Vitamin D₂ and Vitamin D₃ Circulate in Different Fractions of Cattle Plasma

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Introduction
Vitamin D exists in 2 forms relevant to cattle: vitamin D₂ (D₂) and vitamin D₃ (D₃). Both must undergo hydroxylation in the liver to become physiologically active. The resulting 25-(OH)-D₂ (25OHD₂) and 25-(OH)-D₃ (25OHD₃) are measured as indicators of the vitamin D status in plasma.

It is often stated that D₂ and D₃ have similar physiological effects but studies in cattle have shown that D₂ is much less efficient than D₃ at securing a sufficient vitamin D status in cattle.

The aim of the present study was to investigate if binding to different plasma fractions could explain the physiological inefficiency of D₂ compared to D₃ in cattle.

Methods
- 3 Holstein bull calves
- 75μg D₃/day and ad libitum hay (contains D₂)
- Blood samples 2 times/week for 11 weeks
- Plasma isolated by centrifugation
- Plasma fractionated by gradient ultra-centrifugation
- Plasma fractions analysed by HPLC-UV.

Results and Conclusions
D₂ and D₃ were only transported evenly distributed in protein, whereas the percentage of D₂ and D₃ found in other plasma fractions differed. If this means that D₂ is transported in more volatile plasma fractions than D₃, then D₂ could be more prone to degradation and excretion, contributing to its lower physiological efficiency.

25OHD₃ was mainly transported in protein whereas 25OHD₂ was transported in the chylomicron and heavier lipoprotein fractions. Associating with designated binding proteins is vital to the function of 25OHD₃. Hence transportation in other plasma fractions than protein could explain a compromised physiological function of 25OHD₂ compared to 25OHD₃.