

THE BIRTH PROCESS MAKES THE IMMATURE SMALL INTESTINE SENSITIVE TO FEEDING-INDUCED INTESTINAL DISEASE

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Many newborn animals suffer from severe intestinal disease in the immediate postnatal period. We have shown that such disease is particularly prevalent when animals are *born prematurely* and *fed a milk-placer* (in stead of mother's colostrum). By feeding a milk-replacer to fetuses in utero and comparing them with corresponding pigs fed ex utero, we tested the hypothesis that the response of the immature intestine to oral feeding depends on the process of birth. Under anaesthesia, eight fetuses in 2 pregnant sows (105-106 d gestation, term = 115 d) were prepared with a feeding tube inserted into the fetal esophagus. After the operation, the fetuses were fed either sow's colostrum (n=4) or a milk-replacer (formula, n=4) for 24 h while in utero (15 ml/kg/3 h). After the 24 h feeding, the operated fetuses were removed from the sows by caesarean section and killed for tissue collection. From these and some other pregnant sows (105-107 d gestation) we also removed some unoperated control fetuses. These were either killed at birth (no feed, n=4) or postnatally after 24 h of feeding (colostrum, n=7, formula, n=8). Results from all 5 treatment groups are shown below.

Table. Intestinal growth and enzyme activities in premature pigs fed colostrum or formula, either as fetuses or newborns (mean values \pm SE for 3 intestinal regions). *P<0.05, *higher* value in colostrum-fed pigs than in corresponding formula-fed pigs.

	Control	Premature fetal pigs		Premature newborn pigs	
	No feed	Colostrum	Formula	Colostrum	Formula
Intestine (g/kg)	21.2 \pm 2.1	33.9 \pm 2.7	30.9 \pm 2.8	33.9 \pm 0.8	31.2 \pm 1.8
Mucosa (%)	62.6 \pm 3.2	80.0 \pm 3.5	76.6 \pm 1.6	83.1 \pm 1.2*	73.4 \pm 1.3
Maltase (U/g)	0.76 \pm 0.06	2.54 \pm 0.27*	1.49 \pm 0.21	3.05 \pm 0.14*	1.08 \pm 0.12
Lactase (U/g)	14.5 \pm 2.2	9.4 \pm 1.0	10.2 \pm 1.1	9.09 \pm 1.03*	3.81 \pm 0.43
ApN (U/g)	4.31 \pm 0.31	3.29 \pm 0.18	4.40 \pm 0.38	5.15 \pm 0.47*	2.62 \pm 0.30
ApA (U/g)	1.86 \pm 0.14	2.51 \pm 0.10	3.19 \pm 0.18	3.31 \pm 0.26*	1.68 \pm 0.20
DPP IV (U/g)	1.55 \pm 0.18	0.61 \pm 0.13	0.78 \pm 0.13	1.48 \pm 0.21*	0.76 \pm 0.09

The results show that fetal pigs and newborn pigs differ markedly in their response to feeding. Feeding increased the relative mass of the intestine in all groups (+50-60%), but only in newborn pigs did formula-feeding induce marked decreases in mucosal mass and enzyme function, relative to colostrum-feeding. Thus, exposure of the immature intestine to a milk-placer is associated with intestinal mal-function, only if the animal is born. Probably, the detrimental effects of formula-feeding depend on the birth transition and the associated bacterial colonization and changes in blood and oxygen supply.