

Can sows maintain their bone mineral status when fed low-phosphorus lactation diets over successive parities?

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Previous studies have shown that sows are able to mobilize bone mineral reserves, depending on dietary calcium (Ca) and phosphorus (P) supply, to meet the high mineral demands of lactation and to subsequently restore these reserves during the following gestation, when mineral requirements are lower. Bone mobilization is enhanced under low dietary P supply. However this resilience has only been reported for a single lactation cycle, this study aimed to assess resilience over consecutive lactations.

Twenty-eight primiparous Swiss Large White sows were selected from the Agroscope's herd. Throughout lactation, sows received ad libitum one of four diets designed to meet established nutrient requirements, except for digestible P and Ca: **100** (9.0 g Ca, 3.0 g digestible P/kg, and a 3:1 Ca/digestible P ratio; 8 sows); **50** (4.5 g Ca, 1.5 g digestible P/kg, and a 3:1 Ca/digestible P ratio; 8 sows); **100+FTU** (6 sows) and **50+FTU** (6 sows) corresponded to the **100** and **50** diets with an exogenous 6-phytase (750 FTU/kg, Quantum[®] Blue 5G, AB Vista, Marlborough, United Kingdom). During the first 80 days of gestation, sows were fed 2.8 kg of a single diet per day, and from day 81 onwards, they received 3.0 kg per day. The diet was formulated to contain 2.4 g/kg of digestible P and 7.8 g/kg of Ca. Bone mineral content (BMC) was assessed by dual x-ray absorptiometry scanner (DXA) during three consecutive lactations (Lact1, Lact2, Lact3) at 2 (d2) and 24 (d24) days postpartum, and during the second gestation (Gest2) at day 40 (d40). Litters were standardized to 13 piglets, and piglets were weighed at birth and at weaning. The BMC, BMC mobilized ($BMC_{d24} - BMC_{d2}$) during lactation, and litter average daily gain (ADG_{litter}) were analyzed using mixed-effects models including stage (time point of measurement) or lactation number, lactation diet, and their interaction as fixed effects, with sow as a random effect and a corsymm residual covariance structure.

On d24, BMC tended to be lower in Lact50 than in Lact100+FTU during Lact1 ($P = 0.054$), and was lower than in both Lact100 and Lact100+FTU during Lact2 and Lact3 ($P < 0.05$). BMC did not differ between treatments at the other stages. BMC mobilization during lactation and ADG_{litter} did not differ between treatments across lactations. ADG_{litter} was lower in Lact1 compared to Lact2 and Lact3 ($P < 0.05$).

These results confirm that sows fed a low-P diet during lactation mobilized more BMC without affecting litter performance, and showed that the mobilized BMC was restored over two consecutive gestations. The sow thus appears resilient to a low dietary P supply across several consecutive cycles. This supports the potential for strongly limiting mineral phosphate use in lactation diets without compromising sow skeleton longevity nor litter performance.