Hematologic and Serum Chemical Values for Free-ranging Bobcats, Felis rufus (Schreber), with Reference to Animals with Natural Infections of Cytauxzoon felis Kier, 1979

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bination of drugs (Pertz and Sundberg, 1978, J. Am. Vet. Med. Assoc. 173: 1243).

Another possible diagnosis for the deaths of these four wolves was peracute CM. However, failure to obtain skeletal muscle and blood for histopathologic and serum chemistry examinations precluded confirming this diagnosis. CM accompanying capture stress is well documented in free-ranging ungulates (Chalmers and Barrett, 1982, *In* Noninfectious Diseases in Wildlife, Hoff and Davis (eds.), Iowa State Univ. Press, Ames, Iowa, pp. 84–94) but has not been reported in wild carnivores. All four wolves died immediately after anesthesia, a finding which is consistent with death from hyperacute and acute forms of CM, in which shock, acidosis, and hyperthermia are primary components. Because of frequent physical exertion necessitated by their predatory behavior and their physiological adaptation to it, wolves may not be as susceptible to the less acute forms of CM observed in ungulates.

In conclusion, our experience suggests that EH in combination with AP should not be used for capturing wolves from a helicopter during periods of high ambient air temperatures. This drug and dose (2.5 mg EH/5 mg AP) combination resulted in a significant increase in capture mortality during these periods. Conceivably, the same thermoregulatory disruption could also occur at very low temperatures. EH alone, or possibly in combination with a different, less potent phenothiazine tranquilizer, appears satisfactory for immobilizing wolves from a helicopter during these periods.

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There is little information available on hematologic and serum chemical values for free-ranging felids. As a portion of a separate study, 16 free-ranging bobcats were live-trapped in Oklahoma. Animals were immobilized with ketamine hydrochloride (20 mg/kg) (Bristol Laboratories, Syracuse, New York 13201, USA) within 24 hr of capture. Blood samples were obtained from the jugular vein and placed into vacutainer tubes containing EDTA(K_3) and vacutainer tubes without anticoagulant. Hematologic values determined included total red blood cells, packed cell volume, hemoglobin, total leukocytes and differential leukocyte counts. Serum chemical values determined were blood urea nitrogen, albumin, globulin, calcium, creatine, glucose, mag-

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TABLE 1. Hematologic and serum chemical values for free-ranging bobcats from Oklahoma.

	Bobcats without observable erythroparasites ($n = 11$)	Bobcats with natural infections of *Cytauxzoon felis* ($n = 5$)
Red blood cells ($\times 10^6/\mu l$)	6.1 (4.5)*	7.7 (4.6)
Hemoglobin (g/dl)	13.1 (1.6)	12.0 (1.8)
Packed cell volume (%)	36.3 (4.5)	31.8 (4.8)
Leukocytes ($\times 10^3$/ml)	10.6 (6.5)	14.7 (6.2)
Blood urea nitrogen (mg/dl)	31.4 (9.4)	28.2 (8.2)
Creatinine (mg/dl)	0.7 (0.5)	1.2 (0.5)
Glucose (mg/dl)	101.8 (70.1)	153.6 (76.1)
Serum protein (g/dl)	7.1 (0.2)	8.3 (0.3)
Albumin (g/dl)	3.6 (0.2)	2.7 (0.3)
Globulin (g/dl)	4.4 (0.7)	4.6 (0.8)
Calcium (mg/dl)	9.2 (0.6)	8.4 (0.7)
Phosphorus (mg/dl)	5.5 (1.5)	5.3 (1.5)
Potassium (mEq/L)	4.2 (4.1)	4.2 (4.4)
Sodium (mEq/L)	155.6 (6.0)	154.4 (5.0)
Neutrophils (#/μl)	8,271.9 (416.6)	13,441.3 (459.5)
Lymphocytes (#/μl)	2,165.6 (812.2)	2,045.3 (854.5)
Monocytes (#/μl)	69.6 (106.9)	66.0 (132.0)
Eosinophils (#/μl)	307.3 (696.9)	281.5 (482.7)
Basophils (#/μl)	26.1 (29.9)	36.0 (45.6)
Mean corpuscular volume (μl)	59.5 (4.1)	41.3 (4.3)
Mean corpuscular hemoglobin concentration (%)	21.5 (4.0)	15.6 (4.2)
Mean corpuscular hemoglobin (μg)	36.1 (3.2)	37.7 (3.4)

* Numbers in parentheses are standard deviations.

nesium, phosphorus, potassium, sodium and serum protein. All hematologic and serum chemical values were determined by standard laboratory procedures using human standards. Albumin standards were verified against domestic animal species by electrophoresis.

Table 1 lists hematologic and serum chemical values for 16 free-ranging bobcats: 13 adult females and three adult males. Statistical comparisons of physiologic values utilizing the Student's t-test showed greater numbers of eosinophils in male bobcats (5.7% vs. 0.4%) and higher glucose values for females (150.2 mg/dl vs. 100.3 mg/dl). There were no significant sex-associated differences in other values at the $P = 0.05$ level of significance.

Examination of stained peripheral blood films (Diff-Quik stain, Dade Diagnostics, Aguada, Puerto Rico 00602) revealed that five of the 16 cats were infected with *Cytauxzoon felis* as indicated by intraerythrocytic piroplasms (Glenn et al., 1982, J. Am. Vet. Med. Assoc. 181: 1251–1253). Statistical comparison of physiologic values utilizing the Student's t-test showed lower values in cats infected with *C. felis* for PCV (31.8% vs. 36.3%), albumin (2.7 g/dl vs. 3.6 g/ml) and calcium (8.4 mg/dl vs. 9.2 mg/dl). Total serum protein (8.3 g/dl vs. 7.1 g/dl) and glucose (153.6 mg/dl vs. 101.8 mg/dl) values were statistically higher in cats with *C. felis* (Table 1). Other values were not statistically different at the $P = 0.05$ level of significance.

Physiologic values for bobcats were similar to those of domestic and other wild felines (Fowler, 1978, Zoo and Wild Animal Medicine, W. B. Saunders, Philadelphia, Pennsylvania, pp. 650–667; Schlam, 1975, Veterinary Hematology, Lea and

Febiger, Philadelphia, Pennsylvania, pp. 219–283). Of interest was the observation that the granules seen in the eosinophils of the bobcat were densely packed and rodlike, similar to those reported for domestic cats rather than being round as seen in some wild felids (Schlam, 1975, op. cit.).

Although the values reported in this study should prove useful in future hematologic studies in bobcats, they cannot be considered as normal. The excited state of the cats at the time of sampling and the use of ketamine for immobilization undoubtedly produced variations from the normal state. Studies have shown that, even in domestic cats, the state of excitement can directly affect the values obtained in leukocyte numbers and in the percentage of specific leukocyte types (Coles, 1974, Veterinary Clinical Pathology, W. B. Saunders, Philadelphia, Pennsylvania, pp. 40–98). As would be expected, the values obtained in this study revealed excessively large standard deviations in total leukocyte numbers, percentages of lymphocytes and neutrophils, total number of red blood cells, blood urea nitrogen, glucose, and potassium values.