Toxoplasmosis in a Siberian tiger (*Panthera tigris altaica*)

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TOXOPLASMA gondii is one of the most widespread parasites of warm blooded animals. However, Felidae are the only hosts capable of shedding oocysts (Miller and others 1972). Not only the domestic cat (*Felis catus*), but other members of the Felidae, such as the mountain lion (*F concolor*), ocelot (*F pardalis*), margay (*F weidii*), jaguarundi (*F yagouaroundi*) Asian leopard cat (*F bengalensis*), Pallas cat (*F manul*), bobcat (*Lynx rufus*), Iriomate cat (*Prionailurus iriomotensis*) and lion (*Panthera leo*) can also shed *T gondii* oocysts (Dubey 1986, Akuzawa and others 1987, Dubey and others 1987, 1988, Ocholi and others 1989). The number of oocysts shed by wild Felidae is usually low (Dubey 1986).

In September 1988, a faecal sample from a four-month-old female Siberian tiger (*Panthera tigris altaica*), held in captivity at a private zoo in Limburg, Belgium and with a history of a profuse diarrhoea for 14 days, was found positive for oocysts. These measured 12·4 μm × 10·5 μm. They were identified as *T gondii* after sporulation and inoculation into mice (Frenkel and Dubey 1975). The oocyst shedding was high : 200,000/g faeces. The tiger's condition worsened very quickly and four days after examination of the faecal sample it was euthanased. At necropsy, faeces collected from the tiger were negative for oocysts of *T gondii* but blood collected from the vena cephalica before euthanasia contained antibodies to *T gondii* (titre 1:128) in the modified agglutination test (Desmonts and Remington 1980).

At necropsy a diaphragmatic hernia, pneumonia and severe osteoporosis were demonstrated. A few adult *Toxocara cati* worms were found in the small intestine. Portions of lung, heart, liver, spleen, kidney, pancreas, duodenum, jejunum, colon, mesenteric lymph nodes, cerebrum, cerebellum, thigh muscle, parathyroid gland and humerus were fixed in 10 per cent formol saline, embedded in paraffin, sectioned at 5 μm and stained with haematoxylin and eosin, Giemsa and periodic acid Schiff. Five to 50 g portions of the same organs, except the parathyroid gland and the humerus, were homogenised in a saline solution with added antibiotics (1000 iu of penicillin and 100 μg of streptomycin / ml). Each organ homogenate (1 ml) was inoculated intraperitoneally into two mice.

Histological examination demonstrated a dehydrated aspect of the tissues with mixed bacterial infections but no infection by toxoplasma could be demonstrated. The small intestine showed epithelial desquamation and hypotrophy, infiltration by neutrophils and the presence of eosinophils and mast cells. Asexual or sexual stages of toxoplasma were not detected. The mesenteric lymph nodes had an exhausted aspect with lymphocytic depletion in the lymphoid follicles with clear germinal centres. Eosinophils were present within the medullary cords and sinuses. A slight meningitis was observed. The principal cells of the parathyroid gland were hyperplastic with an eosinophilic enlarged cytoplasm. The compact bone of the humerus was as thin as the periosteum. Numerous osteoblasts were lying against the trabeculae and poor endochondral ossification was noted. All mice inoculated with the tissue homogenates survived and 30 days after inoculation they were slaughtered and exsanguinated. Agglutinating antibodies to *T gondii* were absent (Desmonts and Remington 1980) and toxoplasma cysts were not found in their brains.

Although toxoplasmosis can cause severe lesions in domestic and wild Felidae, especially in young animals (Dubey 1986), the pathological lesions demonstrated that the rapidly declining clinical condition in this young tiger was caused by a severe diaphragmatic hernia and alimentary hyperparathyroidism, complicated by bacterial septicaemia and not to disseminated toxoplasmosis. It is not known if the diarrhoea was caused by toxoplasma. Nevertheless, this is the first report of oocyst shedding of *T gondii* in a Siberian tiger. The negative coprological examination and the presence of antibodies at necropsy indicate that the patent period was finished at that time (Dubey and Frenkel 1972). The source of the toxoplasma-infection was probably the ingestion of tissue cysts through contaminated raw condemned pork. Cyst-induced toxoplasmosis in cats usually leads to simultaneous intestinal and extra-intestinal infection. In some cats, toxoplasma infection may be confined to the gut and after oocyst production has ceased, infection may be eliminated. However, in such cases antibodies are not developed (Dubey and Frenkel 1972). This report also shows that wild Felidae can present high oocyst shedding and consequently seriously contaminate the environment. In zoological gardens this forms a threat to some species which are highly susceptible to toxoplasmosis, like New World monkeys (Dubey and others 1985).

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Different morbilliviruses in European and Siberian seals

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THE recent epizootic among harbour seals (*Phoca vitulina*) in North West Europe was caused by a morbillivirus (phocid distemper virus, PDV) related to canine distemper virus (CDV) and rinderpest virus (RPV) (Kennedy and others 1988, Mahy and others 1988, Osterhaus and others 1988, Osterhaus and Vedder 1988, Osterhaus and others 1989c). It was also shown that a CDV-like morbillivirus had caused an epizootic of distemper in Lake Baikal seals (*Phoca sibirica*), one year before the outbreak took place in North West Europe (Grachev and others 1989, Osterhaus and others 1989a). Therefore, it has been speculated that the virus may have spread from Siberia to Europe either by terrestrial carnivores or by means of the extensive bird migration between Siberia and Europe (Osterhaus and others 1989a). Using a selected panel of monoclonal antibodies (mAbs) generated against the structural proteins of CDV (Örvell and others 1985), the present authors have antigenically compared a morbillivirus isolate from the Lake Baikal seals (MbV-B) (Osterhaus and others 1989a) with a PDV isolate from European seals (Osterhaus and others 1988),

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TABLE 1: Reactivity of canine distemper virus (CDV) in mAbs (Örvell and others 1985) in an indirect immunofluorescence assay with measles virus (MV), rinderpest virus (RPV), canine distemper virus, phocid distemper virus (PDV) and morbillivirus isolate from the Lake Baikal seals (MbV-B)

mAbs	Group number	MAb number	MV	RPV*	CDV	PDV	MbV-B
α-N		3564	–	–	+	–	+
		3662	–	NT	+	–	+
	(1)	3721	–	–	+	–	+
		3775	–	NT	+	+	+
	(3)	3805	–	+	+	+	+
	(4)	3958	–	–	+	+	+
	(5)	3991	–	–	+	–	+
	(7)	4100	–	–	+	+	+
		4271	–	NT	+	+	+
α-P		3568	–	–	+	+	+
		3630	–	–	+	–	+
	(3)	3695	–	–	+	–	+
		3768	–	–	+	+	+
	(4)	3780	–	–	+	+	+
		3788	–	–	+	+	+
	(5)	4051	–	–	+	–	+
	(6)	4088	–	–	+	+	+
α-F	(2)	3551	+	+	+	+	+
	(2)	3584	+	+	+	+	+
	(2)	3697	+	+	+	+	+
	(2)	4068	–	–	+	–	+
	(3)	4985	–	–	+	–	–
	(1)	5086	+	+	+	+	+
	(3)	5148	–	–	+	+	+
α-H	(1)	1347	–	NT	+	+	+
	(2)	2267	–	NT	+	–	+
	(3)	3734	–	NT	+	–	–
	(4)	3775	–	NT	+	–	–
	(3)	3900	–	NT	+	–	–
		4074	–	NT	+	+	+
	(6)	4275	–	NT	+	–	–
	(7)	4941	–	NT	+	–	–

Virus strains, propagated in Vero cells: MV LEC-K1 strain; RPV RBOK vaccine strain; CDV Onderstepoort strain; PDV European isolate (Osterhaus and others 1988); MbV-B Lake Baikal isolate (Osterhaus and others 1989a)
Immunofluorescence staining; + Distinct; – Negative * Data partly taken from Sheshberadaran and others 1985)
NT Not tested

CDV, RPV, and measles virus (Table 1). The mAbs were tested in an indirect immunofluorescence assay (Osterhaus and others 1988) on Vero cells infected with the respective viruses. As expected (Sheshberadaran and others 1985), only a minority of the mAbs reacted with measles virus and RPV. All the N- and P-specific mAbs and all except one of the F-specific mAbs reacted with MbV-B. Also three of the eight H-specific mAbs recognised this virus. PDV was recognised by five of the nine N-specific, five of the nine P-specific and five of the eight F-specific mAbs, whereas three of the eight H-specific mAbs reacted with this virus.

These data indicate that the MbV-B isolate is antigenically very similar to CDV and may on the basis of the known antigenic variation amongst CDV isolates, which is most pronounced in the H protein (Örvell and others 1985), perhaps even be regarded as a genuine CDV isolate. The PDV isolate is antigenically more distinct from CDV, and PDV should, on the basis of the cross reactivities observed and in line with previous suggestions (Mahy and others 1988), be regarded as a separate phocid morbillivirus.

The demonstration of three apparently different morbilliviruses in seals, PDV, the CDV-like isolate from Lake Baikal seals and a morbillivirus which was recently shown to have infected European harbour seals before the epizootic of 1988 (Osterhaus and others 1989b), indicates that seals may be considered important host species of morbilliviruses. More detailed biological and biochemical studies on different morbillivirus isolates of pinniped species will be required to further resolve their origins and variations.

From the data presented it should be considered unlikely that an epizootiological link has existed between the epizootics among seals in North West Europe and Lake Baikal.

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Tracheal foreign body in a German shepherd dog

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A THREE-year-old entire male German shepherd dog was presented at Cambridge veterinary school in a shocked and collapsed state. The dog had aspirated a metal spanner while presenting it to his handler during a retrieval exercise on the previous day. The local veterinary practice referred the case under pentobarbitone sedation to Cambridge veterinary school.

Clinical examination revealed tachypnoea with marked respiratory embarrassment. Periods of collapse were interspersed with excited

FIG 1: Dorsoventral radiograph of a spanner lodged in the trachea of a German Shepherd dog

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