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and recommended to treat hypocalcaemia (parturient paresis), requires reappraisal. Until this is accomplished calcium solutions alone, as prescribed by the original workers, remain the preferred treatment for milk fever (hypocalcaemia) in all seasons.

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Short Communications

Comparison of *Campylobacter sputorum* subspecies *mucosalis* strains in PIA and PHE

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Veterinary Record (1977). 101, 407

ROWLAND and Lawson (1975), stated that the diseases porcine intestinal adenomatosis (PIA), necrotic enteritis (NE), regional ileitis (RI) and proliferative haemorrhagic enteropathy (PHE) all had a common pathological basis and that organisms that could not be differentiated from *Campylobacter sputorum* subsp *mucosalis* had been isolated from the first three of these conditions. Recently, Love and others (1977) described the isolation of a strain of *C sputorum* subsp *mucosalis* from PHE in Australia. Further strains of this organism have been isolated and a comparison has been made between these strains and a strain of *C sputorum* subsp *mucosalis* (National Collection of Type Cultures, NCTC 11000) originally isolated in the United Kingdom from PIA (see Lawson and others 1975a).

Organisms were isolated and tested biochemically as described previously (Love and others 1977). Tests for response to inhibitory substances were made using the replicate-plating method described by Lawson and others (1975b). The results (Table 1) showed that the organisms isolated from PHE (designated strain 22²⁰) and NCTC 11000 could not be distinguished on biochemical criteria and that their response to inhibitory substances was identical.

The rabbits were given twice weekly intravenous injections of increasing amounts of the antigen over a six week period.

Tube agglutination tests were carried out using whole cells which were washed from 48 hour blood agar culture plates with 0.3 per cent formol phosphate buffered saline (PBS) pH 7.4. Antigen was diluted in 0.3 per cent formol PBS to Wellcome opacity tube 2 immediately and stored at 5°. Agglutination tests were performed in parallel against homologous and heterologous antigens. There was marked cross reaction between the strains with homologous titres (>10,240) higher than heterologous titres (>1286). A number of pigs which had recovered from PHE were bled and their sera tested for antibodies to strain 2220 and NCTC 11000. Control sera were obtained from animals which had been prevented from developing PHE by feed medication (see Love and Love 1977) and from pigs on a farm with a history of freedom from PHE and related conditions. Table 2 shows that there is a significant agglutination titre to *C sputorum* subsp *mucosalis* strain 2220 in animals recovered from PHE and that there is a weak, but significant, cross reaction with NCTC 11000. Control pigs showed no agglutination antibody titre to either strain 2220 or NCTC 11000.

These findings indicate that strains of *C sputorum* subsp *mucosalis* isolated in the United Kingdom and Australia are biochemically identical and that there is a strong cross reaction between the strains isolated in both countries from two forms of the porcine intestinal adenomatosis. They also indicate that some animals recovered from PHE have circulating antibody to strain 2220 and low titres to another strain (NCTC 11000). They also support the hypothesis of Rowland and Lawson (1975) that *C sputorum* subsp *mucosalis* infection is common to PIA and the related disease in pigs.

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TABLE 1: Comparison of *C sputorum* subsp *mucosalis* strains

STRAIN	Catalase	H ₂ S	NO ₂	NO ₃	Glycine			NaCl			DOC ⁺	0.2 per cent
					1.0 per cent	1.5 per cent	2 per cent	1 per cent	2 per cent	3 per cent		
2220	—	—	—	—	*	—	—	—	—	—	—	—
11000	—	—	—	—	*	—	—	—	—	—	—	—

+ deoxycholate

* on some occasions, some weak growth was noted

TABLE 2: Tube agglutination titres of pig sera against *C sputorum* subsps *mucosalis* strains

STRAIN	PIG SERUM								
	Recovered PHE						Controls		
	1	2	3	4	5	6	1	2	3
2220	640	320	160	320	320	320	10	10	10
11000	160	40	40	80	80	40	10	10	10

Control of diabetes in a capuchin monkey with tolbutamide

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RECENT reports have discussed spontaneous diabetes mellitus in non-human primates, including prosimians, Old World monkeys and apes (Di Giacomo and others 1971, Jones 1974) and New World monkeys (Davidson and others 1967). Most of the classical signs of diabetes have been recognised in primates, including weight loss, polydipsia, polyphagia, polyuria, glucosuria, periodontal disease and cataract. The clinical pathology has been fully studied in the Celebes black ape (*Macaca nigra*) (Howard 1972). Many cases have been

associated with the stress of laboratory experiments and the feeding of high carbohydrate diets. The response to insulin has been reported and evaluated (Howard 1972, Jones 1974) and there are two reports of response to oral therapy with chlorpropamide (Reuther 1967) and tolbutamide (Davidson and others 1967).

A four-year-old male hooded capuchin monkey (*Cebus apella*) in private ownership developed vague signs of dysphagia with regurgitation and reswallowing of food. Therapy was unsuccessful until the owner associated the syndrome with the feeding of sugar or sweet foods. Reduced sugar intake and oral antacid (Maalox; Pharmax) controlled the signs but two months later the monkey developed clear signs of diabetes mellitus including depression, weight loss, poor appetite, polydipsia, polyuria and pruritic balanitis. Urine testing revealed persistent high glucose levels, confirming the diagnosis but without evidence of blood or protein (Hema-Combistix; Ames). Handling problems precluded confirmatory blood glucose examination. Polyphagia, cataract and periodontal disease were not present.

The monkey's diet had included much fruit, sweet foods and about 30 g sucrose daily. The diet was adjusted to contain minimal carbohydrate and high protein, based on a milk/protein food (Casilan; Glaxo-Farley), eggs, meat and vegetables, avoiding sucrose and starch foods. The monkey adapted readily to this diet. Initial therapy was with 250 mg tolbutamide (Rastinon; Hoechst) given orally once daily, reducing to 100 mg daily after seven days. The monkey weighed 3.5 kg. The owner monitored progress by stick-testing a free stream of urine four times daily (Clinistix; Ames), and adjusted the dose of tolbutamide to maintain a negative glucose reaction.

Three months' treatment with 100 mg tolbutamide on alternate days was required before the drug could be withdrawn. The monkey has remained asymptomatic for 10 months and glucosuria only occurs in response to feeding sugars. Body weight has increased to 4.2 kg. The balanitis responded to local therapy (Panolog ointment V; Squibb).

The history and progress of this case in a monkey resemble "maturity-onset" diabetes in man, although obesity was not present. Urethral inflammation and balanitis, a classical sign of diabetes in man thought to be due to local moniliasis (Malins 1968), has only been observed rarely in primate diabetes (Hill 1957). Polyphagia did not occur, despite considerable weight loss.

Primate diabetes may be predisposed by high carbohydrate diets, stress and perhaps heredity, but obesity or restriction of movement have not been implicated (Howard 1972). Davidson and others (1967) reported the correction of high fasting blood glucose levels and abnormal oral glucose tolerance tests in squirrel monkeys (*Saimiri sciureus*) by oral treatment with 15 mg per kg tolbutamide twice daily. Some 50 per cent of clinically normal individuals were affected. The presence of abnormal glucose metabolism in squirrel monkeys has been shown to be age-dependent and more common in males (Lang 1966). A similar incidence occurs in the Celebes black ape (Howard 1972) and severe clinical diabetes develops occasionally in both species. Cases of spontaneous diabetes occurring in pet monkeys, hitherto unreported, are of particular comparative interest, because such animals live close to man and often receive similar diets to children. In addition the chronic stress level is probably lower than in the laboratory. The presence of a "latent" diabetic state in some species should make diabetes a more common diagnostic consideration in monkeys.

Insulin therapy for diabetes in animals requires a skilful owner and a co-operative patient. It would be almost impossible in a pet monkey. The control of glucosuria in diabetic rhesus monkeys (*Macaca mulatta*) has been achieved solely by dietary control (Maller and Hamilton 1968), but additional therapy was required in this case. It would appear that a combination of tolbutamide therapy with strict dietary control should be attempted in spontaneous cases of primate diabetes.

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Efficacy of fenbendazole against naturally acquired *M. expansa* infections in lambs

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NUMEROUS studies have shown good efficacy of fenbendazole (Panacur; Hoechst) at the recommended dose level of 5 mg per kg in the treatment of naturally acquired and experimental infestations with gastrointestinal and respiratory nematodes in sheep (Kirsch and Duwel 1975, Ross 1975, Kelly and others 1975, Esлами and Anwar 1976).

Little evidence has been presented on the efficacy of fenbendazole at that dose rate on natural *Moniezia* spp infections in lambs although Duwel and others (1975) showed 95 per cent elimination at 15 mg per kg and Kennedy and Todd (1975) 94 per cent elimination at 7.5 mg per kg. These results confirmed an earlier report by Bezubik (1974) who showed a 99 per cent reduction in *Moniezia* spp faecal egg count after treatment with 5 mg per kg fenbendazole. It was thus thought pertinent to establish, under commercial and experimental conditions, the efficacy of a 5 mg per kg dose level against naturally acquired *Moniezia* spp infestations in lambs.

Studies were carried out in the summer of 1976 on a farm in Northamptonshire, where tapeworm infections in fattening lambs had been prevalent in previous years.

Two flocks (A and B) each containing 250 ewes and about 400 lambs were made available. The flocks grazed on similar pastures and were subjected to identical management. On days 1, 20 and 56, all lambs in flock A were treated orally with 5 mg per kg fenbendazole and all the lambs in flock B received the manufacturer's recommended dose of levamisole (Nilverm; ICI) orally on each treatment day. Faeces samples were taken from a random selection of 30 lambs from each flock at each drenching and a further sample obtained at slaughter (day 82), when the intestines of 56 lambs from each flock were examined for the presence of cestodes. All cestodes recovered were found to be *M. expansa*.

Results of *Moniezia* spp faecal egg counts and post mortem examinations are shown in Table 1.

It is apparent from these results that a single dose of 5 mg per kg fenbendazole was followed by a reduced number of *Moniezia* spp eggs in the faeces of infected lambs. It was not clear whether the mechanism involved was elimination of segments alone or segments plus scolices. It was evident that the tapeworms recovered post mortem from the fenbendazole treated lambs were less mature (size range 50 to 1450 mm)

TABLE 1: Results of faecal egg counts and post mortem examination

Treatment	Mean count of <i>Moniezia</i> eggs for 30 lambs (egg.)				Moniezia worms in intestine (56 lambs examined in each flock)	
	Day 1	Day 20	Day 56	Day 82	No of infected lambs	Mean tapeworm length
Flock A						
Fenbendazole	2100	NIL	300	NIL	15	313 mm
Flock B						
Levamisole	6300	1270	1630	460	14	1895 mm