

Evaluation of the Effects of Nano-Chromium and Chromium on Serum Changes of Some Minerals in High-Producing Holstein Cows

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Abstract

During the transition and peak lactation period, high-yielding dairy cows may face significant metabolic challenges, which can affect their health and productivity. These problems can be alleviated by Chromium, which is an essential trace element. This study investigated the effects of nano-chromium picolinate (Nano-Cr) and chromium picolinate (Cr) on serum concentrations of Ca, Ma, P, Iron, Copper, Zinc, Cobalt, and Selenium in Holstein dairy cows. Thirty-six cows were divided into three groups: the control group, the Nano-Cr group which received nanochromium picolinate 0.1 mg/Kg MW (metabolic weight) orally for 21 days, and the Cr group, which received chromium picolinate 0.1 mg/Kg MW orally for 21 days. The collection of blood samples took place on days 0, 7, 14, 21, and 28 and serum mineral concentrations were assessed using ICP-OES. The results demonstrated that the serum levels of ionized calcium on days 21 and 28 and magnesium on day 28, rose significantly compared to the control group. Also, the ionized calcium concentration in the blood of the nanochrome group was significantly higher than that of the Cr group on day 28. In the Cr group, a significant increase in the serum level of ionized calcium and magnesium was only noted on day 28 in comparison to the control group. The serum iron levels in the Nano-Cr group showed a significant decline on days 14, 21 and 28 compared to the control group. On day 28, the reduction in iron levels in the Cr group was also significant in comparison to the control group. Additionally, serum Zinc concentrations decreased on day 28 in both Nano-Cr and Cr groups compared to the control group. Serum concentrations of phosphorus, copper, cobalt, and selenium remained stable across all groups and time points. According to these findings, Nano-Cr has a higher bioavailability than Cr and has a positive impact on calcium and magnesium homeostasis, which is essential for preventing metabolic disorders in dairy cows. Also, the simultaneous decreases in iron and zinc concentrations emphasize the importance of monitoring supplementation closely to prevent mineral imbalances.

Keywords: Nano-chromium picolinate, Chromium picolinate, Dairy cattle, Serum minerals

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