Mild heat treatment does not reduce the colitis-protective effects of bovine colostrum in preterm pigs

Støy, Ann Cathrine Findal; Sangild, Per; Skovgaard, Kerstin; Thymann, Thomas; Bjerre, Mette; Chatterton, Dereck Edward Winston; Purup, Stig; Boye, Mette; Schmidt, Mette; Heegaard, Peter M. H.

Publication date: 2013

Mild heat treatment does not reduce the colitis-protective effects of bovine colostrum in preterm pigs

Ann Cathrine F. Støy¹, Per T. Sangild², Kerstin Skovgaard¹, Thomas Thymann², Mette Bjerre³, Dereck E.W. Chatterton⁴, Stig Purup⁵, Mette Boye¹, Mette Schmidt⁶, Peter M. H. Heegaard¹

¹Innate Immunology Group, National Veterinary Institute, Technical University of Denmark, Bülowsvej 27, DK-1870 Frederiksberg C, Denmark
²Department of Human Nutrition, University of Copenhagen, Rolighedsvej 30, DK-1958 Frederiksberg C, Denmark
³The Medical Research Laboratories, Department of Clinical Medicine, Faculty of Health Sciences, Aarhus University, DK-8000 Aarhus C, Denmark
⁴Department of Food Science, Dairy Technology, University of Copenhagen, Rolighedsvej 30, DK-1958 Frederiksberg C, Denmark
⁵Department of Animal Science, Aarhus University, Blichers Allé 20, DK-8830 Tjele, Denmark
⁶Department of Large Animal Sciences/Veterinary Reproduction and Obstetrics, University of Copenhagen, DK-1958 Frederiksberg C, Denmark
Abstract

Objective and study: Fresh bovine colostrum (BC) prevents development of necrotizing enterocolitis (NEC) in preterm pigs. Spray drying and pasteurization are required to use BC in clinical settings but this may also reduce its bioactivity. In studies on preterm pigs, we compared raw BC with spray dried and pasteurized BC.

Methods: Preterm pigs were fed total parenteral nutrition for 2 d, followed by two boluses of milk formula (15 mL/kg/3h) and continued enteral feeding with milk formula (FORM, n = 14), fresh BC (COLOS, n = 14), spray dried, powdered BC (POW, n = 8), or spray dried, pasteurized BC (POWPAS, n = 9). Pigs were euthanized after two days of enteral feeding and NEC lesions, intestinal structure, digestive and absorptive functions, microbiota, and tissue protein and mRNA levels of immune factors were analyzed. Finally, we determined the concentrations of some bioactive proteins in the colostrum products and studied treatment-related aggregation of proteins.

Results: POW and POWPAS pigs showed lowered gut NEC severity, IL-1β and IL-8 levels and lactic acid levels, and higher intestinal villus heights, hexose absorption, hydrolase activities (lactase, maltase, peptidases) than FORM pigs (all $P < 0.05$). These values in POW and POWPAS groups were similar to those in the COLOS group. Intestinal expression of $IL1B$, $IL6$ and $IL8$ and bacterial abundance score were positively correlated with NEC severity ($P < 0.05$). Spray drying, and especially pasteurization, increased the breakdown of growth factors (TGF-β1 and -β2) and aggregation of milk proteins.

Conclusion: Spray drying and pasteurization affect BC proteins but such treatments do not necessarily decrease its trophic and anti-inflammatory effects on the immature intestine. It remains to be studied if such colostrum products also improve gut maturation in preterm infants.