

Reproductive performance and bone status markers of gilts and lactating sows supplemented with two different forms of vitamin D

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Abstract :

In swine nutrition, little is known about the vitamin D requirements for reproductive processes and bone health. Consequently, the vitamin D recommendation for sows during gestation and lactation is not based on scientific reports. The current study was undertaken to obtain information on the dose-response pattern of 2 vitamin D sources, the commonly used cholecalciferol, called vitamin D₃, and a newly developed Hy-D product (25-hydroxycholecalciferol). In Exp. 1, a total of 160 gilts were randomly assigned from the first estrus until d 28 of gestation to dietary treatments containing 4 concentrations of 1 of the 2 different vitamin D sources [200, 800, 1,400, and 2,000 IU/kg of vitamin D from cholecalciferol or corresponding doses of 5, 20, 35, and 50 µg/kg of feed from 25(OH)D₃ (Hy-D)]. In a concurrent experiment, the same 8 dietary treatments were provided to 160 multiparous sows from the first day of mating until weaning. Plasma concentrations of 25(OH)D₃ were influenced by a dose x form interaction ($P < 0.001$); furthermore, plasma 25(OH)D₃ concentrations were influenced by the lactation state of the sows. Irrespective of the dietary dose and form of vitamin D provided to the sows, very little vitamin D was transferred to the progeny. Reproductive performance was not influenced by dietary vitamin D treatments, except for a decreased number of stillborn piglets ($P = 0.03$, $SE = 0.40$) with the larger doses of vitamin D (1,400 and 2,000 IU of vitamin D, resulting in 1.17 and 1.13 stillborn piglets per litter, respectively) compared with the smaller doses of vitamin D (200 and 800 IU of vitamin D, resulting in 1.98 and 1.99 stillborn piglets per litter, respectively). In the gilt trial, the ultimate strength of the bones ($P = 0.01$) and their content of ash ($P = 0.02$) were greater when vitamin D₃ was supplemented in doses larger than 800 IU, compared with the same amount of Hy-D supplementation. In the sow experiment, lactation day ($P < 0.001$), rather than dietary vitamin D, influenced the concentrations of osteocalcin and Ca as well as the activities of total alkaline phosphatase and bone alkaline phosphatase in plasma. Age of the suckling piglets affected their plasma bone health markers. In conclusion, at doses greater than 200 IU, Hy-D was more bioavailable than vitamin D₃ and, as such, could be considered an equivalent or even more advantageous source of vitamin D. In addition, a dietary dose of approximately 1,400 IU of vitamin D is recommended for reproducing swine. Irrespective of the dietary dose and form of vitamin D provided to the sows, very little vitamin D was transferred to the progeny.

Key Word :

calcium, gestation, 25-hydroxyvitamin D₃, lactation, piglet, vitamin D₃

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