Necrobacillosis in Wildebeest Calves

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TABLE 1. Susceptibility of California ground squirrels to plague and pathological signs of disease.

	Number of *Y. pestis* inoculated			
	Squirrels 5 mo of age			Squirrels 24 mo of age
	6–60	600–6,000	60,000–600,000	100,000
Mortality (no. dead/no. inoculated)	17% (3/18)	39% (7/18)	60% (6/10)	83% (5/6)
Average day of death	9.7	9.7	5.7	9.4
Bubo at site of inoculation[a]	0% (0/3)	0% (0/7)	0% (0/6)	100% (5/5)
Abscess in spleen or liver[a]	33% (1/3)	14% (1/7)	17% (1/6)	80% (4/5)
Agonal nosebleed[a]	0% (0/3)	57% (4/7)	17% (1/6)	0% (0/5)

[a] Parentheses give number presenting over number examined. The squirrels examined were those that died of plague.

was not demonstrated in this study. Admittedly, only small numbers of squirrels could be tested, but earlier investigations by Meyer (1942, op. cit.), in which hundreds of California ground squirrels were tested, also failed to demonstrate such a difference. However, old squirrels displayed a greater ability to localize infection in our study, as evidenced by a high frequency of abscess formation. This ability was insufficient to overcome disease by fully virulent *Y. pestis*, although death was delayed in most old squirrels. Perhaps old squirrels might be more capable than young animals of surviving inoculations with lesser doses of virulent *Y. pestis* or infections with strains of reduced virulence (Cavanaugh and Williams, 1980, *In* Fleas, Traub and Starcke (eds.), Balkema, Rotterdam, Netherlands, pp. 245–256).

Young squirrels present a great threat of contagion because of agonal nosebleeding during bacteremia. Such animals, and their carcasses, are especially hazardous to persons and wild or domestic animals that have contact with them. Agonal nosebleeding in old squirrels, while not observed in this study, remains a possibility at lower infective doses of *Y. pestis*.

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Rosen (1981, *In* Infectious Diseases of Wild Mammals, 2nd Ed., Davis, Karstad and Trainer (eds.), Iowa State Univ. Press, Ames, Iowa, pp. 332–338) described necrobacillosis as an infectious disease caused by *Fusobacterium necrophorum* characterized by a purulent, hoof necrosis in wild ruminants. This condition is better referred to as "foot abscesses" rather than "hoof rot," a condition normally associated with a distinctly separate disease. Drager (1975, Trop. Anim. Prod. 7: 200) diagnosed necrobacillosis in gemsbok (*Oryx gazella*) in the Kalahari Desert, Botswana and it has been implicated as an infection in wildebeest (*Connochaetes taurinus*) in the Serengeti National Park (Talbot and Talbot, 1963, Wildl. Monog. 12: 1–88; Mustafa, 1973, Coll. Afr. Wildl. Manage., Mweka, Tanzania, 126 pp.).

Stobart (1970, Tanz. Game Div. Rep. Dar-es-Salaam, Tanzania, 30 pp.) made reference to a severe outbreak of a condition in wildebeest calves that answers the description of the foot abscess form of necrobacillosis. This occurred during the wet season near the Miombo Research Center in the eastern sector of the Selous

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Game Reserve, Tanzania. The estimated recruitment of calves into yearlings for that year was relatively low, i.e. 50%.

In the wet season of 1972, I recognized a similar condition in the northern sector of the Reserve (Gainer, 1979, M.S. Thesis, Univ. British Columbia, Vancouver, British Columbia, 203 pp.). Virtually every herd of wildebeest in this area contained calves that were lame. Two 3-mo-old calves were collected for examination as part of a survey of the parasites, diseases and anomalies of wildlife in the Reserve.

One calf was weak and captured by hand, another was shot. The live calf was lethargic and reluctant to move, maintaining a head-down, stiff-legged posture. Its rectal temperature was 36 C, the ambient air temperature. Several limb joints were noticeably enlarged and purulent material drained from the left front interdigital space. Despite treatment with procaine penicillin, the animal died 20 hr later.

At necropsy, both calves had limb joints full of a dry, caseous material. The intermetacarpals and intermetatarsals were the most severely affected joints, but the most extensive involvement was one of the live calf's coxofemoral joints. The joint capsule was obliterated completely and the necrotic femoral head had separated from the femur. In addition, the liver of this calf had a 15-cm region of unwalled necrosis and a 2-cm localization of inflammation in the left posterior-dorsal lung. These lesions are all typical of the fulminating foot abscess form of necrobacillosis in young ruminants (Rosen, 1981, op. cit.).

Several samples of the joint material were submitted for bacterial culture and identification. From this material *F. necrophorum* was isolated and identified according to established criteria (Merchant and Packer, 1971, Veterinary Bacteriology and Virology, Iowa State University Press, Ames, Iowa, 752 pp.).

Despite the fact that this is the first published account of necrobacillosis in wildebeest, biologists in the area consider this disease to cause significant losses in this species. The recruitment of calves into yearlings in the population near Miombo Center was 80% in 1972 and 1973, approximately 25% higher than in 1969 when the outbreak occurred. Calves that are even mildly affected would have little chance of escaping predation. In this area, wildebeest were the only species affected, and only calves were involved.

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Fetal Mummification in the Sandbar Shark, *Carcharhinus plumbeus* (Nardo, 1827)

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Reports of fetal mummification in sharks are rare. Randall (1977, Pac. Sci. 31: 143–164), Springer (1960, Fish. Bull. 178, 61: 1–38) and Clark and von Schmidt (1965, Bull. Mar. Sci. 15: 13–83) reported fetal "mummies" but provided no detailed descriptions. Springer (1960, op. cit.) reported two fetuses of *C. plumbeus* with no noticeable putrefactive decomposition. Randall (1977, op. cit.) reported one fetus in *Triaenoden obesus*, and Clark and von Schmidt (1965, op. cit.) reported three species representing three genera of the family Carcharhinidae, *Mustelus norrisi* (1 fetal mummy); *Carcharhinus plumbeus* (2 fetal mummies) and

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