Pulmonary Carcinoma in a Captive Fennec Fox

Jennifer N. Niemuth, DVM; Seth N. Ghantous, DVM, Dipl ACVIM and Scott M. Averill, DVM, MS, Dipl ACVS

A 7-year-old castrated male fennec fox (*Vulpes zerda*) was presented with a 10-day history of coughing and regurgitation immediately after eating. The owner also noted that the fox’s water consumption was decreased and its urine appeared more concentrated. The fox had been neutered approximately 3 years prior and had no other medical history. The animal was not receiving any medications.

The fox was in adequate body condition (body weight 2.82 kg). It was lethargic on physical examination with tacky mucous membranes. Its temperature was elevated at 102.9°F (39.4°C). No other abnormalities were noted. Complete blood count and serum biochemistry values were within reference ranges.

Thoracic radiographs revealed a mass in the cranial mediastinum causing dorsal deviation of the esophagus cranial to the heart. Bicavitary ultrasonographic examination revealed a right cranial lung lobe mass measuring 1.43 cm x 1.64 cm (Fig 1) with a normal abdomen and no evidence of metastasis. A fine needle aspirate of the mass yielded a caseous yellow material on gross examination. Cytology, bacterial culture and fungal culture were submitted. The patient was discharged with famotidine (1 mg/kg PO q12h), amoxicillin clavulanate (Clavamox drops, 13.75 mg/kg PO q12h) and instructions for elevated feedings.

Cytological examination of the aspirate did not provide a definitive diagnosis but was consistent with a cyst, an area of necrosis or an obstructed bronchus. Aerobic and anaerobic bacterial cultures of the aspirate yielded no growth.

The patient was re-examined 5 days later and found to be depressed with a persistently elevated temperature of 103.1°F (39.5°C). The owners reported that the fox continued to regurgitate and had started vomiting. Repeat thoracic radiographs (Fig 2) showed a persistent mass in the right cranial thorax. Due to the persistent regurgitation and vomiting, nondiagnostic aspirate sample and progression of clinical signs, neoplasia was suspected. Surgical excision was recommended.

A right intercostal thoracotomy was performed to remove the right cranial lung lobe. The fox was induced with IV propofol (13.5 mg) to effect. Cefazolin (22 mg/kg) and buprenorphine (0.01 mg/kg) were administered IV at induction. The fox was intubated and maintained on isoflurane (3%) using a nonbreathing circuit.

Jennifer Niemuth graduated from the University of Wisconsin-Madison with a BS in Wildlife Ecology in 2004. She received her DVM degree from the University of Wisconsin-Madison in 2008. In 2009, Jennifer fulfilled a rotating, small animal internship at Animal Emergency and Referral Center in Northbrook, Illinois. She is currently completing an avian and exotics internship at Animal Specialty Center in Yonkers, New York and plans to pursue residency training and board certification in zoological medicine.
ECG, noninvasive blood pressure, pulse oximetry and capnography were monitored during surgery.

During the 4th intercostal thoracotomy approach, the 3rd, 4th and 5th ribs were fractured. The mass was soft and tan in coloration and measured 4 cm x 3 cm. It included the right cranial lung lobe hilus and was intimately associated with the great vessels of the heart. The local tumor invasion into the heart base caused the vasculature to be very friable. There was no evidence of metastasis within the thoracic cavity. Hemorrhage could not be controlled and humane euthanasia was recommended and elected. A full necropsy was not performed.

Histopathology of the mass was consistent with pulmonary carcinoma, pleocellular and neutrophilic inflammation. Fungal cultures from the fine needle aspirate had heavy growth of an *Aspergillus* sp.

**Discussion**

Wild canids, such as the fennec fox, are expected to have similar prevalence rates and types of neoplasia as the domestic dog. Reports of neoplasia are limited, especially in fennec foxes. Nutritional and metabolic bone diseases are common in many exotic species. Domestic dogs are unable to synthesize adequate amounts of vitamin D and therefore require a dietary source. Both calcium and phosphorus levels in this patient were considered within normal limits with an appropriate calcium-to-phosphorus ratio of 1:2.3. The diet of this fox, a commercial dog kibble, was also appropriate and should have been a nutritionally complete diet. The fragility of this fennec fox’s ribs may be normal for this species or may be secondary to pathology not detected by routine radiography and serology.

Primary pulmonary neoplasia is uncommon in domestic dogs, with metastatic pulmonary neoplasia being much more common. Almost all primary pulmonary tumors are carcinomas. In patients with solitary lesions, surgical excision is considered the most effective treatment. Radiation therapy may be used but requires intensity-modulated radiation therapy or CyberKnife® radiosurgery. Chemotherapy with single or multiple agents has also been used. Use of vinorelbine is promising in dogs with a 28.5% response rate for bronchoalveolar carcinoma. Computerized tomography (CT) may be used prior to any treatment for staging and obtaining biopsy samples. The presence of an *Aspergillus* sp. may be similar to cases in humans with concurrent cancer and a canine case where actinomycosis was found concomitant with pulmonary neoplasia. It is unknown if the fungal infection is clinically significant or if it can mask or delay a diagnosis of neoplasia. Other forms of pulmonary disease have been reported in the fennec fox, such as tuberculosis, histoplasmosis and pulmonary fibrosis. To the authors’ knowledge, this is the first documented case of pulmonary carcinoma in a fennec fox.

**References and Further Reading**