Relationships between nutritional status and hair levels of several elements analyzed using PIXE in dairy cattle

Yasuhiro Aoki and Sada Ando*

National Institute of Livestock and Grassland
Senbonmatsu 768, Nishinasuno, Tochigi, 329-2793, Japan

National Agricultural Research Center for Western Region
Yoshinaga 60, Kawai, Oda, Shimane, 694-0013, Japan

Abstract

The experiment was carried out to investigate the hair levels of elements analyzed using PIXE in dairy cows related to nutritional and physiological status. Two lactating cows at early lactation stage (Cow A and B) and one heifer pre-parturition (Cow C) were used. Cow A and C were under good nutritional condition while Cow B suffered malnutrition due to disorder of health. Hair samples were collected from back of Cow A and B and from neck of Cow B and C. Two samples per each site were obtained, but several major and trace elements showed considerably different values to each other within a site. Selected elements were compared, which showed similar values within a site (S, Ca, K, Mg, P, Fe, Zn, Cu, Mn and Se). The levels of major elements (S, Ca, K, Mg and P) did not differ depending on the site (back vs. neck) of samples within a cow, while a few trace elements showed different levels. Nutritional status seemed not to affect on major elements levels in hair when comparing among lactating cows, especially, S and Ca were found to be stable, although trace elements levels differed due to nutritional status. When comparing between a lactating cow under malnutrition and a heifer under good nutritional condition, major elements, such as K and P, seemed to be varied as well as trace elements did, suggesting that the interaction of nutrition and physiology (parturition) can influence on the hair levels of several major elements. From these facts, several elements detected using PIXE might be useful tools to estimate the nutritional status of dairy cattle.