Comparison of sialic acid content in sow's milk and pig milk replacers

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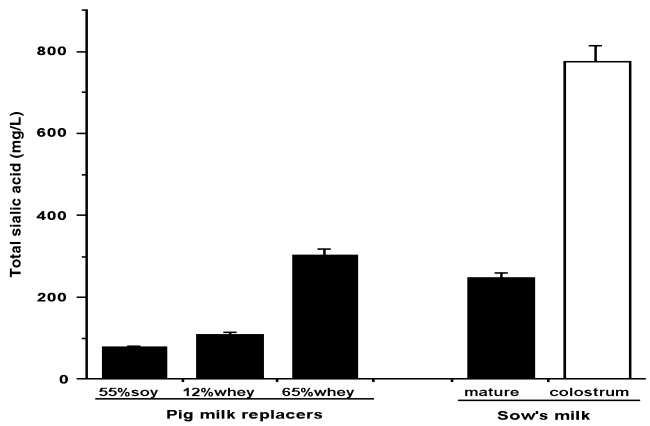
Sialic acid is an important structural and functional component of brain gangliosides. The piglet is a good animal model for human infant nutrition, as it has a similar digestive system, as well as similar nutritional requirements as the human infant. Therefore, we have determined the concentration of sialic acid in sow's colostrum and mature milk, commercial pig milk replacer and two modified pig milk formulas.

Sow's colostrum and mature milk were collected from Camden pig farm, University of Sydney. The ratio of cassein:whey was 62:38 with total protein concentrations ranging from 3.7 to 7.2 g/L. The ratio of cassein:whey in commercial pig milk replacer (Wombaroo food products) was 35:65, modified 1 formula contained 55% soy protein (36:9:55 cassein:whey:soy) and modified 2 formula contained 12% whey protein (88:12 cassein:whey). All formulas contained 5.6 g/L protein with the remaining ingredients the same. Milk replacers were prepared according to the manufacturer's directions. The milk samples were defatted, and the protein precipitated using TFA. Protein-bound, oligosaccharide-bound and free sialic acid concentrations in milk were determined using our published method (1).

The two modified pig milk replacers both had a significantly lower total sialic acid content than the commercially-available pig milk formula and sow's mature and colostrum milk ($P < 0.05$) (Fig). 80% of the sialic acid was bound to protein. Less than 2% of the sialic acid was in the free form, with the remaining~ 20% bound to oligosaccharides. The proportion of sialic acid in each of the forms is similar to that in cow's milk, but is in contrast to that of human milk, which contains predominantly oligosaccharide-bound (~70%) sialic acid. However both glycoprotein-bound and oligosaccharide-bound sialic acid levels of the pig are lower than those of human milk due to differences in the milk composition of the two species. The soy based pig milk replacer had a significantly lower total sialic acid level than the whey-based pig milk replacer ($P < 0.01$).



Total sialic acid content in sow's milk and pig milk replacers.

We conclude that sow's milk colostrum contains significantly higher levels of sialic acid than mature milk and pig milk replacers. Sow's milk and all pig milk replacers contained predominantly protein-bound sialic acid, rather than the oligosaccharide-bound form.

Reference

Wang B, Brand-Miller J, McVeagh P, Petocz P. Concentration and distribution of sialic acid in human milk and infant formulas. Am J Clin Nutr 2001; 74: 510–515.

Key words: sialic acid, sow's milk, pig milk replacer