Pancreatic Amylase Activity and Metabolic-Endocrine asset in weaning kids

D. Magistrelli[1], L. Pinotti[2], L. Rapetti[1], F. Rosi[1]
[1]Institute of Animal Science, Faculty of Agronomy, University of Milan, Italy;
[2]Department of Veterinary Sciences and Technology for Food Safety, Veterinary Faculty, University of Milan Italy
damiano.magistrelli@unimi.it

Weaning in mammals is characterized by several changes that include diet and digestive function. In non ruminant species for example starch consumption as energy source requires the secretion of specific digestive enzymes. The aim of this study was to investigate the effects of weaning on pancreas activity and on metabolic traits in kids during the transition from pre-ruminant to ruminant state. For this purpose, 11 kids (fed colostrum until 3 d of age and than goat milk until 4 weeks of age) were randomly assigned to one of two groups: MILK and WMIX. Starting from week 4 to week 6 of age MILK group (6 animals) continued to receive goat milk (3.22 % protein, 3.61 % fat, 4.73 % lactose), while WMIX group (5 animals) was fed milk (in decreasing quantity) plus weaning mix concentrate (15.6 % crude protein as fed, 5.36 % ether extract as fed, and 16.7 % starch as fed); on week 7 milk was completely removed in WMIX group diet. During the experimental period, body weight and feed consumption were recorded. Blood samples were taken before the first meal of the day on week 3, 4, 5, 6 and 7. Plasma was analysed for alpha amylase, insulin, ghrelin, leptin, glucose, alpha-amino nitrogen, urea, creatinine, total protein and albumin. At 7 weeks of age all kids were slaughtered, carcass weight measured and pancreas samples obtained. On pancreas, amylase activity and zymogen content were determined. Both final body weight (15.33 vs 13.66 kg for WMIX and MILK, respectively at week 7) and carcass weight (9.54 vs 9.04 kg for WMIX and MILK, respectively) did not differ between the two groups, while MILK group showed higher ($P<0.05$) slaughtering yield (66.17 %) than WMIX group (62.18 %), probably due to the feed efficiency in milk group. The weaning diet decreased significantly overall means of plasma glucose (6.55 vs 6.90 mmol/l, $P<0.05$) and alpha-amino N (4.89 vs 5.27 mmol/l, $P<0.01$) and increased ($P<0.05$) plasma creatinine (71.70 vs 69.27 μmol/l, for WMIX and MILK group, respectively). Further differences in plasma metabolites were observed on week 7 of the experiment on which glucose (5.40 vs. 6.63 mmol/l, $P<0.001$), alpha-amino nitrogen (4.21 vs 5.58 mmol/l, $P<0.01$), urea (5.67 vs. 7.66 mmol/l, $P<0.01$), and insulin (7.03 vs. 21.25 pmol/dl, $P<0.05$) were lower in WMIX group than in MILK one; creatinine (78.92 vs 69.30 μmol/l) and ghrelin (2.19 vs 1.23 pmol/l) were higher ($P<0.01$) in WMIX kids compared to MILK kids. Pancreatic zymogen content was not different between groups (10.81 vs 9.65 mg/g fresh tissue in WMIX and MILK, respectively). On the contrary pancreatic amylase activity expressed as unit per gram of fresh tissue, as well as amylase activity expressed as unit per mg of zymogen were more than three times higher ($P<0.05$) in MILK group compared to WMIX one. Together results herein presented indicated that: first, weaning on week 7 affected plasma metabolites, i. e., reduced plasma glucose, insulin, alpha-amino N and increased plasma ghrelin and creatinine, as consequence of the lower feed efficiency of WMIX diet; second, weaning decreased more than three times plasma insulin and pancreatic amylase activity, without any significant effect on pancreatic zymogen content; this latter result suggests that in ruminant the regulation of pancreatic alpha-amylase is complex and likely regulated by both transcriptional and posttranscriptional events, and milk diet could affect its activity; third, it is worthwhile to note that the weaning diet increased plasma concentration of ghrelin, novel hormone involvolved in anabolism, feeding behavior, and nutritional homeostasis for GH secretion and gastrointestinal motility. In conclusion, even if dietary effect on glucidic and protein metabolism could be expected, interesting results on endocrine traits and on pancreatic activity around weaning are reported. However, more extensive feeding experiments on the effect of weaning are required in order to establish a possible role of milk bioactive components in the transition from non ruminant to ruminant state in kids.

Key-words: kids, pancreatic amylase activity, metabolic traits, weaning.