

***Pneumocystis carinii* in Large Domestic Animals in Denmark. A Preliminary Report.**

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Settnes, O.P. and Sv. Aa. Henriksen: *Pneumocystis carinii* in large domestic animals in Denmark. A preliminary report. Acta vet. scand. 1989, 30, 437-440. – By microscopic examination of toluidine blue O stained autopsy lung imprints *Pneumocystis carinii* was shown in 6 calves out of 160 (3.8%), in 1 sheep out of 28 (3.6%) and in 8 pigs out of 119 (6.7%). This is the first report of *Pneumocystis carinii* in calves, sheep and pigs in Denmark.

calves; sheep; pigs.

Introduction

Pneumocystis carinii has been reported to occur in sheep and goats (Carini & Maciel 1916, McConnell *et al.* 1971), pigs (Nikolskij & Scetinin 1967, Kučera *et al.* 1968, 1971, Ječný 1973, Seibold & Munnell 1977), horses (Shively *et al.* 1973) and cattle (Kučera *et al.* 1971, Ječný 1973, Shimizu *et al.* 1985).

Preliminary studies on the occurrence of *Pneumocystis carinii* among large domestic animals in Denmark are presented in the following report.

Materials and methods

The examined animals were selected at random among carcasses submitted to the National Veterinary Laboratory for routine diagnostic examinations.

Necropsy lung imprints were obtained from 160 cattle (calves), 28 sheep, 1 goat, 119 pigs and 3 fallow deer. Imprints were produced and stained by the toluidine blue O method as earlier described (Settnes & Larsen 1979, Settnes & Lodal 1980, Settnes & Genner 1986). The imprints were mounted under coverglass, screened at 100 and 400 and finally checked at 1000X enlargement.

Results and discussion

Pneumocysts were demonstrated in 6 calves (3.8%), in 1 sheep (3.6%) and in 8 pigs (6.7%). No pneumocysts were found in the goat and the fallow deers. This is to our knowledge the first report of *Pneumocystis carinii* in calves, sheep and pigs in Denmark. Our results together with those of other authors are given in Table 1.

The majority of the animals examined showed only lowgrade infection levels, i.e. only few pneumocysts were found in the whole imprint. However, in 4 pigs, age group 2 to 7 weeks, a massive infection was registered (cf. Fig. 1), i.e. 50 to 200 pneumocysts could be seen in each lightfield viewed at 100X enlargement. The number of pneumocysts in the lung imprint was comparable to the number found in imprints from human patients with lymphoma or AIDS dying from *Pneumocystis pneumonia* (Settnes & Genner 1986 and unpublished) or in imprints from lungs or rats with steroid-induced *Pneumocystis pneumonia* (Settnes & Genner 1989). This number would be equivalent of the grade 4 pathology of Ogino (Ogino 1978, Hughes 1987). Three of the 4 pigs concerned

Table 1. Reports on the occurrence of *Pneumocystis carinii* in pigs, cattle and sheep.

Pigs		Cattle		Sheep		Method of demonstration**	Authors (Country)
n*	%	n	%	n	%		
82	3.6	77	16.8	65	23.0	(M)	Ječný 1973 (CSSR)
		23	13.0			(C + M)	Shimizu <i>et al.</i> 1985 (Japan)
5	60.0						(Tottori prefecture)
24	8.3						(Hyogo prefecture)
24	12.5					(CF)	Kučera <i>et al.</i> 1968 (CSSR)
110	4.6	63	1.6			(FAT)	Kučera <i>et al.</i> 1971 (CSSR)
119	6.7	160	3.8	28	3.6	(M)	Settnes & Henriksen 1989 (DK)

* n = number examined, % = percentage of n with pneumocysts.

** M = direct microscopy of imprints, C + M = concentration method and M, CF = complement fixation, FAT = fluorescent antibody technique.

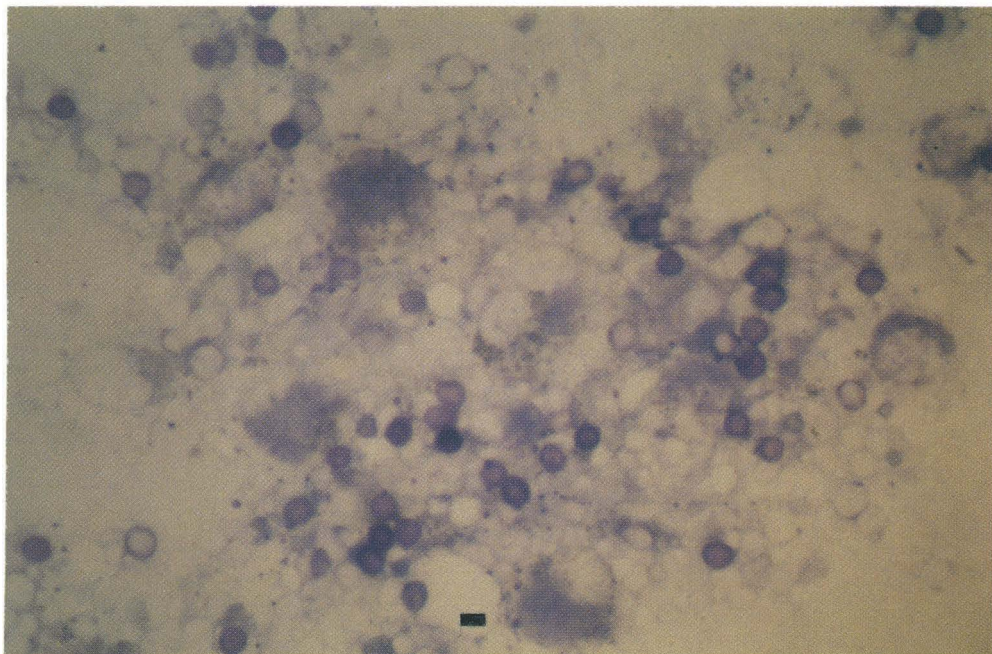
died from diarrhoea and only 1 from pneumonia, however, and *Bordetella bronchiseptica* was isolated from the pig dying from pneumonia.

Our findings do not allow any conclusion as to the potential pathogenic role of *Pneumocystis carinii* in large domestic animals in Denmark. Elsewhere, however, pneumocystosis and *Pneumocystis* pneumonia have been observed in goats (McConnell *et al.* 1971) and horses (Shively *et al.* 1973), and 4 reports on pneumocystosis and *Pneumocystis* pneumonia in pigs have occurred. Thus pneumocysts have been observed in piglets affected by exudative pneumonia in CSSR (Jelínek loc. cit. Bondy 1958) and in pigs in USSR (Nikolskij & Scetinin 1967). Pneumocystosis and *Pneumocystis* pneumonia have been reported in 3 out of 24 research pigs, 4 months old, in CSSR (Kučera *et al.* 1968). At the age of 2 months these pigs experienced an acute pneumopathia with coughing, dyspnoea and fever lasting 2 weeks. After the acute attack a chronic condition with coughing and mild dyspnoea persisted until they were slaughtered. At necropsy the lungs showed hypertrophied interstitia and foci with red and grey infiltrations. Histology

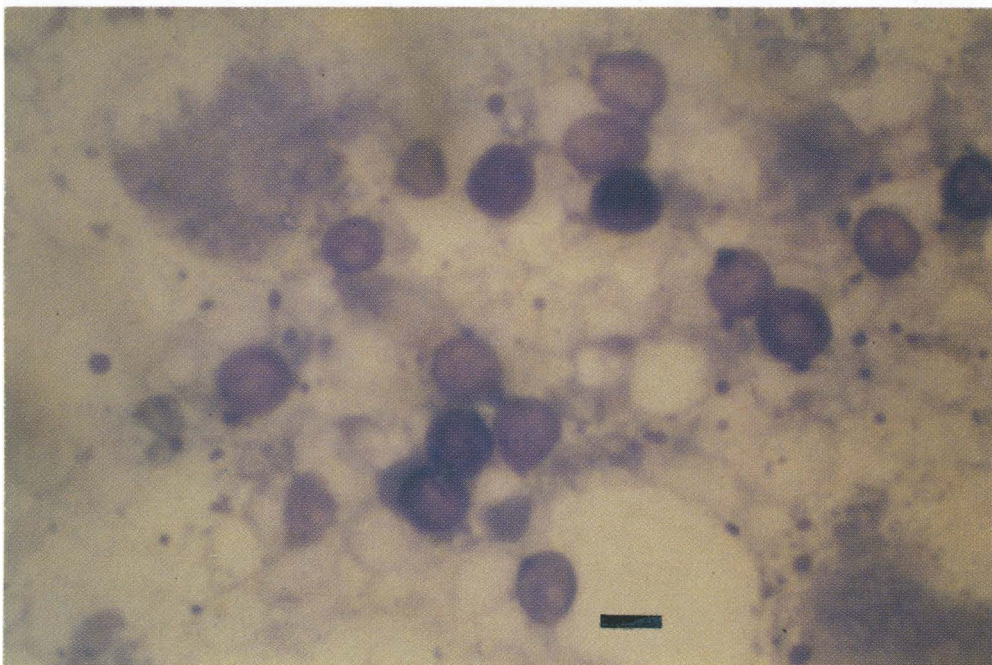
showed honeycombed material in some of the alveoli and pneumocysts were seen in lung imprints. One case of *Pneumocystis* pneumonia in a 10-week-old pig has been described in Maine, U.S.A. (Seibold & Munnell 1977).

Pneumocystis carinii is apparently not a primary pathogenic microorganism in a host with normal defence mechanisms (Hughes 1978, Pifer 1984). It may, however, be fatal in hosts affected by infections or other diseases resulting in a decreased competence of the host's immune system. Diarrhoeotic conditions, resulting in a decreased absorption of essential nutrient factors and a loss of protein may allow unrestrained growth of *Pneumocystis carinii* in the lungs because of an impairment of the immune system (Hughes 1984). Pneumocysts and *Pneumocystis* pneumonia have been induced in rats given a protein deficient or protein-free diet (Hughes *et al.* 1974, Settnes & Lodal 1980), and pneumocysts have been observed in hares with enteritis due to coccidiosis and in a roe deer with a shotgun lesion in the *os mandibulare*, seriously impeding the feeding (Settnes *et al.* 1986). It is interesting to note that 3 out of the 4 piglets, massively infected

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A



B

Figure 1. (A) *Pneumocystis carinii* cysts from a pig. Necropsy lung imprint stained with Toluidine Blue O. 400 x. (B) Higher magnification of (A). 1000 x. The bars represent 5 μ m.

with pneumocysts, had died from diarrhoea. Future studies on the potential pathogenic role of *Pneumocystis carinii* in large domestic animals in Denmark, particularly in pigs will have to pay attention not only to lung disorders but to gastro-intestinal disorders with diarrhoea as well.

Acknowledgements

The authors want to thank Mr. Poul-Erik Larsen and Miss Lotte Pedersen for excellent technical assistance.

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Sammendrag

Pneumocystis carinii i større danske husdyr. En foreløbig rapport.

En undersøgelse for forekomsten af *Pneumocystis carinii* i lungerne hos større huspattedyr er foretaget. Aftrykspræparater er fremstillet af lungevæv udtaget fra dyr indsendt til diagnostisk undersøgelse på

Statens Veterinære Serumlaboratorium i København. Efter farvning med ortho-toluidinblåt er aftrykspræparaterne undersøgt mikroskopisk. Pneumocyster er blevet påvist i lungerne fra 6 kalve ud af 160 undersøgte (3.8%), 1 får ud af 28 undersøgte (3.6%) og 8 grise ud af 119 undersøgte (6.7%). Det er første gang pneumocyster påvises i kalve, får og grise

i Danmark. De fleste undersøgte dyr havde kun en lettere infektion i lungerne, dvs. kun enkelte pneumocyster kunne påvises, men 4 grise i alderen 2-7 uger havde en massiv infektion. *P. Carnu*'s betydning for pneumonier hos grise må afklares gennem yderligere undersøgelser.

(Received January 6, 1989; accepted January 25, 1989).

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