month in the present study is representative of a real fall in prevalence.

Such a marked decline is likely to have been directly associated with the introduction and subsequent widespread use of the macrocyclic lactone endectocides in the cattle industry since the late 1970s (Burg and others 1979, Schneider and others 1999, Stafford and Coles 1999), given that ivermectin and doramectin have a high efficacy against *Thelazia* species (Kennedy and Phillips 1993, Kennedy and others 1994). Endectocide usage might also affect the prevalence of *Thelazia* species indirectly by reducing population numbers of, and hence transmission by, the muscid fly intermediate hosts. For example, residues of ivermectin, doramectin, moxidectin and eprinomectin have been shown to impair the development of *Musca* species in the dung of treated cattle (Floate and others 2001, Farkas and others 2003). Muscid population numbers are also influenced by changes in environmental temperature (Wall and Shearer 2001). Differences in mean temperature during the warmer months in the years before each of the survey periods might have influenced the number of *Musca* species pupae overwintering, and hence the number of adult flies on the wing early the following year. However, such changes in environmental temperature are unlikely to have been responsible for any decline in fly numbers in the present study, since the mean (se) monthly temperature between April and September in both 1975 and 2003 was similar (13·8 [1·7]°C, 14·7 [1·4]°C, respectively) (Meteorological Office 2004).

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Seminoma in a southern white rhinoceros (*Ceratotherium simum simum*)

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REPRODUCTIVE evaluation of both male and female white rhinoceroses has become commonplace in recent years in an attempt to elucidate the underlying causes of subfertility and reproductive failure in captive populations. Pathological changes observed in the reproductive tracts of female white rhinoceroses include uterine cystic hyperplasia and, less frequently, leiomyomas and adenomas (Hermes and others 2004). In male white rhinoceroses, germ cell degeneration and increased fibrosis of the interstitial space have been reported without apparent effects on fertility (Hermes and others 2005), but urogenital tract neoplasia has not been described in the male rhinoceros. This short communication describes the clinical diagnosis of testicular neoplasia, and its histological characterisation as a seminoma, in a captive southern white rhinoceros (*Ceratotherium simum simum*) with intact fertilising capacity.

In 2003, a 35-year-old, male southern white rhinoceros housed at the Western Plains Zoo, New South Wales, Australia, was anaesthetised for reproductive evaluation, including collection of semen by electroejaculation. Anaesthesia was induced with 3 mg etorphine hydrochloride (Etorphine; Vericore) and 10 mg detomidine hydrochloride (Domosedan; Orion), administered intramuscularly by projectile syringe, and maintained by the intravenous administration of 15 mg midazolam hydrochloride (Hypnovel; Roche) and 4 to 6 g guaifenesin (Giafen; Parnell) as required. Oxygen was delivered at 15 l/minute via nasal insufflation. At the conclusion of the procedure, anaesthesia was reversed with 150 mg naltrexone hydrochloride (Naltrexone; Kyron Laboratories), administered intravenously.

Transrectal and transcutaneous ultrasonographic examination of the accessory sex glands and testes, respectively, was performed using a B-mode ultrasound scanning system equipped with a 2 to 4 MHz convex array transducer (Sonosite Vet 180PLUS, C60 probe; Product Group International) with the rhinoceros in lateral recumbency (Hermes and others 2005). The dimensions of the accessory sex glands were determined by ultrasonography and used to calculate the volume of the accessory sex glands. The accessory sex gland volumes are listed, and compared with those

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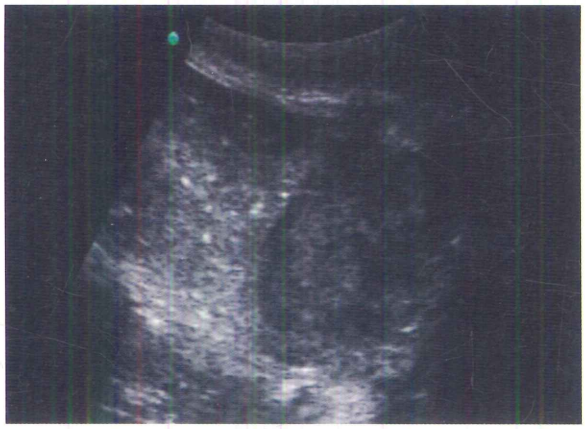

FIG 1: Ultrasonographic appearance of the left testis of a southern white rhinoceros, demonstrating the presence of a neoplastic mass

TABLE 1: Comparison of the mean (sd) accessory sex gland volumes and semen characteristics of white rhinoceros bulls with good fertility determined in a previous study (Hermes and others 2004) with those of a white rhinoceros bull with testicular neoplasia

Reproductive characteristic	Rhinoceros bull with testicular neoplasia	Rhinoceros bulls with good fertility
Bulbourethral gland volume (cm^3)	30·9	32·6 (1·8)
Prostate volume (cm^3)	45·0	50·4 (17·4)
Vesicular gland volume (cm^3)	38·5	46·4 (5·4)
Sperm motility (%)	90	86·8 (1·3)
Semen volume (ml)	21·25	67·4 (16·4)
Sperm concentration (x 10^6/ml)	131·1	75·8 (15·6)
Total sperm (x10^9/ejaculate)	2·8	2·8 (0·8)

of bull rhinceroses with good-quality semen, in Table 1 (Hermes and others 2005).

A well-demarcated structure of decreased echogenicity and inhomogeneous ultrasonographic appearance was identified in the caudal aspect of the left testis (Fig 1). Ultrasonographically, this mass was characterised as a neoplasm. Necrosis was not evident. The diameter of the cranial aspect of the left testis was less than that of the right testis and of the caudal aspect of the left testis containing the tumour mass. This was attributed to atrophy caused by pressure necrosis due to the presence of the tumour. The parenchyma of the right testis was homogenous, with occasional fibrotic foci.

A combination of electroejaculation, using a specifically designed rectal probe positioned via ultrasonography over the accessory sex glands, and manual massage of the penile and pelvic urethra was performed to collect semen (Hermes and others 2005). Approximately 21 ml of semen was collected into a sterile, warmed collection vial. The pre-freeze progressive motility of the sperm, assessed using a phase-contrast microscope with a warm stage, was 90 per cent and the concentration of sperm, determined using a haemocytomer, was 131·1 x 10^6 per ml. The semen was extended using a DMSO egg yolk extender before it was frozen in liquid nitrogen. In total, 44 0·5 ml straws, equivalent to 5 to 10 artificial insemination doses, were frozen. The post-thaw progressive motility of the sperm, following immersion of frozen straws in a waterbath at 37°C for 10 seconds, was assessed as 55 per cent.

The rhinoceros died 11 weeks later from unrelated causes. At postmortem examination, approximately two-thirds of the caudal parenchyma of the left testis was obliterated by a firm, pink to grey, homogenous mass (Fig 2). No evidence of metastatic disease was apparent. Histological examination of the tumour mass revealed that an amorphous proteinaceous material, which was partially mineralised and contained cholesterol clefts, was separated from the tumour tissue by prominent fibrous bands. The tumour cells were present as densely packed, broad sheets divided by fine, fibrous septae into poorly defined pseudolobules. In some areas within the tumour, small lakes of proteinaceous exudate were completely surrounded by tumour cells, and small accumulations of loosely arranged lymphocytes were scattered throughout. Tumour cells sometimes completely surrounded seminiferous tubules that were undergoing degeneration (Fig 3). Typically, the tumour cells were large and polyhedral, with much eosinophilic cytoplasm and pleomorphic vesicular nuclei, which mostly contained one or several nucleoli. Mitoses were frequent (approximately one to two per high-powered field) and were sometimes bizarre. Necrosis of single cells or small groups of cells within the tumour was common. In sections of testis submitted with the tumour, spermatazoa were abundant in the tubules but there appeared to be excessive stroma between the seminiferous tubules, in some of which there was spermiostasis and mineralisation. A diagnosis of malignant seminoma was made.

Seminomas are the most frequently occurring testicular neoplasm in horses – a domesticated member of the order Perissodactyla – and occur most often in cryptorchid testes (Schumacher and Varner 1993, Slusher 1997, Brinsko 1998). Seminomas are rarely reported in wildlife (Seefeldt and Helfer 1980, Karesh and Kunz 1986, Gonzalo and others 1992, Reimer and Lipscomb 1998) and have not previously been reported in captive or free-ranging rhinoceros species. The lack of neoplastic processes affecting the urogenital tract of

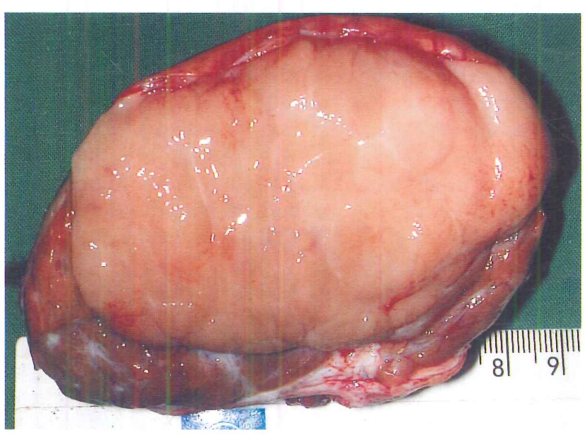

FIG 2: Gross appearance of the cut surface of the seminoma, showing the reduction of normal testicular tissue to a thin rim surrounding the tumour. Bar is in cm

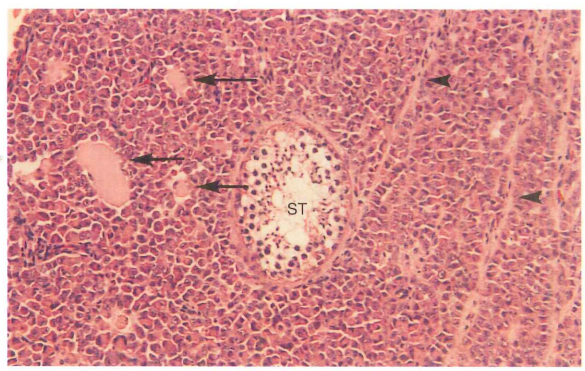

FIG 3: Histological appearance of the testicular tumour. A degenerating seminiferous tubule (ST) is completely surrounded by tumour cells. Small lakes of proteinaceous exudate (arrows) and thin but irregular fibrous septae (arrowheads) can be seen. Haematoxylin and eosin. x 20

captive male rhinoceroses is in contrast to the situation in female rhinoceroses, in which reproductive tract neoplasia, in particular uterine leiomyomas, is a common finding in older, captive females. Neoplastic and other pathological changes in the reproductive tracts of female rhinoceroses have been attributed to an asymmetric ageing process associated with continuous oestrous cycle activity without conception (Hildebrandt and others 2002, Hermes and others 2004).

Seminomas in stallions have been associated with traumatic injury and the subsequent exposure of the surrounding tissue to spermatozoa and seminal fluid (Slusher 1997). Seminomas in the stallion grow rapidly (Brinsko 1998), and similar findings might plausibly be expected in male rhinoceroses. The male rhinoceros described here had been introduced to three new females approximately six months before the neoplastic mass was characterised ultrasonographically. Establishment of a social hierarchy within the group involved a prolonged period of low-grade fighting, and it is possible that the male sustained testicular trauma from one of the females and subsequently developed the seminoma. Alternatively, the seminoma may have arisen spontaneously.

Characterisation of the neoplastic mass as a seminoma might have been achievable antemortem by testicular biopsy; however, the potential for transient or permanent reductions in fertility following biopsy remains to be quantified accurately in many species. The options for management of the unilateral testicular neoplasia in this animal could have included surgical removal of the affected testis or local cryotherapy, both of which were considered likely to reduce its fertility. A conservative approach was elected in this case because of the animal's age and intact fertilising capacity, and the benign ultrasonographic appearance of the neoplastic mass.

The reproductive parameters of the male rhinoceros were well maintained despite the presence of the testicular neoplasia. The sizes of the gonads and accessory sex glands were within the ranges described for male white rhinoceroses producing sperm-rich ejaculates in a previous study (Hermes and others 2005), although considerably smaller than values recorded for male white rhinoceroses in another study (Schaffer and others 2001). The characteristics of the semen were within limits described for males over 30 years of age and considered to be of high breeding potential (Hermes and others 2005). The findings in the present case were consistent with previous studies that concluded that age-related degenerative changes in the reproductive tract of male rhinoceroses had little effect on the semen characteristics (Hermes and others 2005). The fertilising capacity of the male rhinoceros was further confirmed when 30-day-old and 60-day-old fetuses were imaged ultrasonographically in two female rhinoceroses that had been housed exclusively with the male for six months before its reproductive assessment.

Cryopreservation of semen in this case ensured the preservation of genetic potential beyond the animal's life span (Hermes and others 2005). An artificial insemination technique has been developed for species of rhinoceros (Hildebrandt and others 2002), but to date only one pregnancy has been carried beyond the first trimester. Further refinements to this technique, including the more accurate timing of insemination in relation to detection of ovulation subsequent to natural oestrous cycles or synchronisation protocols, offer the opportunity for this male's genetic potential to be realised in the future.

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Uterine horn torsion in a pregnant cat

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UTERINE torsion is defined as twisting of the uterus or uterine horn perpendicular to its long axis (Bloom 1954, Roberts 1971). It is observed more commonly in multiparous animals than in primiparous animals due to stretching of the broad ligament in previous pregnancies, which is a predisposing factor for the condition (Roberts 1971). In cows and mares, uterine torsion occurs during the first stage of labour, but it is reported to be a complication of mid- to late gestation in other domestic species (Roberts 1971, Pratt 1983). The condition is rarely reported in cats, but, if present, it is usually observed to occur just before parturition (Bloom 1954, Kudale and others 1972). The degree of torsion varies from 180° to 900° and is an important factor affecting the clinical signs and thus the prognosis, as it can cause fatal consequences during corrective surgery (Pankhurst and Newman 1961). Previous reports have described uterine torsions in cats in late pregnancy due to twisting at the base of the uterine horn and ovarian end (McIntire and Waugh 1981, Biller and Haibel 1987, Ridyard and others 2000). This short communication describes the clinical findings, surgical management and clinical outcome of a cat with a mid-gestational uterine torsion.

A two-year-old, pregnant British shorthair cat weighing 3·4 kg was presented to the University Veterinary Hospital, University of Putra Malaysia, with a history of scanty, blood-tinged vaginal discharge, anorexia and dullness for a duration of 36 hours before presentation. The cat was kept indoors and its vaccinations were up to date. It had been in

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