

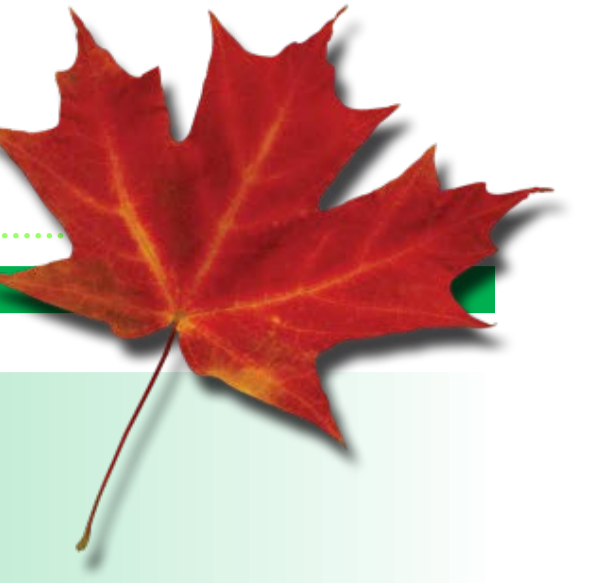


Optimization of phosphorus and calcium supply to maximize their utilization by growing pigs for sustainable farming



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Introduction

- Depletion-Repletion in dietary phosphorus (P) and calcium (Ca) (restricted-non restricted)
 - Following a depletion period, pigs use P and Ca more efficiently (Létourneau-Montminy et al., 2011)
 - Despite these adaptations bone mineralization recovery is not always observed (Ryan et al., 2011)
 - The digestive & metabolic adaptations induce by depletion need to be better understand

Objective

- To better understand the fate of dietary P during depletion and repletion periods
- To optimize P utilization to reduce intake and excretion for pig production sustainability

Materials & methods

- 60 male pigs (iBW 14.0 ± 1.6 kg, fBW 67.6 ± 6.1 kg) fed with control (C) or low (L) corn-soybean meal based diets
- 1st phase: 2 treatments: C (Ca = 1.04%, DigP = 0.36%) and L (Ca = 0.63%, DigP = 0.22%). 2nd phase: 4 treatments: CC, CL, LC and LL (C → Ca = 0.92%, DigP = 0.32%; L → Ca = 0.55%, DigP = 0.19%)
- Whole-body and L2-L4 lumbar region bone mineral content (BMC) was estimated at the beginning and at the end of each feeding phase by dual x-ray absorptiometry (DXA)

Results & discussion

1 st feeding phase	C	L	SEM	P
n	39	20		
ADG, kg/d	0.753	0.696	0.022	0.05
BMC, g	518	338	13.5	< 0.001
BMC L2-L4, g	9.65	5.20	0.352	< 0.001
Δ BMC, g/d	12.2	5.69	0.365	< 0.001
Δ BMC L2-L4, g/d	0.137	-0.018	0.014	< 0.001

2 nd feeding phase	CC	CL	LC	LL	SEM	P	CC vs. LC	LC vs. CL	LC vs. LL
n	29	9	10	10					
ADG, kg/d	1.22	1.14	1.15	1.12	0.034	0.003	0.08	0.78	0.53
BMC, g	1107	831	922	686	40.7	< 0.001	< 0.001	0.11	< 0.001
BMC L2-L4, g	22.9	15.5	18.8	10.4	1.20	< 0.001	0.003	0.05	< 0.001
Δ BMC, g/d	21.1	10.9	21.6	11.7	0.889	< 0.001	0.62	< 0.001	< 0.001
Δ BMC L2-L4, g/d	0.477	0.199	0.491	0.183	0.037	< 0.001	0.73	< 0.001	< 0.001

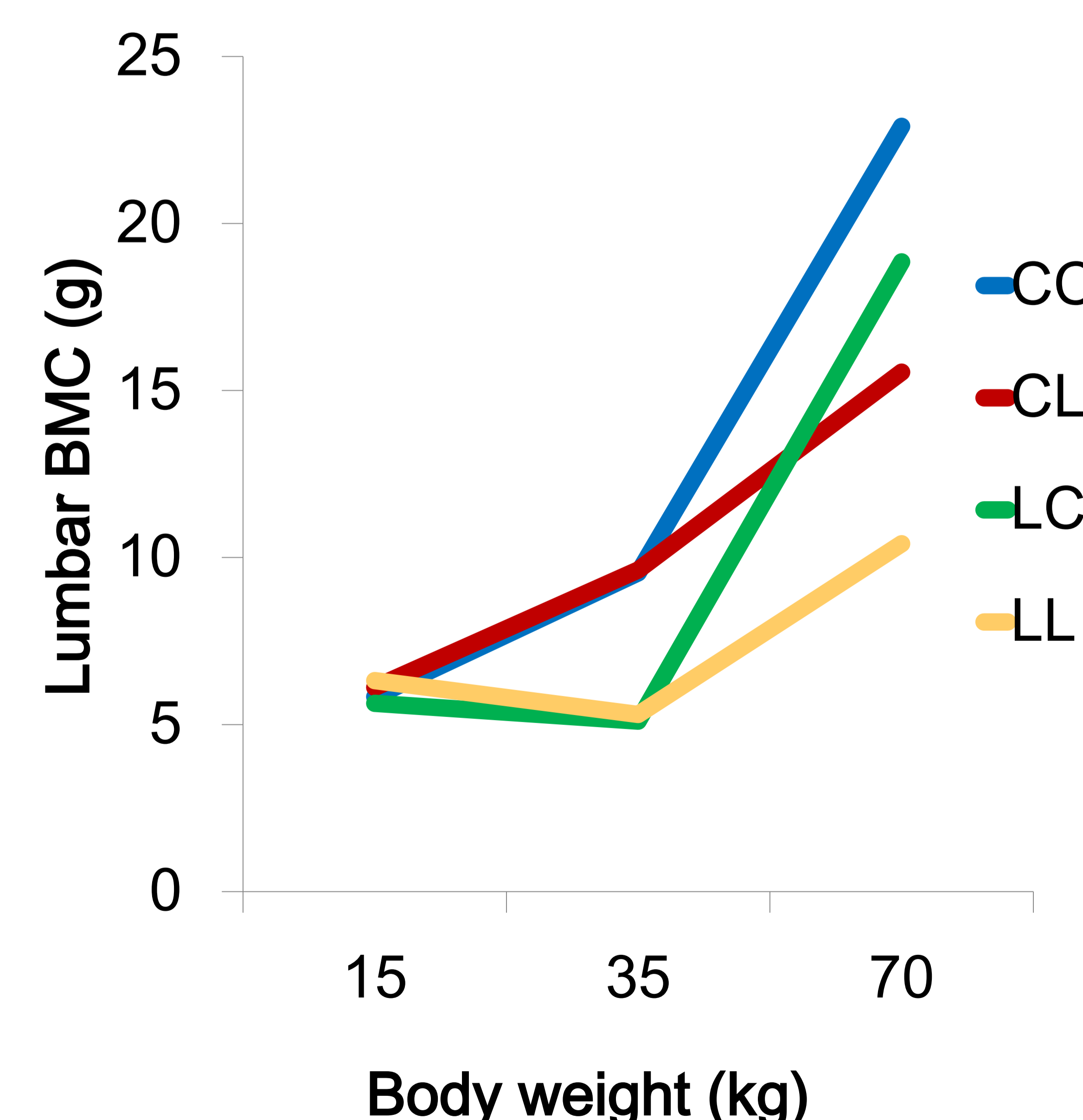
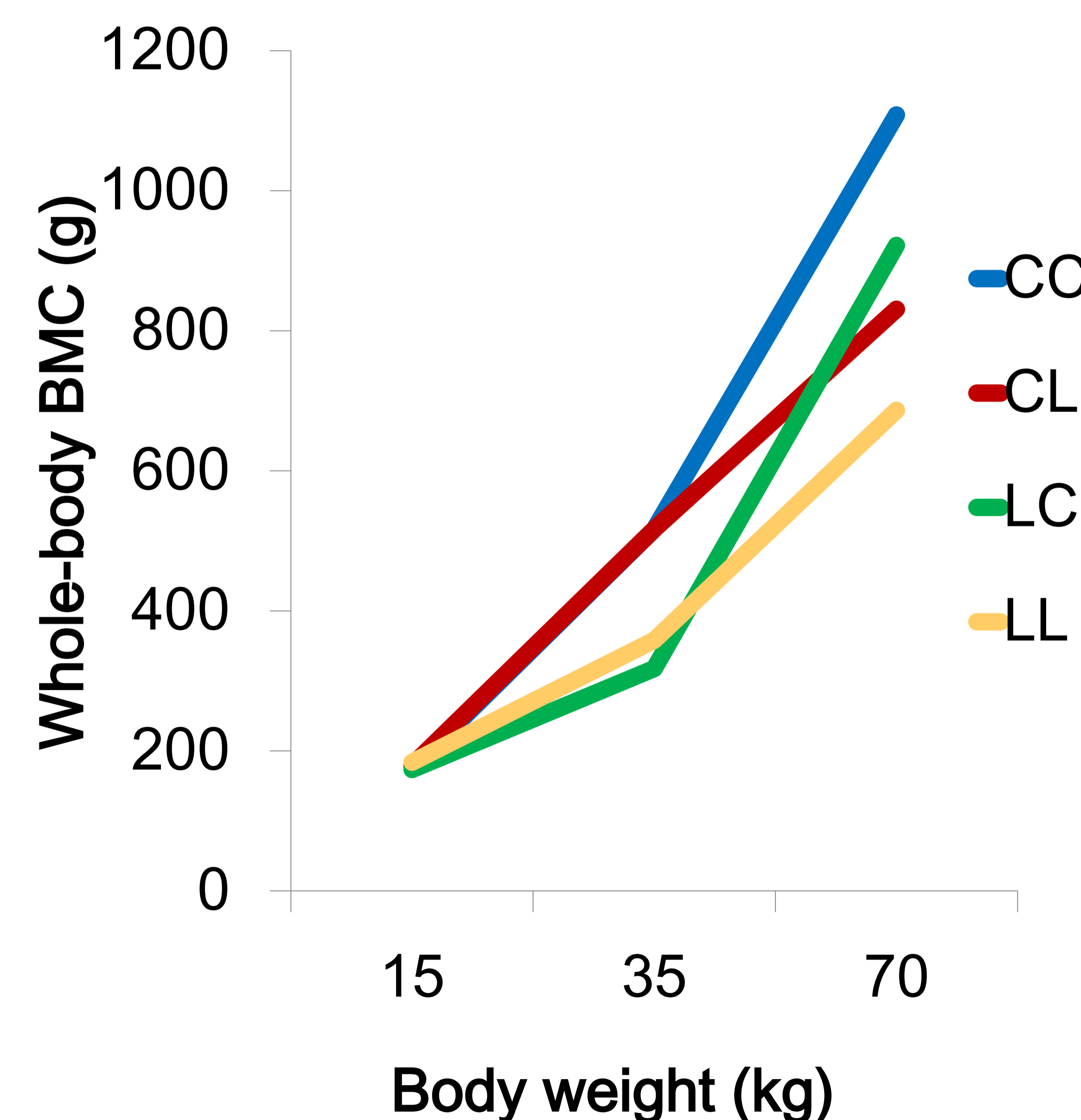
1st feeding phase

L vs. C

- Pigs whole-body Δ BMC was reduced while L2-L4 became negative
- Pigs fed L diet tend to have lower ADG than C diet

2nd feeding phase

- CC vs. LC → higher whole-body and lumbar BMC while Δ BMC in both body components was similar and ADG tend to be reduced
- LC vs. CL → higher whole-body and lumbar Δ BMC and higher BMC in lumbar region
- LC vs. LL → higher whole-body and lumbar BMC due to a higher Δ BMC in both body components



Conclusions

- Pigs depleted from 15 to 35 kg and repleted from 35 to 70 kg, do not compensate the bone mineral deficit
- The responses of whole-body and lumbar bone mineralization to depletion diets are not always similar
- Further research is needed to verify if the levels of Ca and P in C diet during the 2nd phase could have been limiting for bone mineralization recovery
- The results underline the need to study the consequences of this early P deficiency until slaughter

References

Létourneau-Montminy MP, Lovatto PA, Pomar C. Effect of phosphorus and calcium depletion-repletion periods on the digestive and metabolic utilization of dietary phosphorus and calcium in growing pigs, *J Anim Sci*. 2011; 89, E-Suppl. 3, 180.

Ryan WF, Lynch PB, O'Doherty JV. Compensatory effect of dietary phosphorus on performance of growing pigs and development of bone mineral density assessed using dual energy X-ray absorptiometry. *Livest Sci*. 2011; 138:89-95.