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Intestinal Lymphosarcoma in Captive African Hedgehogs

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ABSTRACT: Two captive adult female African hedgehogs (*Atelerix albiventris*) had inappetance and bloody diarrhea for several days prior to death. Both hedgehogs had ulceration of the small intestine and hepatic lipidosis. Histopathology revealed small intestinal lymphosarcoma with metastasis to the liver. Extracellular particles that had characteristics of retroviruses were observed associated with the surface of some neoplastic lymphoid cells by transmission electron microscopy. These are the first reported cases of intestinal lymphosarcoma in African hedgehogs.

Key words: *Atelerix albiventris*, African hedgehog, case report, intestine, lymphosarcoma, neoplasm.

An adult (estimated 3-yr-old) female captive born African hedgehog (*Atelerix albiventris*) housed at the Columbian Park Zoo, West Lafayette, Indiana (USA; 86°56′N 40°26′W) had sudden onset of weight loss and black diarrhea. The hedgehog was treated with 5% dextrose (Baxter Healthcare Corporation, Deerfield, Illinois, USA) injected subcutaneously, 0.3 ml Dexamethasone (Phoenix Pharmaceutical Inc., St. Joseph, Missouri, USA) injected intramuscularly, and 0.10 ml Amoxi drops (SmithKline Beecham Animal Health, West Chester, Pennsylvania, USA) and Nutrical (EVSCO Pharmaceuticals, Buena, New Jersey, USA) administered orally.

Despite supportive care, the hedgehog died and was submitted to the Animal Disease Diagnostic Laboratory at Purdue University (West Lafayette, Indiana, USA) for routine necropsy. The mucosa of the proximal small intestine had a single, 3.0 mm, circular, depressed ulcer. The serosa overlying the ulcer was hyperemic. Distal small intestinal contents consisted of blood-tinged mucus. The large intestine contained tarry fecal material. The liver was friable, yellow, and had a 2.0 mm, pale, raised mass within a single lobe. Sections of small intestine, liver, spleen, kidney, adrenal gland, heart, pancreas, lung, and brain were fixed in 10% neutral buffered formalin, embedded in paraffin, sectioned at 5.0 μm, and stained with hematoxylin and eosin (HE).

A privately owned 2.5-yr-old female captive born African hedgehog was anorectic, lethargic, and had intermittent green diarrhea for several days that progressed to dark, tarry diarrhea. Exploratory laporatomy revealed hemoperitoneum, an omental mass, thickened small intestine, and firm, mottled kidneys. Due to the poor prognosis, the hedgehog was euthanized intraoperatively with intraperitoneal injection of sodium pentobarbital (Euthanasia-6 solution, Vetlabs Limited, Lenexa, Kansas, USA). Sections of liver, kidney, small intestine, and omental mass were fixed in 10% neutral buffered formalin and processed for histopathology using the previously described protocol.

Histologically, the small intestine from both hedgehogs had lymphosarcoma (Fig. 1). The neoplasms were comprised of densely cellular sheets of discrete round cells that had large, anisokaryotic, round to oval, sometimes indented, single, vesicular nucleus with single to multiple, eosinophilic nucleoli, and lightly eosinophilic, cytoplasm with distinct cell borders (Fig. 2). Neoplastic round cells expanded and effaced the lamina propria and submucosa and multifocally infiltrated through the muscularis externa and into the serosa in both neoplasms. The mucosa was eroded, and villi were blunted and fused.

Both hedgehog livers had severe diffuse fatty degeneration of hepatocytes. Portal triads were expanded by neoplastic round cells that infiltrated into adjacent hepatic sinusoids (Fig. 3). Within the hepatic pa-

FIGURE 1. Small intestine of an African hedgehog with lymphosarcoma. The mucosa and submucosa were expanded by neoplastic lymphoid cells. Villi were atrophic and fused. H&E. Bar = 150 μm.

renchyma of one hedgehog was a partially circumscribed mass of neoplastic round cells. One hedgehog had metastasis of lymphosarcoma to both the mesenteric adipose tissue and kidneys. Other histologic findings were splenic extramedullary hematopoiesis in both hedgehogs and renal infarcts in one hedgehog.

A sample of formalin-fixed intestinal lymphosarcoma from one hedgehog was cut into $1mm^3$ sections, post-fixed in 1% osmium, embedded in 100% epoxy resin, sectioned, and stained with uranyl acetate and lead citrate. Ultrathin sections were examined using a JOEL 100 CX transmission electron microscope (JOEL Limited, Tokyo, Japan). Ultrastructurally, neoplastic cells had large, irregular, single nuclei with prominent, single nucleoli, multiple, large Golgi complexes, and extensive rough endoplasmic reticulum (Fig. 4). Variably sized (130–180 nm), pleomorphic, membrane-bound particles with highly variable core particles and dense surfaces were observed on the extracellular surface of approximately 5 to 10% of examined neoplastic cells (Fig. 5). The electron microscopic features of the particles had some characteristics of retroviruses (N. Cheville, pers. comm.).

A paraffin-embedded block containing representative tissue from the neoplasm was deposited in the Registry of Comparative Pathology (The Registry of Comparative Pathology, Armed Forces Institute of Pathology, Washington, D.C., USA; accession number 2617-98).

The gross lesions, light microscopic lesions, and ultrastructural features of the intestinal neoplasm in both hedgehogs were consistent with lymphosarcoma of the small intestine. Neoplastic disease is common in hedgehogs, but a limited number of cases have been reported (Frye and Dutra, 1973; Wadsworth et al., 1985; Schmidt and Hubbard, 1987; Hruban et

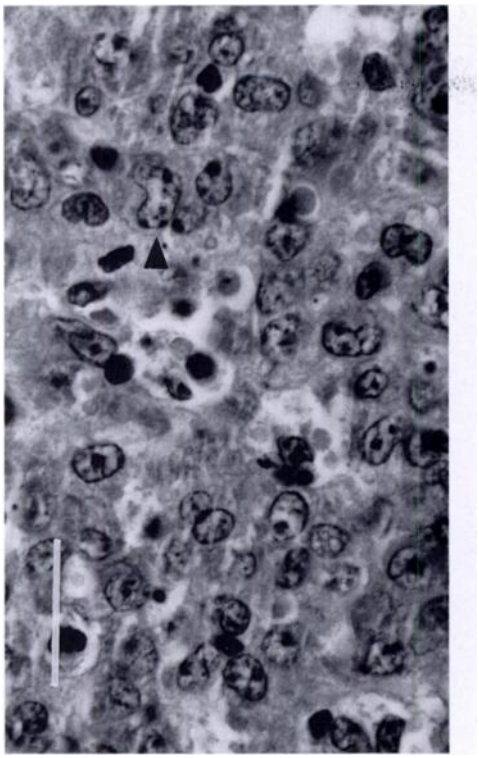

FIGURE 2. Sheets of neoplastic lymphoid cells from the small intestine of an African hedgehog with intestinal lymphosarcoma. Discrete round cells had large, round to oval, sometimes indented (arrowhead), single, vesicular nuclei with single to multiple nucleoli. H&E. Bar = 40 μm.

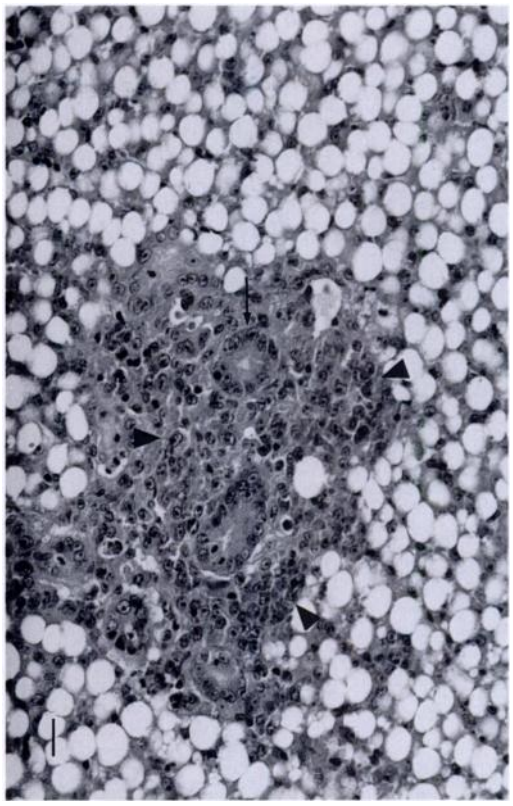

FIGURE 3. Liver from an African hedgehog with intestinal lymphosarcoma. Portal triads were infiltrated by neoplastic lymphoid cells (arrowheads). Note bile ducts (arrow) and diffuse fatty degeneration of hepatocytes. H&E. Bar = 30 μm.

al., 1992; Reams and Janovitz, 1992; Peauroi et al., 1994; Raymond et al., 1997). Neoplastic disease was noted in approximately 30% of hedgehog necropsies from an independent retrospective study (J. T. Raymond and M. R. White, unpubl. data). We believe these are the first reported cases of small intestinal lymphosarcoma in African hedgehogs.

Intestinal lymphosarcoma has been reported in dogs, cats, horses, cattle, swine, and sheep (Barker et al., 1993; Tanimoto et al., 1994). It can either be primary or part of multicentric neoplastic disease. Intestinal lymphosarcoma is the most frequently reported intestinal neoplasm in cats, and is often part of a multicentric disease (Brodey, 1966; Engle and Brodey, 1969). In dogs and horses, intestinal lymphosarcoma is usually primary and tends to involve mainly the small intestine with frequent metastasis to mesenteric lymph nodes and liver (Neufeld, 1973; Couto et al, 1989). The liver from both hedgehogs had metastatic disease, but mesenteric lymph nodes were not examined microscopically from either hedgehog. The primary site of lymphosarcoma in these two hedgehogs was most likely the small intestine with metastasis to the liver.

Microscopically, intestinal lymphosarcoma is characterized by diffuse infiltration of the lamina propria and submucosa by neoplastic lymphoid cells that usually extend into the serosa. There is usually atrophy and loss of intestinal villi. The histologic features of the intestinal lymphosarcoma in these two hedgehogs were very

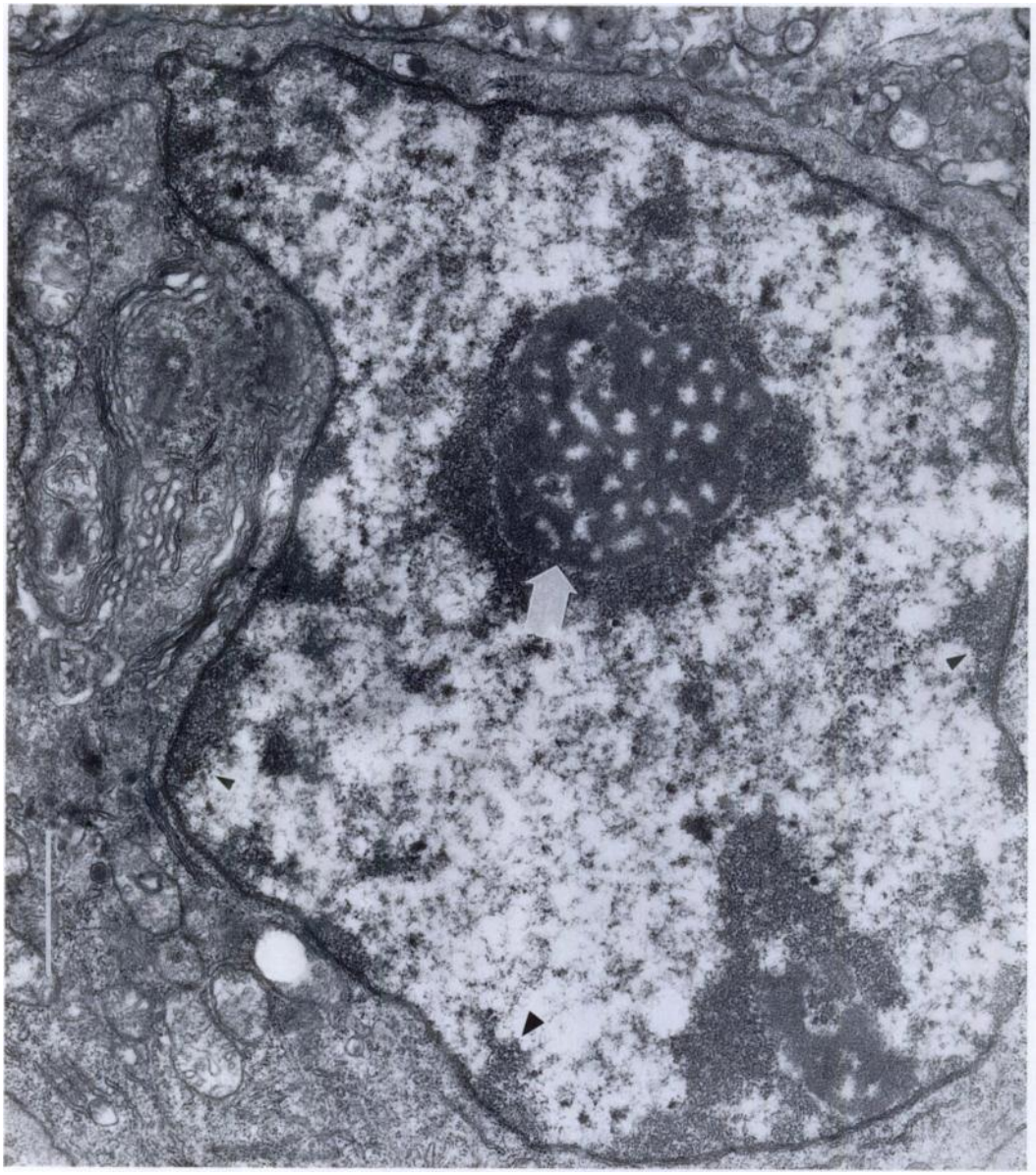

FIGURE 4. Electron micrograph of a neoplastic lymphoid cell from an African hedgehog with intestinal lymphosarcoma. Note the prominent, single nucleolus (arrow), marginated chromatin (arrowheads), large Golgi complexes, and extensive rough endoplasmic reticulum. Bar = 1.0 μm.

similar to intestinal lymphosarcoma in other mammals.

Diarrhea is a frequent clinical sign in mammals with enteric lymphosarcoma. Dogs with primary intestinal lymphosarcoma usually have combinations of emesis and diarrhea that can often be hemorrhagic (Couto et al., 1989; Valli and Parry, 1993). Atrophy and loss of intestinal villi can cause malabsorptive diarrhea in animals with intestinal lymphosarcoma (Roberts and Pinsent, 1975). Both hedgehogs had hemorrhagic diarrhea for several days and histologic evidence of damage to intestinal villi.

Retroviral infection has been associated

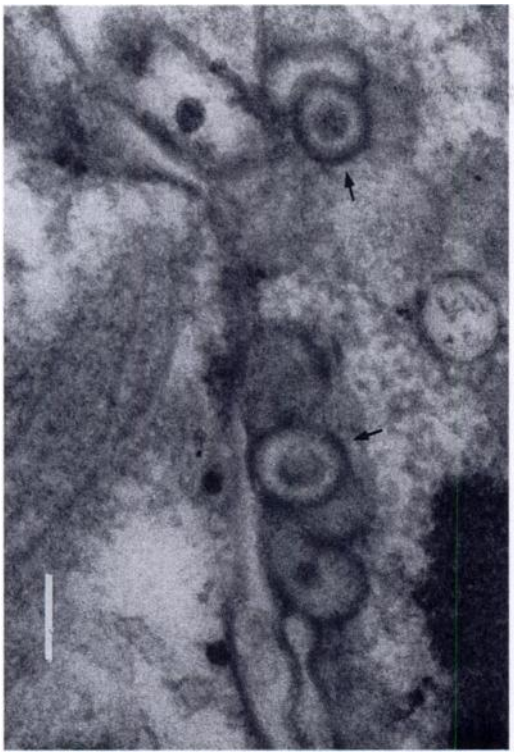

FIGURE 5. Electron micrograph of extracellular, variable sized, pleomorphic, membrane-bound particles that have characteristics of retroviruses (arrows) in an African hedgehog with intestinal lymphosarcoma. Bar = 150 nm.

with lymphosarcoma in cats, sheep, goats, ferrets, and bovines. Feline leukemia retrovirus is a horizontally transmitted tumorogenic disease of domestic cats. Enzootic bovine leukosis is a retroviral disease of adult cattle caused by bovine leukemia virus (BLV). Natural and experimental cases of lymphosarcoma in goats and sheep have also been due to BLV infection. Reverse transcriptase activity and retrovirus-like particles were observed in cultivated cells from ferrets with experimental lymphosarcoma (Erdman et al., 1995). Type C retroviral particles have been associated with multicentric skeletal sarcomas in two African hedgehogs (Peauroi et al., 1994). Extracellular retroviral-like particles were observed in lymphosarcoma from one hedgehog; however, no fresh tissue was available from either hedgehog for virus isolation or evaluation of reverse transcriptase activity.

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