

## **Species-, lactation- and processing-specific effects of milk for preterm neonates**

Prof Per Torp Sangild

Section for Comparative Pediatrics and Nutrition, Faculty of Health and Medical Sciences,  
University of Copenhagen, Denmark

Mother's own milk remains the golden standard for feeding newborn infants but what to do when mother's own milk is not available? This is often the situation for preterm infants in the first week(s) after birth. Is donor human milk optimal? Is milk species-specific and sensitive to different treatments? These seemingly simple questions remain critical and still difficult to answer, and much research is needed to clarify the role of specific milk components and milk diets on short- and long-term infant health. Due to the difficulties in doing clinical infant trials, studies in appropriate animal models may help. Preterm pigs are hypersensitive to small modifications in milk composition and its preparation, and we hereby present a series of dietary interventions that may help in defining the most important diets or dietary components for neonatal development. Intact, raw milk remains a better source of bioactive components than most formulas, especially for hyper-sensitive preterm newborns. Porcine and bovine colostrum have continuously proven to be the optimal diets for preterm newborn pigs, but also human milk shows trends towards beneficial effects on necrotizing enterocolitis (NEC), diarrhea and growth in preterm pigs. Raw human milk or mildly-treated (UV-C treated) donor human milk is superior to Holder-pasteurised milk, suggesting that milk is highly sensitive to processing and heat treatment. Mature donor milk from sows late in lactation is surprisingly not beneficial for preterm pigs, suggesting that the stage of lactation markedly affects the quality of milk for immature newborns. Intact bovine and human milk products are well tolerated in diet-sensitive preterm pigs, suggesting that the source of milk is less important than the processing. Human milk oligosaccharides (HMOs) exert decoy and prebiotic effects and several different HMOs have been tested in preterm pigs but effects were limited, at least during early life. HMOs likely exert beneficial effects to support immune homeostasis and microbial defense in breast-fed infants but caution is needed when adding HMOs to diets for very preterm neonates that are sensitive to maldigestion, bacterial overgrowth and nutrient fermentation. In conclusion, milk has nutritional and gut-protective effects that are species-, lactation- and processing-specific. These milk qualities are particularly important to take into consideration for sensitive preterm infants but could be important for all infants.