THE RESPONSE OF PLASMA GALACTOSE IN PIGLETS FOLLOWING DOSES OF EITHER INTACT OR HYDROLYZED LACTOSE IN WHOLE AND SKIM SOW'S MILK

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Previous results have shown that the digestion of lactose was the functional limitation to the piglet's capacity to utilize lactose dissolved in water (Bird et al. 1989). The present study investigated the digestion of lactose by the piglet when this disaccharide was present in sow's milk by determining the difference in the response of plasma galactose to doses of either intact or hydrolysed lactose. Since milk with a low fat content can affect the utilization of lactose by infants (Woolridge and Fisher 1988), this study also investigated the effect of the presence of fat on the utilization of lactose by sucker piglets.

Sow's milk was collected and treated to produce batches of: whole milk - WM, whole milk in which lactose was hydrolyzed - HWM, skim milk - SM, and skim milk in which lactose was hydrolyzed - HSM. The concentration of lactose, protein and fat in each dose of milk was determined (Table 1). Ten-day-old piglets were fasted for one hour before an oral administration (20 ml) of one the following dosing regimes: Group 1 - WM followed by HWM (n = 6), Group 2 - WM followed by SM (n = 7) and Group 3 - HWM followed HSM (n = 6). Blood samples (60 µl) were taken from the ear veins of the piglets at frequent intervals after each of the 2 doses. The plasma (20 µl) was deproteinized and assayed for galactose and glucose. The change in the concentration of galactose in the blood was plotted against time, and the peak concentration, time to the peak and the area under the curve (AUC) over the first 60 min was calculated (Table 1).

	Group 1		Group 2		Group 3	
	WM	HWM	WM	SM	HWM	HSM
Milk analysis						
Lactose (g/l)	59.9 ± 1.2	< 4.0	57.2 ± 0.6	56.2 ± 1.9	< 4.0	< 4.0
Gal + glu (g/l)	< 0.2	61.7 ± 1.8	< 0.2	< 0.2	58.0 ± 2.6	60.5 ± 1.2
Protein (g/l)	47.2 ± 0.6	45.0 ± 0.5	45.2 ± 0.8	44.7 ± 0.3	45.5 ± 1.0	44.7 ± 0.4
Fat (g/l)	91.3 ± 2.0	95.1 ± 2.0	90.0 ± 3.0[a]	9.2 ± 1.0[a]	85.8[b] ± 2.0	11.6 ± 1.0[b]
Plasma analysis						
Peak galactose (µM)	79 ± 14[c]	101 ± 13[c]	112 ± 27	132 ± 20	91 ± 13	123 ± 37
Peak time (min)	21.5 ± 2.0[d]	15.3 ± 0.9[d]	14.2 ± 3.0	13.7 ± 3.0	16.3 ± 1.9	19.3 ± 3.0
Galactose AUC	0.94 ± 0.17	1.00 ± 0.13	0.95 ± 0.12	1.03 ± 0.12	0.98 ± 0.13	1.20 ± 0.06

Table 1: Analysis of lactose, galactose plus glucose (Gal + glu), protein and fat in the different milk doses and the peak galactose concentration, peak time and the galactose AUC in the plasma of three groups of piglets. Significant differences ($P<0.05$) are denoted by similar superscripts

Although the digestion of lactose delayed both the height and time of the galactose peak (Group 1), the same amount of galactose (AUC) reached the plasma, whether the milk contained lactose or galactose plus glucose. These findings are in contrast to studies which showed that following the administration of doses of deionised water containing either lactose or galactose plus glucose, more galactose reached the peripheral plasma following the latter dose (Bird et al. 1989). Thus, some constituents in sow's milk may have an effect on the digestion of lactose. The presence of fat in milk did not significantly alter the response of galactose in the plasma to doses containing either lactose or galactose plus glucose (Groups 2 & 3). These results show that differences in the concentration of fat in sow's milk do not affect the utilization of lactose by sucker piglets.

BIRD, P.H., MORRIS, S.J. and HARTMANN, P.E. (1989). Manip. Pig Prod. 2: 100.
WOOLRIDGE, M.W. and FISHER, C. (1988). Lancet August 13: 382-384.

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