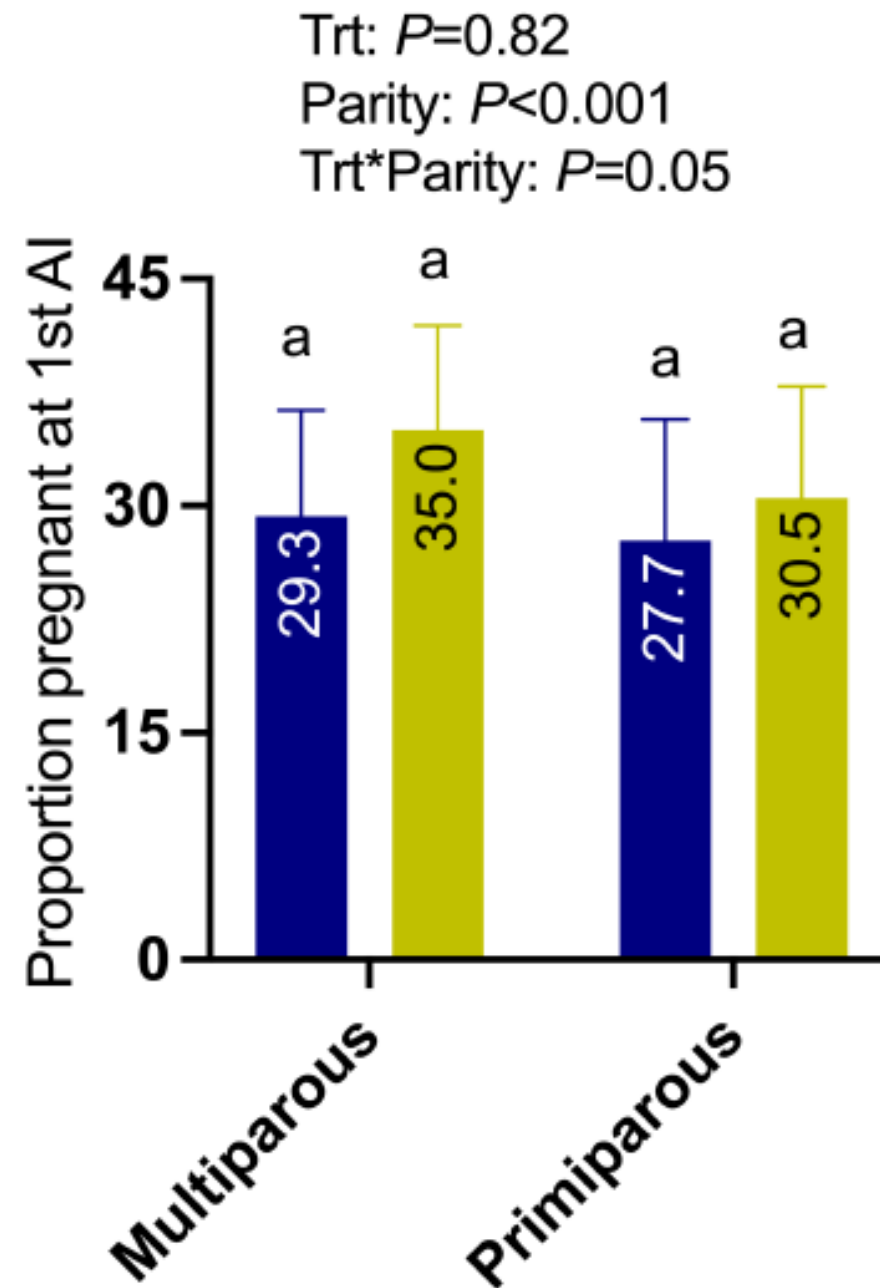
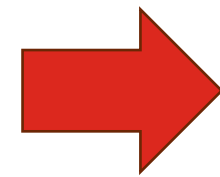
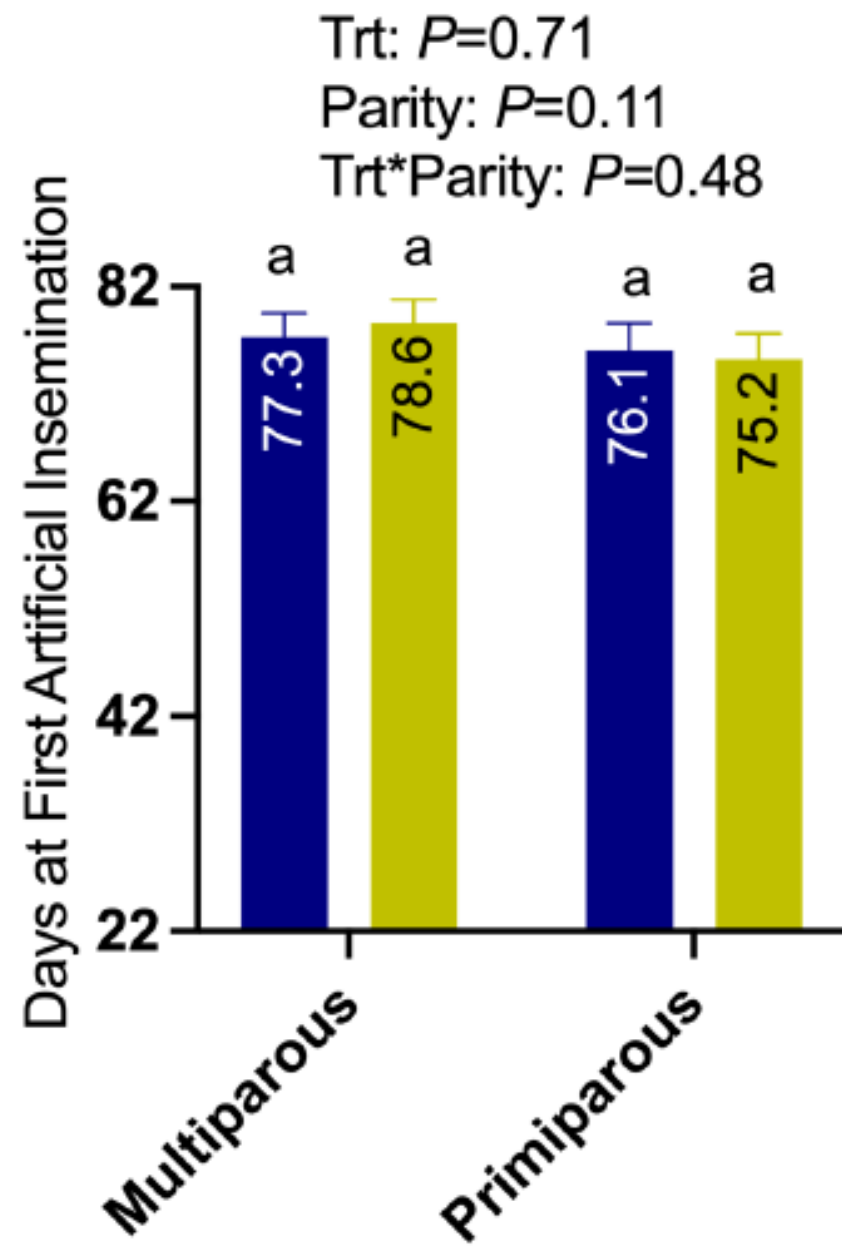
Control : 30 g/d CholiGEM™ 0-21 DIM
Treatment : 15 g/d CholiGEM™ 21 last days pre-partum + 30 g/d CholiGEM™ 0-100 DIM



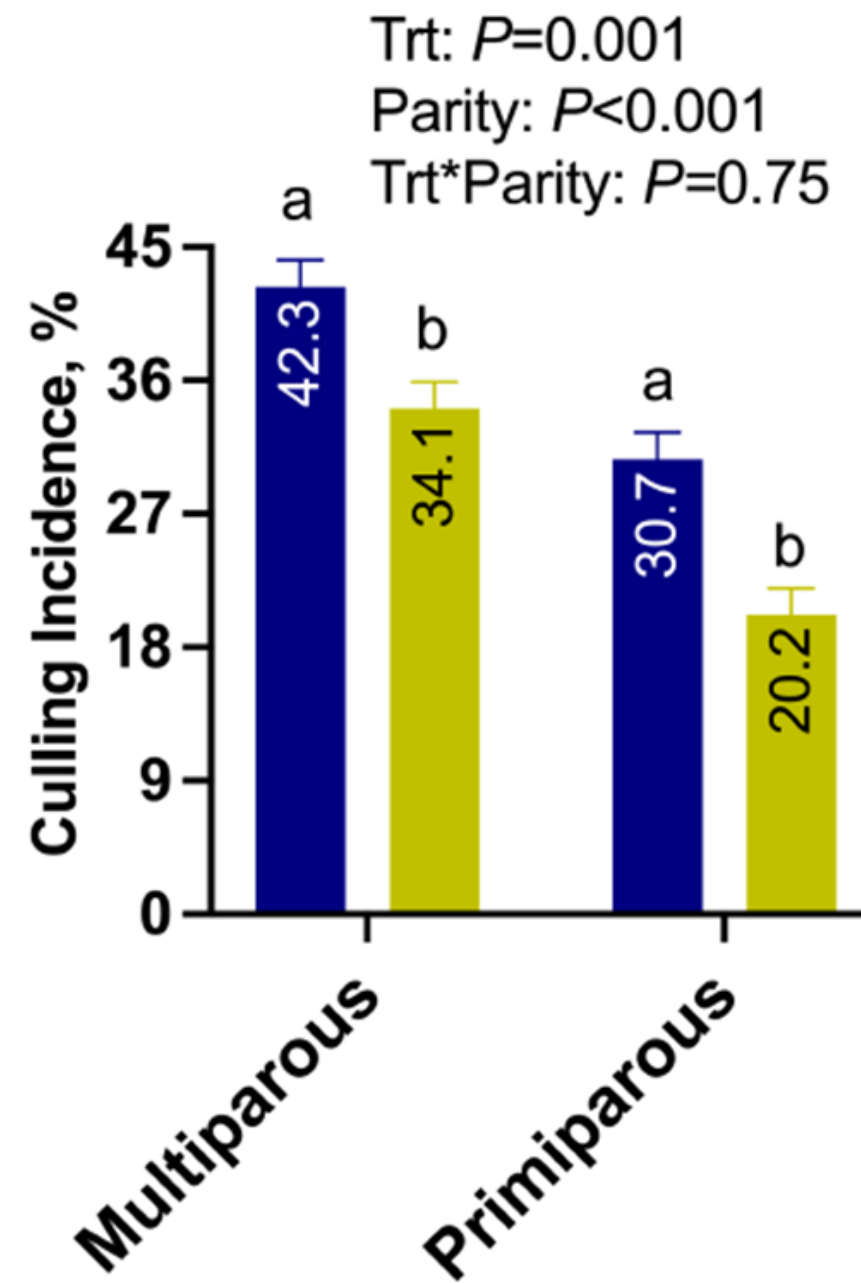
3/ REPRODUCTION



3/ REPRODUCTION

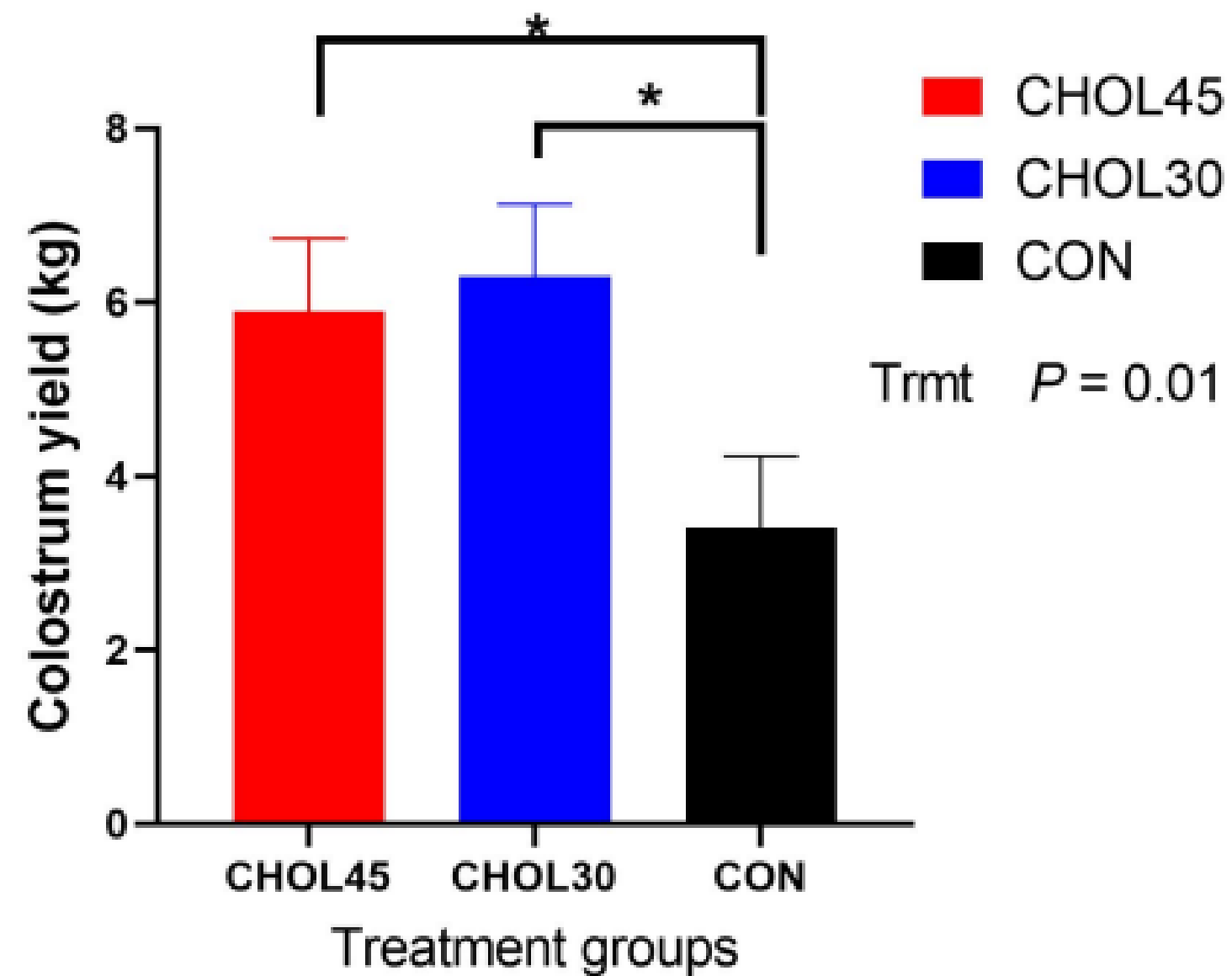


3/ REPRODUCTION

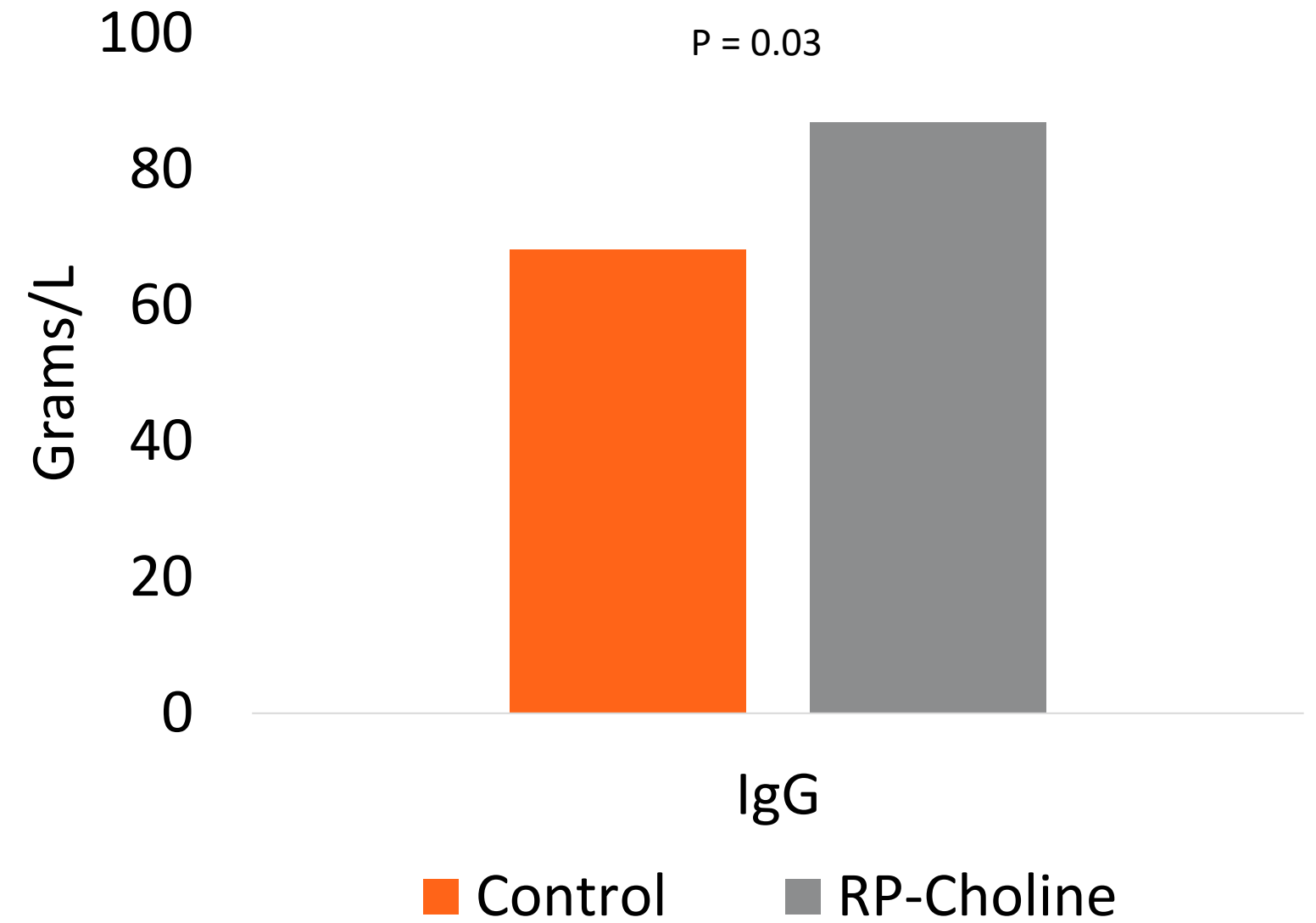


4/ COLOSTRUM & CALF

COLOSTRUM YIELD



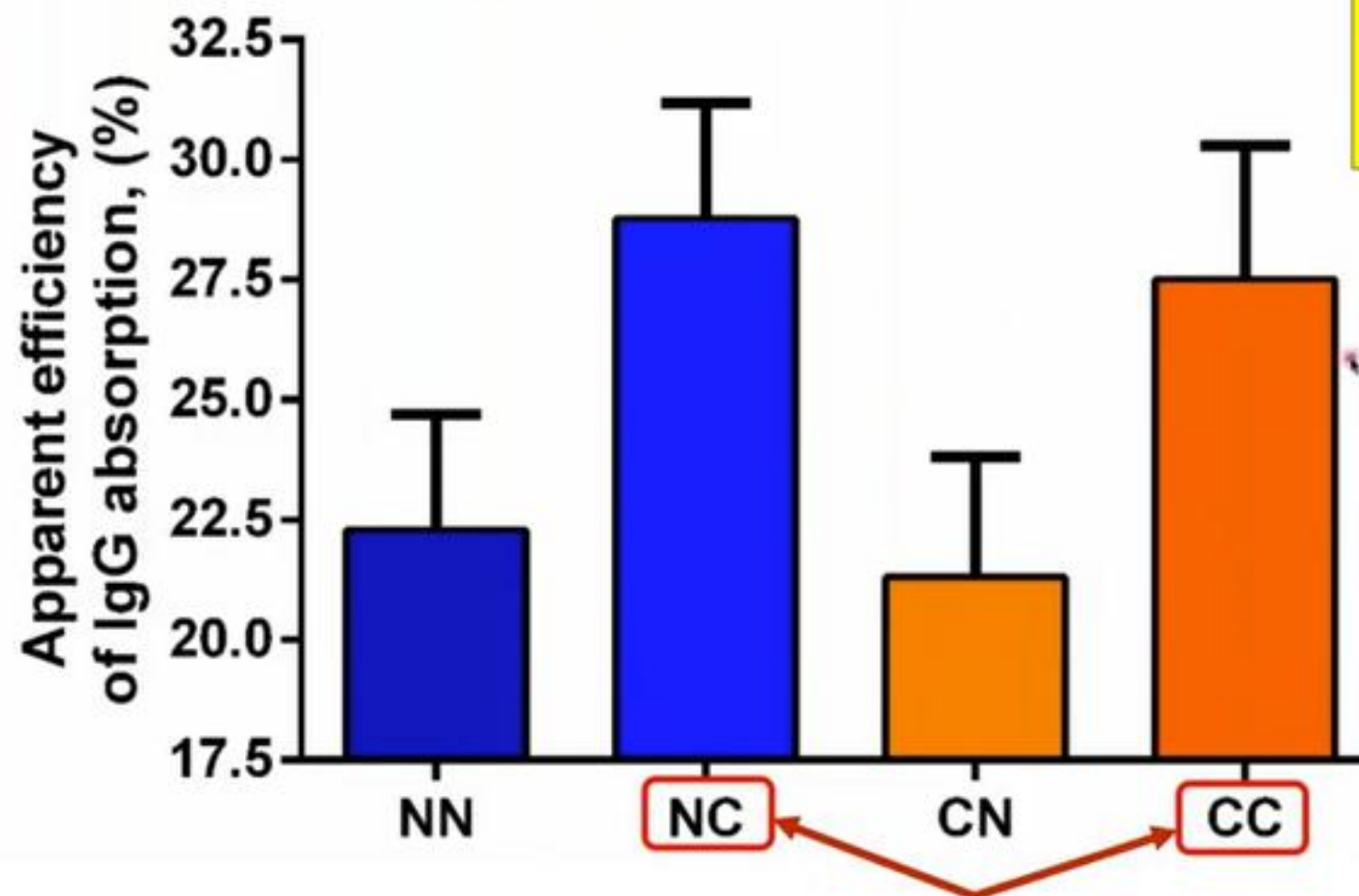
COLOSTRUM QUALITY



4/ COLOSTRUM & CALF

ABSORPTION OF IgG

Blue = no RP choline during gestation
Orange = RP choline during gestation

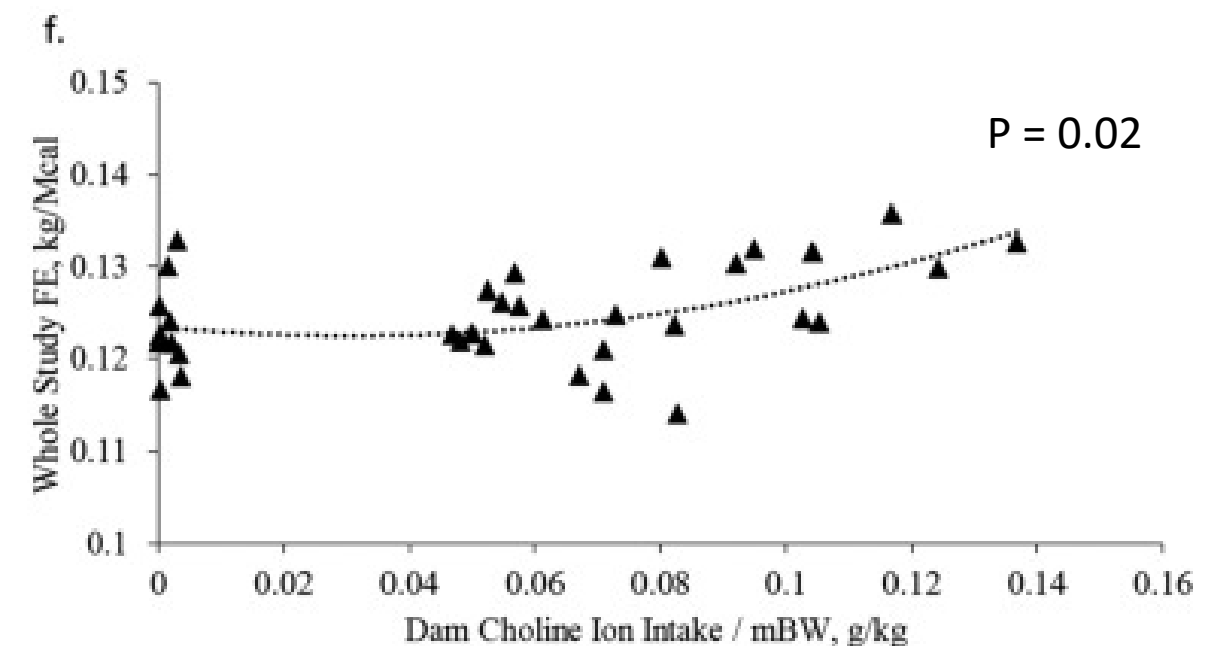
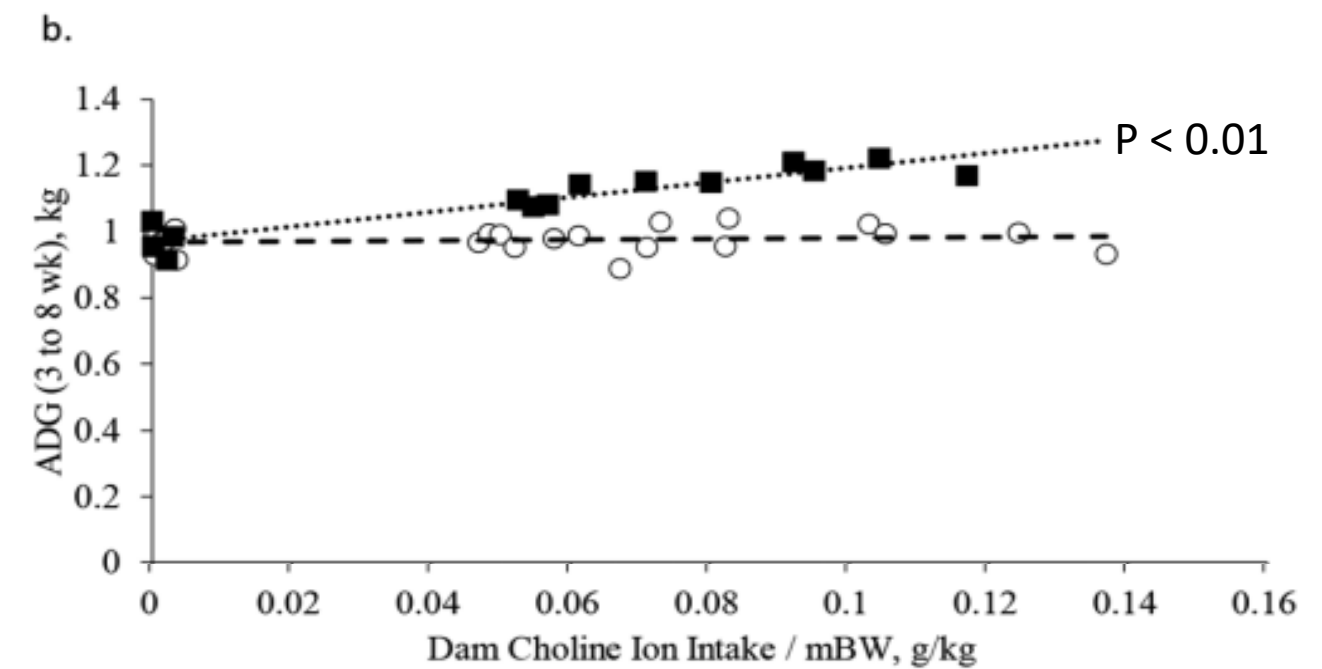
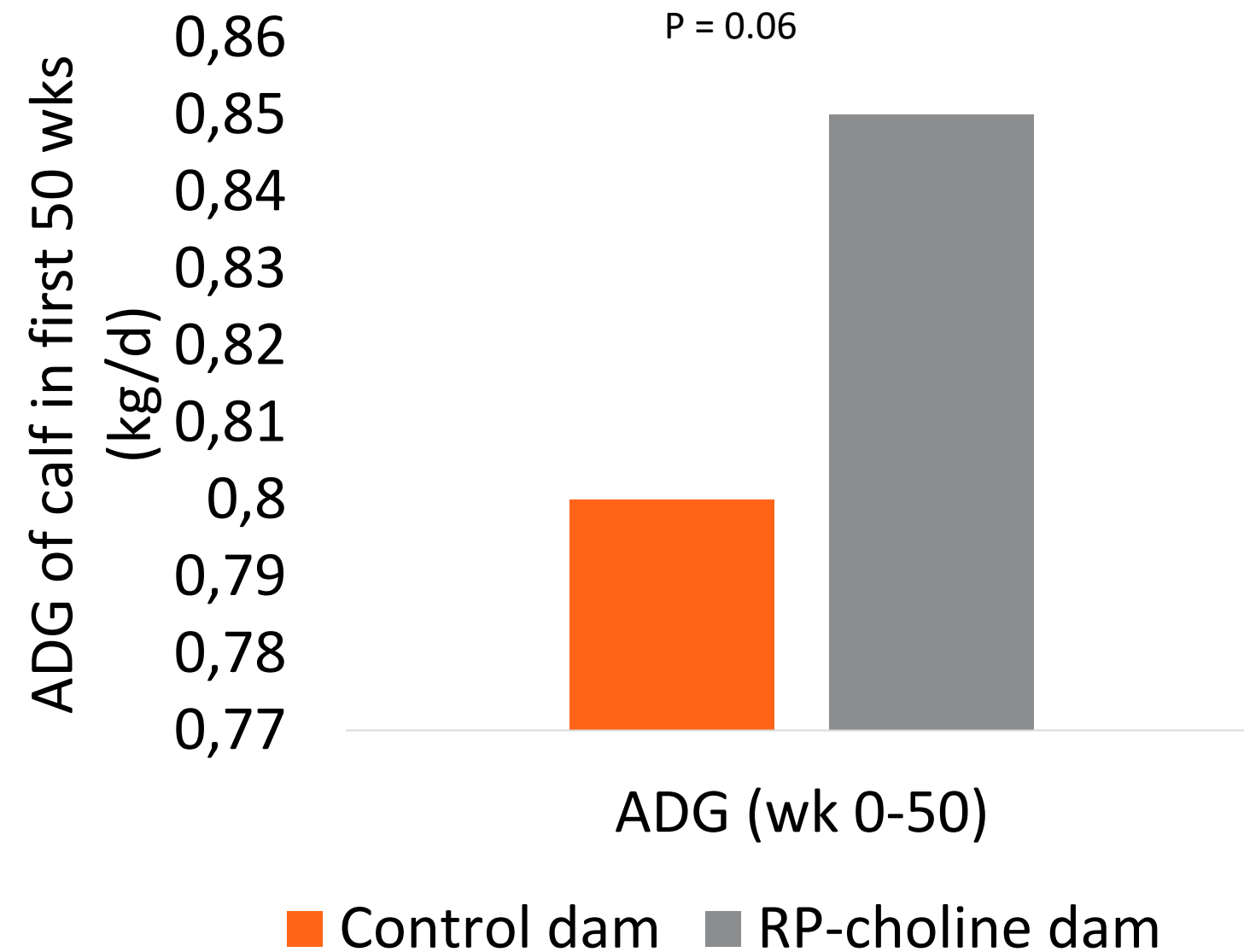


Intake of IgG
-RPC colostrum: 382 g
+RPC colostrum: 386 g

In utero, P = 0.66
Colostrum, P = 0.01
Interaction, P = 0.96

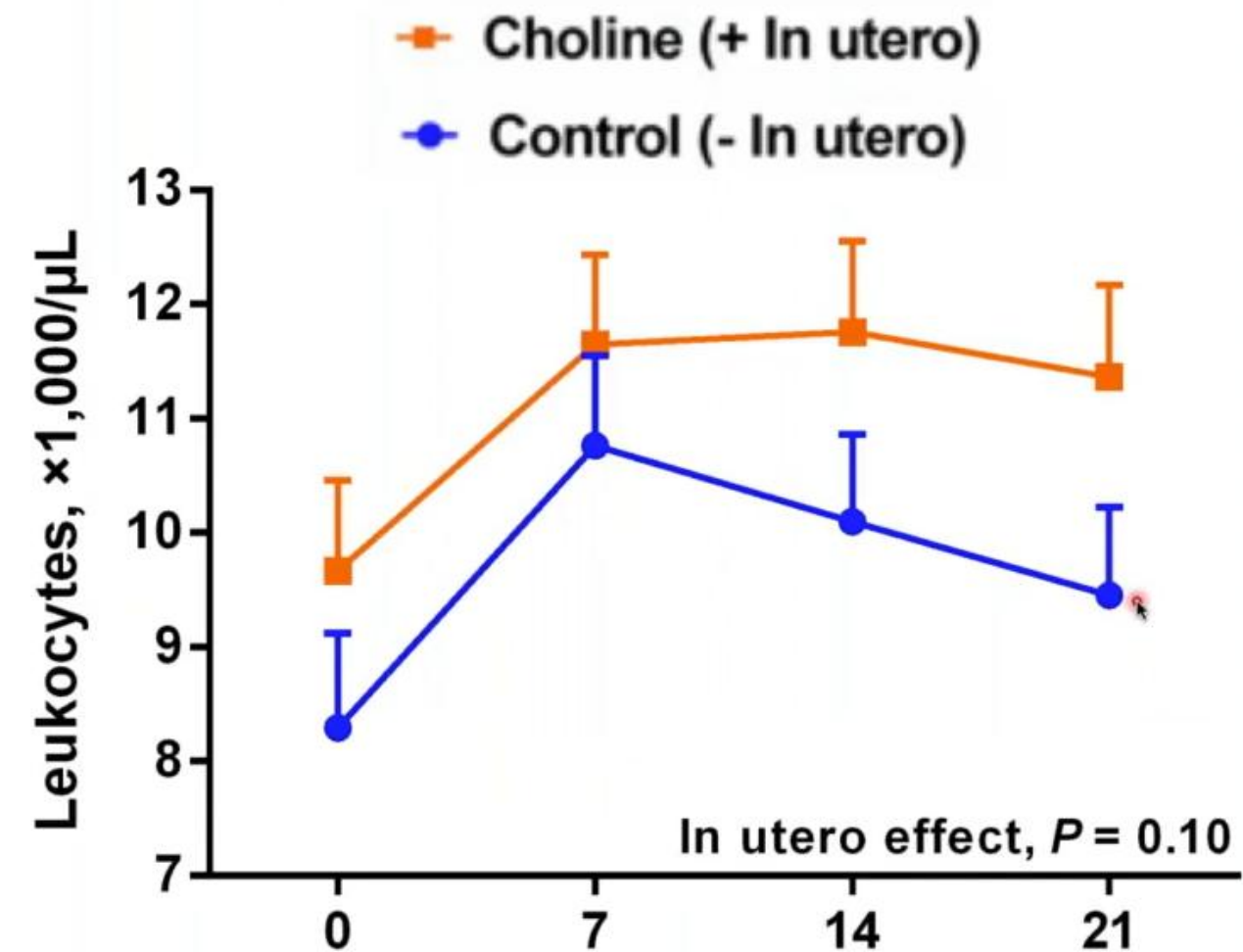
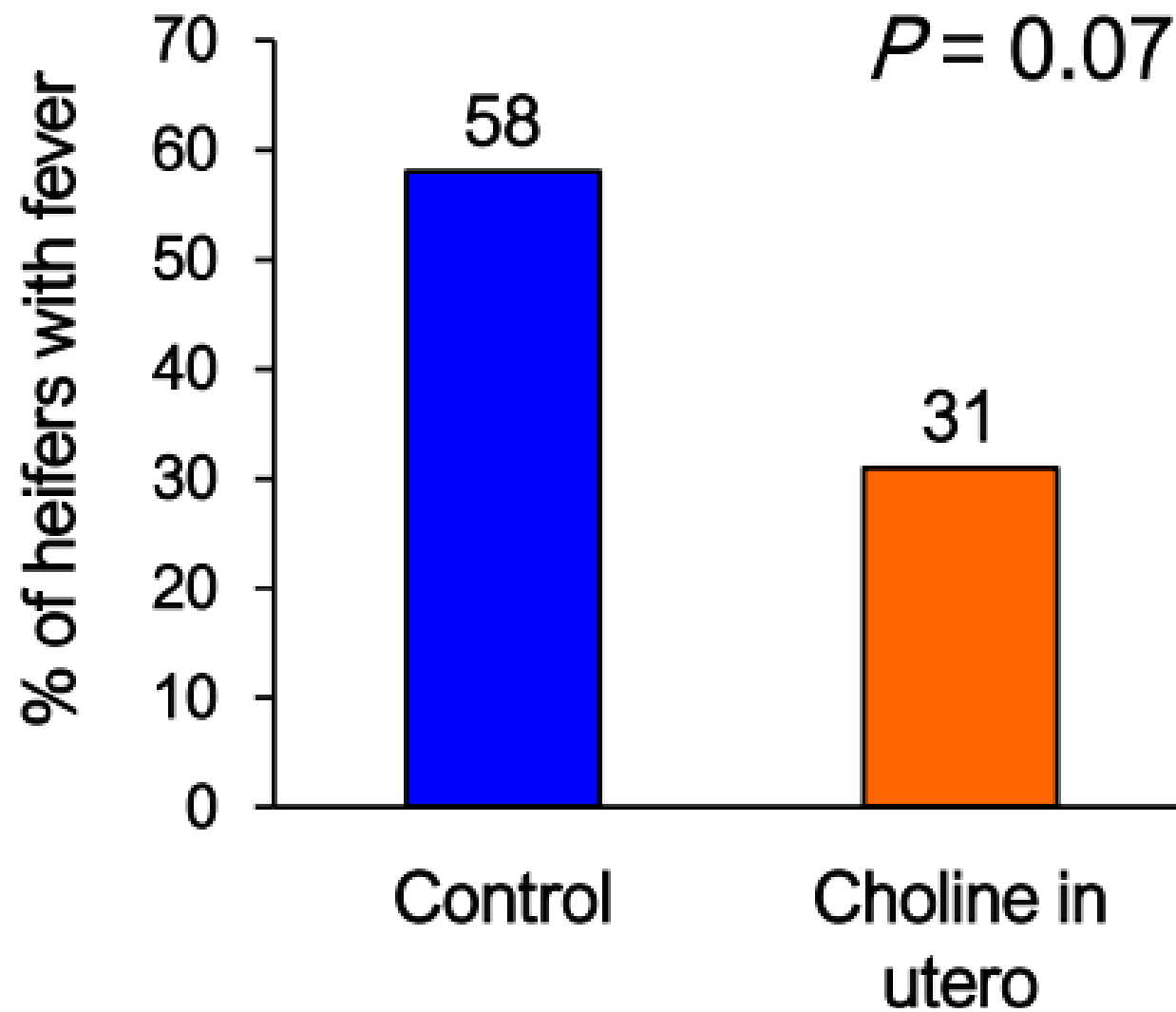
4/ COLOSTRUM & CALF

CALF GROWTH & FEED EFFICIENCY



4/ COLOSTRUM & CALF

CALF HEALTH



Rectal temperatures measured daily.
Fever if > 39.5°C

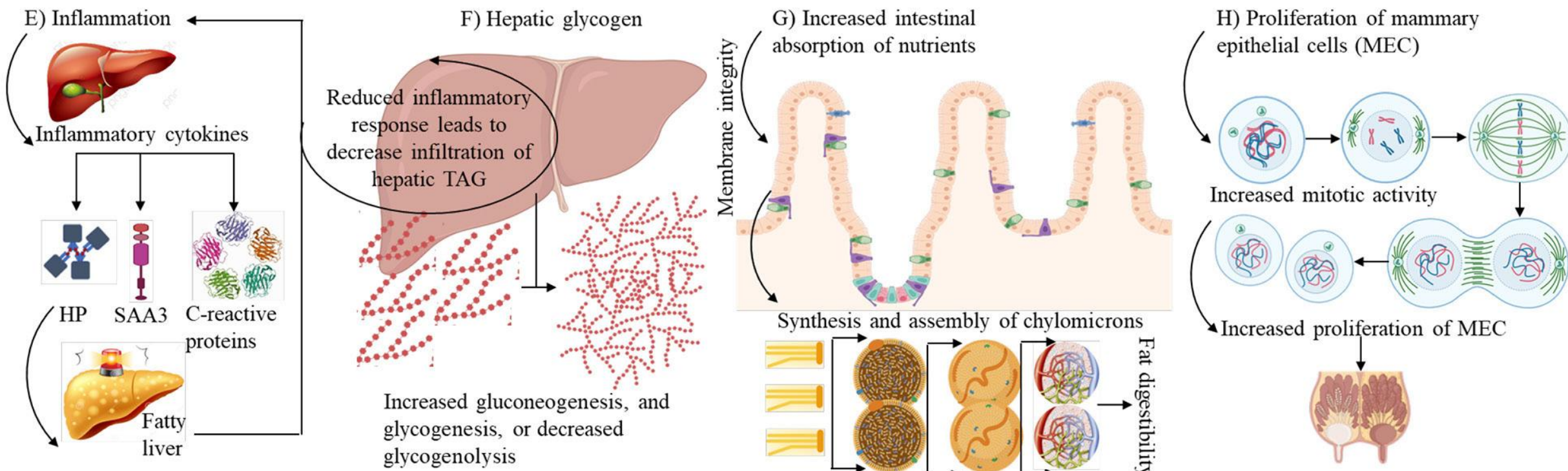
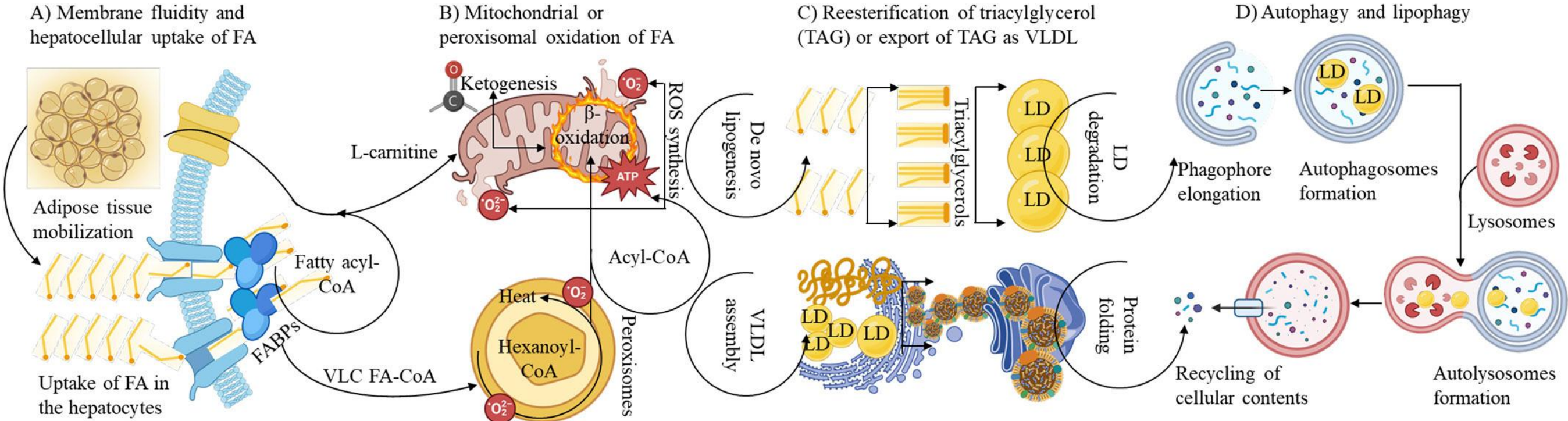
4/ COLOSTRUM & CALF

Trial planned H2 2026 in SLU:

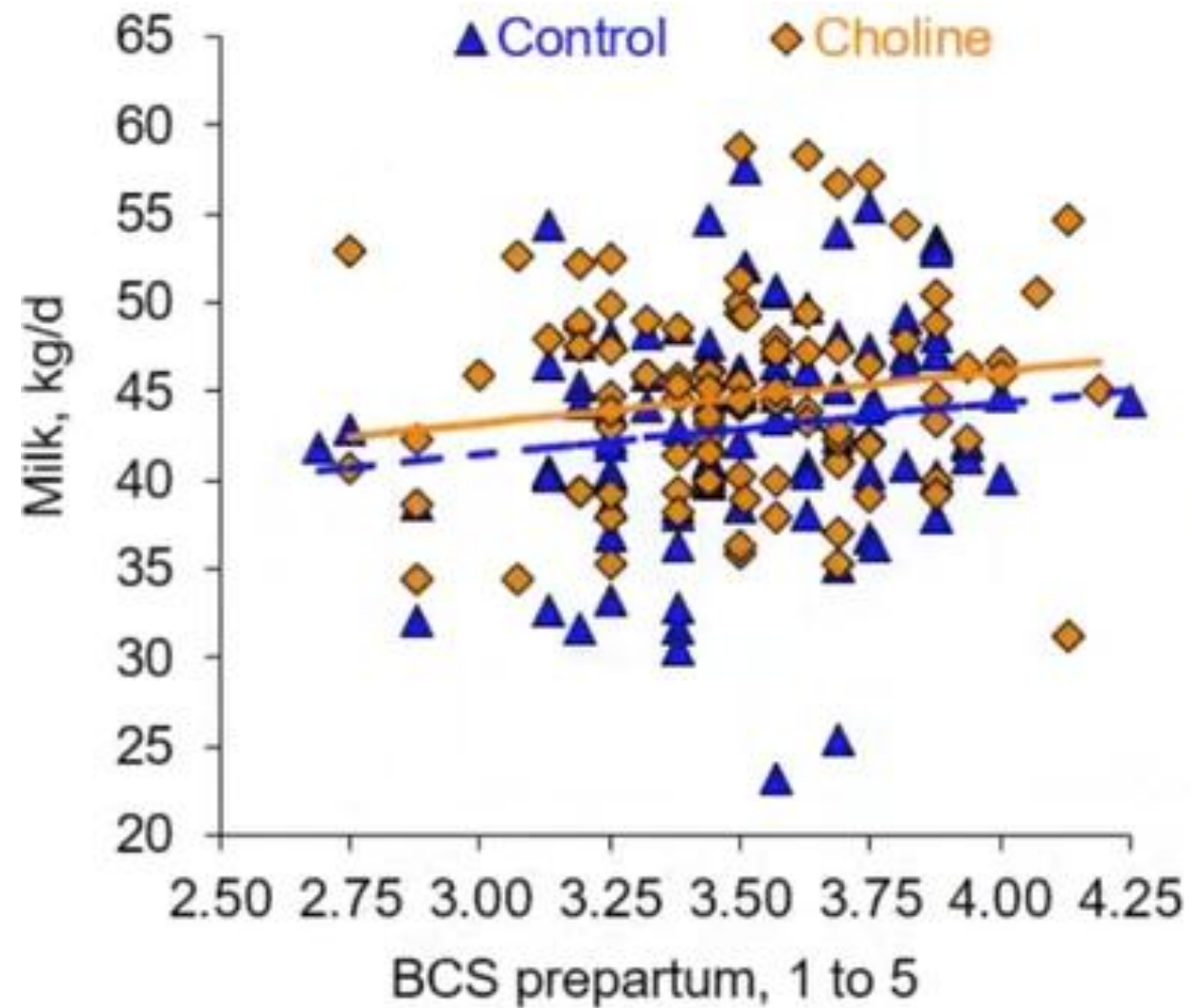
**Effect of RP-choline and/or optimized AAT and AA feeding
in the close-up period on colostrum, calf and cow
performance and health.**



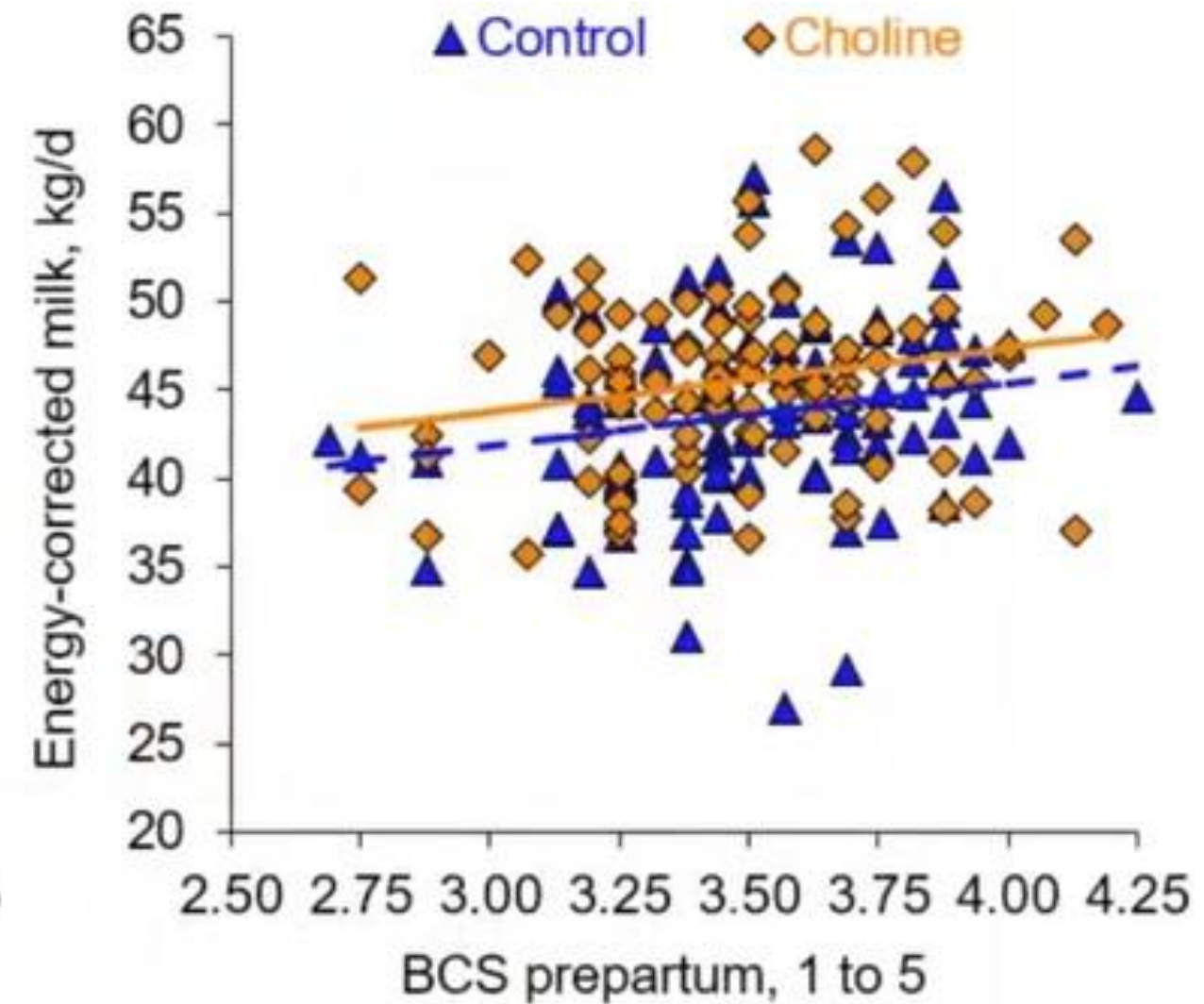
5/ MORE ROLES TO EXPLORE...



CHOLINE vs. BCS



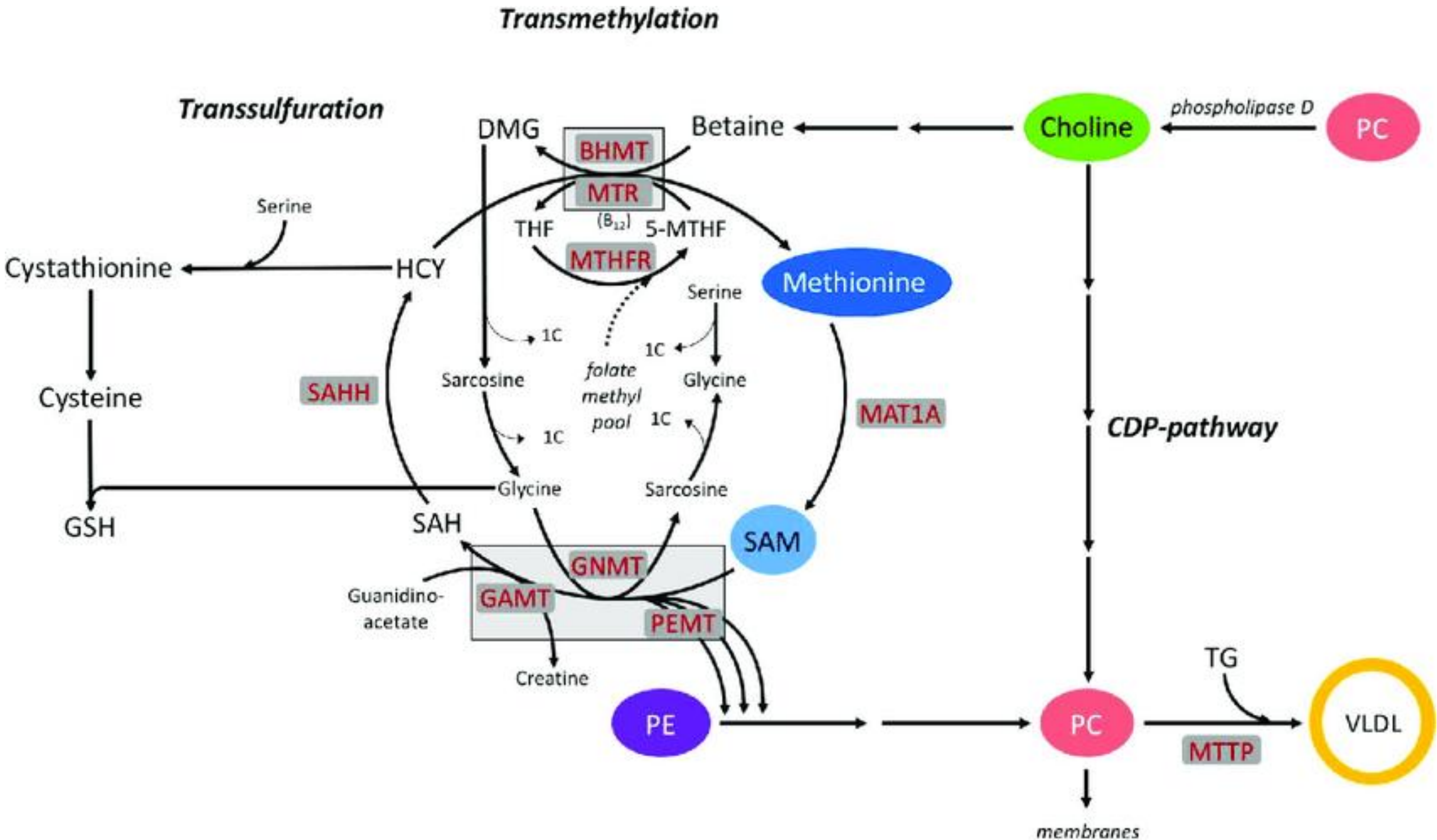
RPC, $P = 0.04$; BCS, $P = 0.05$;
RPC x BCS, $P = 0.32$



RPC, $P = 0.02$; BCS, $P = 0.02$;
RPC x BCS, $P = 0.39$

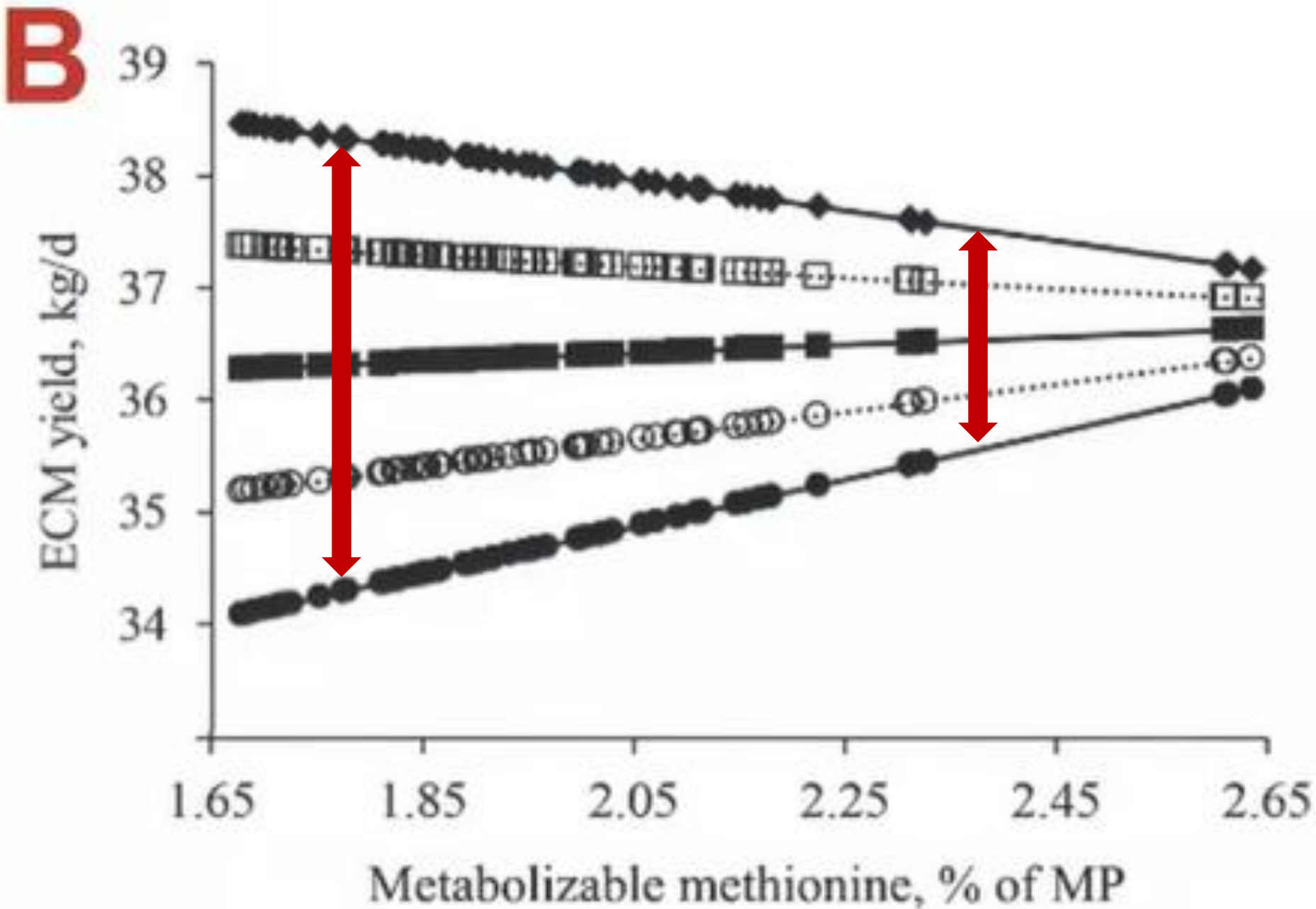
No interaction between BCS & choline supplementation

CHOLINE vs. METHIONINE



Chandler & White, 2017

CHOLINE vs. METHIONINE



Arshad et al., 2020

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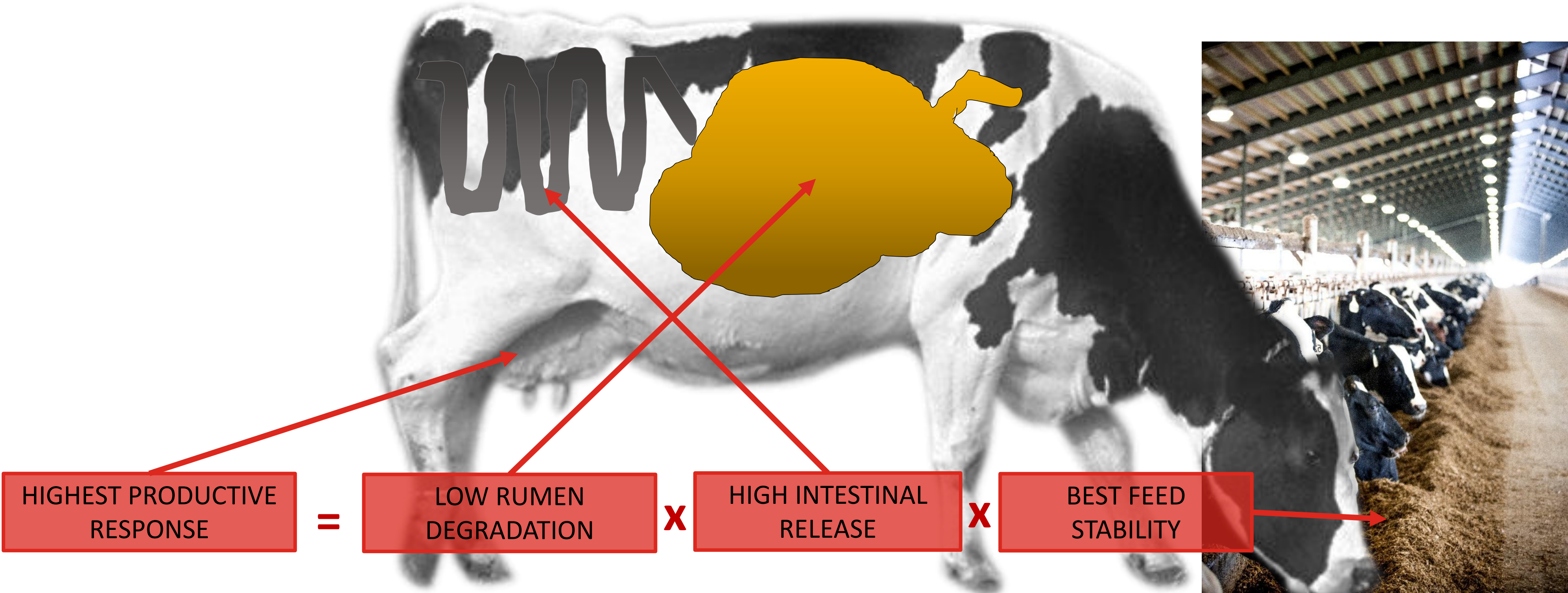




FROM SCIENCE TO FARM



FIELD RESPONSE



CHOLIGEM™

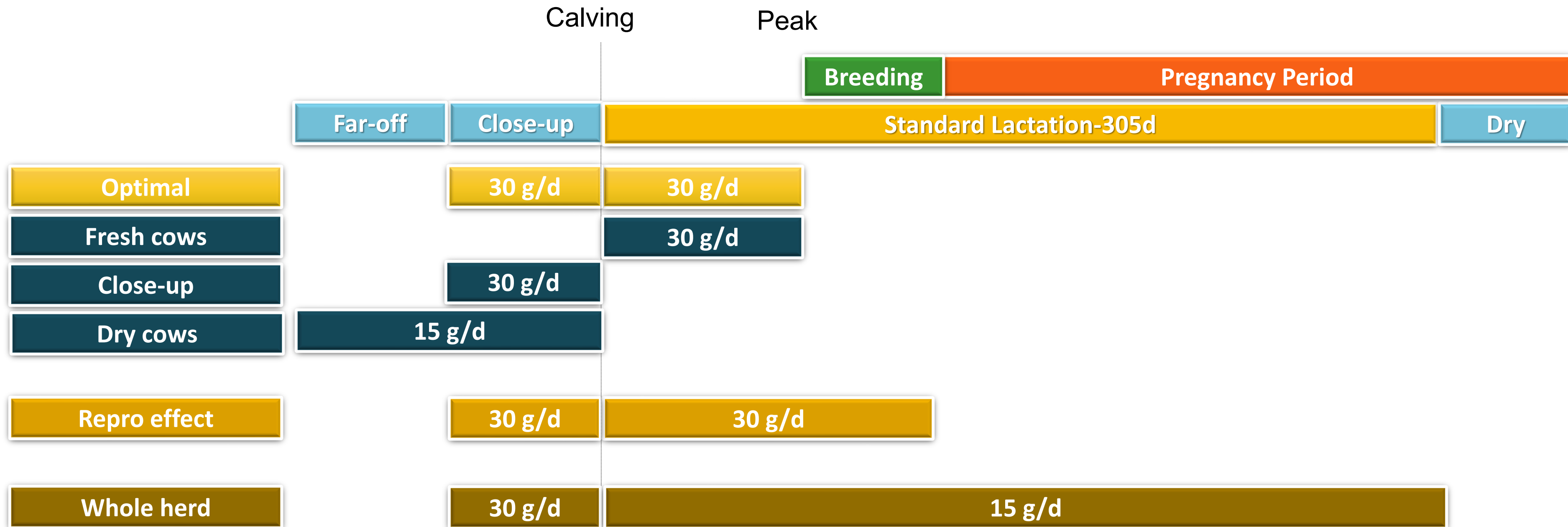
KEMIN's newest generation of rumen-protected choline:

- 60% choline chloride
- Highest bioavailability
- Heat stable for use in pelleted feed


CholiGEM™
WHERE COW MEETS HEALTH



APPLICATION GUIDE CHOLINE



WHAT IS CHOLINE?

“Choline is a key nutrient that should be part of each successful transition cow strategy and even beyond”

Not only for
high-
productive
COWS

Not only for
over-
conditioned
COWS

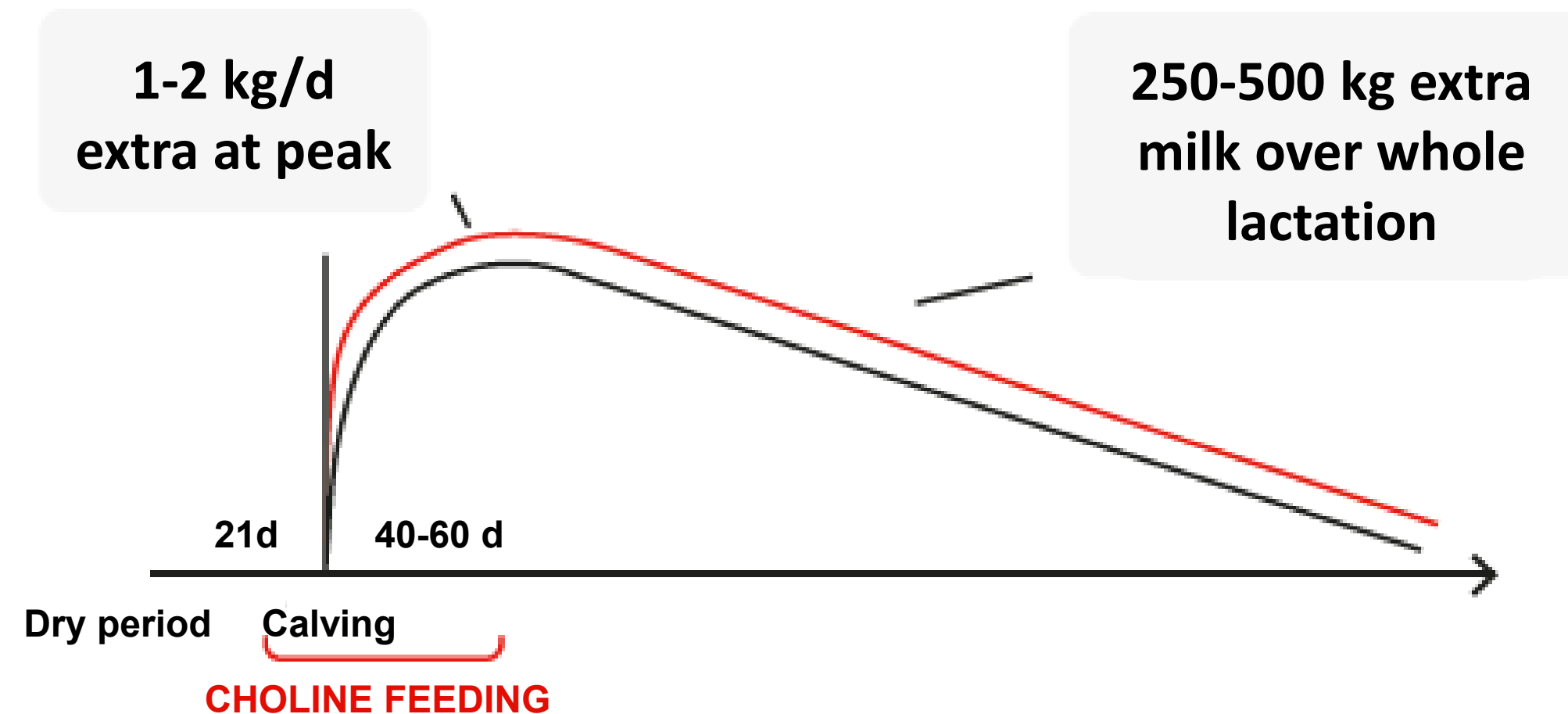
Not only for
ketotic cows

Not only in
low Met diets

Not only in
fresh cows

WHAT IS CHOLINE?

“Choline turns a dedicated transition health investment into a overall whole-lactation return with an ROI > 3-4.”





QUESTIONS?



Bram Pauwelyn

Tech service Kemin Europe

bram.pauwelyn@kemin.com

