

## Colonic ulceration in guinea-pigs and rabbits fed lignosulphonate

R. MARCUS, Surgical Unit, Clatterbridge Hospital, Bebington and J. WATT, Department of Pathology, University of Liverpool

It has been shown that certain sulphated products when fed to animals can cause ulceration of the colon in a variety of species, including guinea-pigs, rabbits, rats, mice, and monkeys (Marcus and Watt, 1969; Watt and Marcus, 1972; Benitz, *et al.*, 1973). We have recently investigated the effects of lignosulphonate on the colon of guinea-pigs and rabbits. Our results may be of interest in view of the wide use of lignosulphonate as a binder in pelleted livestock feeds.

In our initial pilot experiments we used sodium lignosulphonate supplied in the drinking fluid to adult albino guinea-pigs fed a standard cube diet (S.G.1 Nutrients Ltd), the cubes containing no lignosulphonate binding agent; their diet was supplemented with cabbage and hay. When supplied over a period of five weeks, a 5 per cent aqueous solution of sodium lignosulphonate caused loss of weight in five out of eight animals and 100 per cent incidence of ulceration in the colon. In a comparative study using a 5 per cent aqueous solution of the less soluble calcium lignosulphonate, three out of 10 animals lost weight and the incidence of ulceration was 50 per cent.

TABLE 1: Mean bodyweight change and colonic ulceration in rabbits fed 5 per cent aqueous solution calcium lignosulphonate for six weeks

Group (number of animals)	Mean bodyweight		Mean daily intake Ca lignosulphonate per animal	Incidence of colonic ulceration
	Initial (g)	Final (g)		
Experimental (5)	3660	3390	1.8 g/kg	3/5
Control (5)	3540	3790	—	Nil



FIG 1: Rabbit fed 5 per cent calcium lignosulphonate for six weeks. Focal and linear haemorrhagic ulceration of the transverse folds in the caecum M  $\times$  2

We also investigated the effects of calcium lignosulphonate supplied over a period of six weeks in the drinking water at the 5 per cent level to another species, namely, rabbit. The results are summarised in Table 1. One animal died on the 18th day from massive intestinal bleeding; focal ulcers were found in the caecum. A second animal died with intestinal haemorrhage on the 36th day but the source of bleeding was not identified. The remaining three animals were killed with ether anaesthesia, one at the end of four weeks showing bloody intestinal contents but no recognisable ulcers, and two at the end of six weeks both of which showed active ulceration in the caecum and in the lower colon and rectum (Fig 1). All of the experimental animals lost weight in contrast to the control group which received no lignosulphonate in the drinking fluid.

From our observations in guinea-pigs, calcium lignosulphonate appeared to be less ulcerogenic than the more soluble sodium salt. In the rabbit, however, the calcium preparation caused fatal haemorrhage in some animals as well as ulceration. It is possible therefore that there could be species difference in the biological effects of lignosulphonates, as is known to occur in relation to sulphated polysaccharides (Marcus and Watt, 1969).

The 5 per cent concentration of calcium lignosulphonate used in our experiments is admittedly slightly greater than the concentration generally used in animal feeds (1 to 2 per cent). Even so, in our experience, the feeding of other sulphated products, such as degraded carrageenan and sulphated amylopectin, at low concentration (0.1 per cent) over a more prolonged period (three to six months) can interfere with weight gain and cause colonic ulceration and hyperplastic mucosal changes in certain animal species, for example, rabbits (Watt and Marcus, 1970; 1972). The possibility of similar damage occurring as a result of small concentrations of lignosulphonate needs to be investigated.

## REFERENCES

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## Protein and vegetation

ALTHOUGH it was known 200 years ago that green plants contain high grade protein, techniques for making it into a palatable product were not developed until recently. N. W. Pirie, at Rothamsted, pulped the plants to separate protein-rich juice from the fibre and coagulated the juice to produce a moist dark-green curd which tasted of spinach and had the keeping qualities of cheese. Drying, canning, salting or pickling prolonged its shelf-life and it could be turned into a brown powder by solvent extraction. A robust and simple machine produced 100 kg protein concentrate (60 to 70 kg pure protein)/hour and could supply 10 per cent of the daily protein needs of about 50,000 people. Three hundred Indian children were eating the protein in a trial which was at present under way.

ANON (1974). *Environmental Health*. **82**, 34.