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THE INFLUENCE OF COLOSTRUM ON NEONATAL ROTAVIRAL INFECTIONS

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Rotaviruses are an important cause of diarrhoea in young calves, piglets and lambs (Bridger and Woode, 1975; Woode *et al.*, 1976; Snodgrass *et al.*, 1977a), and also in human infants. The virus infects epithelial absorptive cells on the small intestinal villi, leading to villus atrophy and an intestine deficient in both digestive and absorptive capacities (Davidson *et al.*, 1977; Snodgrass *et al.*, 1977b). Animals in the first few days and weeks of life are most susceptible, so ingestion of colostrum is likely to have an important influence on the outcome of rotaviral infections.

Most adult farm animals have serum antibody to rotavirus. Antibody is also secreted in high titre in first-day colostrum, but is absent within 3 days of parturition in cows and ewes (Woode *et al.*, 1975; Wells *et al.*, 1978). Many young animals infected with rotavirus nevertheless have circulating rotavirus antibody absorbed from the colostrum (Woode *et al.*, 1975; Lecce *et al.*, 1976; Snodgrass *et al.*, 1977a). This apparently anomalous situation has caused the protective role of colostrum to be queried. We have investigated this situation experimentally, using rotavirus infections in gnotobiotic lambs as our model system (Snodgrass and Wells, 1976 and 1978).

We first attempted to reproduce the common field situation, in which animals with serum antibody are susceptible to rotavirus

infection. Two lambs were fed 100 ml of a colostrum pool, and absorbed sufficient immunoglobulin to produce serum neutralising antibody titres of 40 and 80 respectively. However, these lambs were still susceptible to rotavirus infection when challenged after 2 days, developing diarrhoea and excreting rotavirus in faeces. Two further lambs were fed 450 ml of the same colostrum pool, and were then resistant to infection with rotavirus when challenged after 2 days. Thus it was shown that colostrum could protect against rotavirus infections if fed in large enough quantities.

A second colostrum pool was fed in 450 ml amounts to two lambs within a few hours of birth, and these lambs absorbed immunoglobulin so that serum immunoglobulin concentrations were in the normal range and rotavirus antibody was present. They did not develop diarrhoea after infection with rotavirus, and virus excretion was delayed for several days. Two other lambs fed 450 ml of the same pool on the second day of life were hypogammaglobulinaemic and had no serum antibody to rotavirus. However, they also were protected against the effect of rotavirus infection. These results indicate that serum antibody is not essential for protection against rotavirus infection, and suggest that antibody needs to be present in the gut lumen for effective protection.

A third pool of colostrum was used to

confirm the finding that the important protective factor was the continuing presence of antibody in the gut lumen. Two lambs fed 100 ml of this pool within a few hours of birth were susceptible to rotavirus infection, while two lambs which received 100 ml daily for four days as part of their diet were protected. Protection by continued feeding of colostrum has also been shown in calves (Bridger and Woode, 1975). This is similar to the lactogenic immunity described in transmissible gastroenteritis in pigs (Hooper and Haelterman, 1966).

Thus there are two ways in which colostrum can be used to protect against rotavirus diarrhoea. The traditional good husbandry practice of ensuring the ingestion of large amounts of colostrum on the first day of life is likely to confer protection for at least 48 hours, which was the challenge interval in these experiments. A more effective and longer term protection can alternatively be provided by continuing to feed smaller amounts of colostrum as part of the diet, which can presumably protect for as long as it is continued.

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