Feeding milk replacer instead of whole milk affects blood plasma proteome and lipid profile in preruminant calves

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Abstract

The study was undertaken to determine the effect of feeding milk or milk-replacer on the blood plasma proteome and lipid profile in calves during the second week of life. Feeding milk-replacer significantly decreased the expression of plasma apoA-I. Age of calves affected apoA-I expression, which was higher on the 8th than on the 11th and 14th day of life. A significant effect of interaction between diet and age was also observed. The expression of apoA-IV, was significantly affected by diet and was lower in calves fed milk replacer. Expression of this protein was significantly lower at the 8th day of life and was up-regulated in the calves fed milk-replacer at the second week of life. Calves fed milk-replacer had greater expression of haptoglobin, which differed significantly between days of blood sampling, being higher on the 8th than on the 11th and 14th day. The interactive effect of diet and age affected haptoglobin expression, which was successively down-regulated in calves fed milk-replacer. Diet had a significant effect on the plasma lipid profile. Animals fed milk had a greater concentration of TC, HDLC and LDLC. The composition of milk-replacer, especially fat source, is probably the main factor that affects expression of proteins involved in cholesterol metabolism and level of components of lipid profile in calves fed formula. We claim that the initially increased level of haptoglobin, followed by its decrease during the second week of life in calves fed milk-replacer may indicate the presence of short-term stress induced by changes in the feeding system.

Key words: proteome, calves, milk, milk replacer, blood plasma, two-dimensional electrophoresis, MALDI-TOF mass spectrometry

Introduction

Proper feeding and management is extremely important during the first weeks of a calf’s life. First colostrum intake triggers a variety of crucial adaptive changes in the vital organs of newborns, and these changes can be reflected in the changes in body fluid composition (Herosimczyk et al. 2011, 2012). Feeding milk replacers is a common practice on dairy farms. Although currently most of the milk replacers comprise colostrum and milk-derived proteins, these supplements are deprived of essential non-nutritional factors, necessary to maintain homeostasis and proper development of calves. Thus, the absence of these