

# ULTRASONOGRAPHY AND FINE NEEDLE ASPIRATE CYTOLOGY OF THE MESENTERIC LYMPH NODE IN NORMAL DOMESTIC FERRETS (*MUSTELA PUTORIUS FURO*)

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The large mesenteric lymph node of 28 normal ferrets was imaged with ultrasound. The large node, located in the mid-abdomen at the root of the mesentery, was round to ovoid and uniformly hyperechoic. Mean ultrasonographic dimensions of the lymph node were 12.6 +/- 2.6 mm by 7.6 +/- 2.0 mm. Fine needle aspirates of 20 lymph nodes were obtained either using ultrasound guided free-hand techniques or at necropsy. The cytological descriptions were compared to histological descriptions of 13 lymph node core biopsies obtained during laparotomy or necropsy as well as 10 peripheral blood smear differentials. The large mesenteric lymph node of ferrets could be easily imaged and measured by ultrasound and evaluated by fine needle aspirate cytology. Normal lymph node cytology may include an eosinophilic infiltrate. *Veterinary Radiology & Ultrasound*, Vol. 40, No. 3, 1999, pp 308-310

**Key words:** ferret, lymph node, ultrasound, cytology, histology.

## Introduction

A SINGLE MESENTERIC lymph node can be palpated in normal ferrets, but it is most often palpated when ferrets are underweight or when the lymph node is enlarged. One large mesenteric lymph node has been reported as normal for another mustelid species, the mink.<sup>1</sup> In thin ferrets with adrenal gland disease, the large mesenteric lymph node has been mistaken by palpation or ultrasound as an enlarged adrenal gland because of its shape and location. Very little information is available about normal ferret mesenteric lymph nodes, including their anatomic location. The purpose of this paper is to provide information about the location, ultrasound appearance, size, histologic appearance and cytologic characteristics of the mesenteric lymph node in normal ferrets.

## Materials and Methods

The large mesenteric lymph node of 28 normal ferrets was imaged with ultrasound. Twenty-three of the ferrets were sexually intact young adults (7 females and 16 males), weighing 780-1510 grams. These ferrets were housed at the University of Wisconsin Animal Care facility and were

healthy based on normal clinical history and physical examination. Five ferrets were neutered, (3 female, 2 male) privately owned animals. All ferrets were clipped on their ventral abdomen, placed in dorsal recumbency and imaged with acoustic coupling gel using a 7.5 MHz linear transducer.\* Measurements were made from static video images, using the built-in calipers of the ultrasound machine and recorded using an image recording device.†

The first cohort of ten ferrets, approximately six months old, (2 female, 8 male) was part of another experimental protocol; ultrasound evaluation was conducted immediately after euthanasia. Necropsy examination was performed on eight ferrets to locate the mesenteric lymph nodes. Two bodies were frozen and sectioned in approximately 5 mm thick sagittal or transverse slices.

Eighteen ferrets were sedated with an intramuscular injection of a combination of tiletamine and zolazepam‡ (10 mg/kg) and examined with ultrasound. From this group of eighteen, eight ferrets (3 intact males, 3 neutered females and 2 neutered males) were used only for ultrasound measurements. The remaining ten ferrets (5 female, 5 male) had ultrasound examinations, fine needle aspirates of the lymph node, and venipuncture. One to two ml whole blood obtained from the jugular vein was placed in EDTA microtainer tubes for complete blood count (CBC) analysis. The ultrasound guided fine needle aspirates of the mesenteric

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\*SI450 D, Siemens Medical Systems Inc., Issaquah, WI

†Video Imager Model 1010, Matrix Instruments Inc., Northvale, NJ

‡Telazol, Fort Dodge Laboratories Inc, Fort Dodge, IA

lymph nodes were performed freehand using a 22 gauge needle with a 6 ml syringe. The aspirated material was examined cytologically using Wright's stain. In addition, a surgical core biopsy of the large lymph node was obtained from three of the female ferrets subsequently ovariohysterectomized.

An additional cohort of 10 healthy adult male ferrets, weighing 730–1550 grams, was also studied. Sonography was not performed on these animals as they were part of a separate experimental protocol that required them to be euthanized. A descriptive location of the mesenteric lymph node, fine needle aspirate (using a 22 gauge needle with a 6 ml syringe) and tissue for histologic examination biopsy were obtained following euthanasia. Lymph node dimensional measurements were made in nine of the ten ferrets using a metric caliper, after removal of the peri-nodal fat.

### Results

Grossly the single large mesenteric lymph node was located at the junction of the cranial and caudal mesenteric veins and embedded in fat at the root of the mesentery. The mean ( $\pm$  standard deviation) dimensions of the large lymph node as determined by calipers at necropsy were 12.4  $\pm$  2.4 mm in length by 6.9  $\pm$  2.0 mm in width ( $n = 9$ ). Several additional small lymph nodes less than 3 mm diameter were scattered in the fat of the mesenteric root.

Ultrasonographically, a solitary lymph node was easily found in the mid abdomen, in close proximity to the cranial and caudal mesenteric veins at the center of the small intestinal mesentery. In no ferret were additional lymph nodes seen at this location. All mesenteric lymph nodes were surrounded by a large amount of fat (Fig. 1). The round to ovoid shape and uniform echoic appearance was characteristic (Fig. 2). Mean dimensions ( $\pm$  standard deviation) of the large mesenteric lymph node were 12.6  $\pm$  2.6 mm in length by 7.6  $\pm$  2.0 mm in width ( $n = 28$ ).

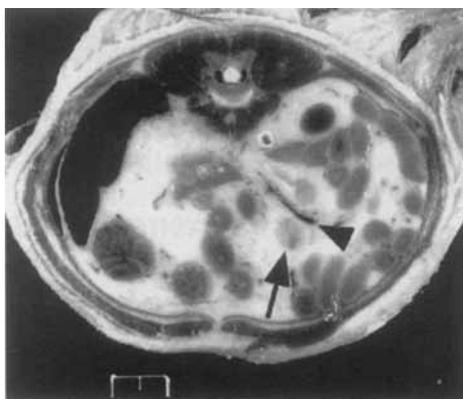


FIG. 1. Cross-section of a six month old intact male ferret at the level of the left adrenal gland. The mesenteric lymph node (arrow) and mesenteric vessel (arrowhead) are clearly seen.

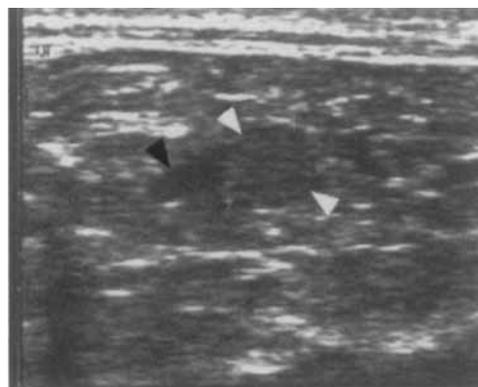


FIG. 2. Sagittal sonogram of the mesenteric lymph node (white arrowheads) and mesenteric vessel (black arrowhead).

The white blood cell differential of the peripheral blood smears from 10 ferrets was within the normal range.<sup>2,3</sup> The eosinophil count was less than 6% in all blood samples. Twenty fine needle aspirates (10 freehand ultrasound guided and 10 by direct visualization at necropsy) were moderately to highly cellular and contained 50–60 small lymphocytes, 2–3 lymphoblasts and prolymphocytes, and 0–1 macrophages, plasma cells and nondegenerate neutrophils per 200X field (Fig. 3). Eleven of 20 (55%) lymph node aspirates had 2–10 eosinophils per 200x field. There was no difference in the needle aspirate sample quality or cellularity when comparing those taken from an anesthetized ferret using ultrasound guidance compared to those samples taken at necropsy. There was no correlation between the numbers of eosinophils in the blood smear and the number of eosinophils in the lymph node aspirate from the ferrets that provided both peripheral blood cytology and lymph node cytology.

Lymph node biopsy specimens (3 obtained at laparotomy and 10 obtained at necropsy) had a rich cellular cortex made up of follicles and a perifollicular cortex. The predominant cell in both areas was a small lymphocyte, however lymphoblasts were present in some areas. Medullary cords were made up primarily of small lymphocytes and histiocytic cells seen in the sinuses. Approximately one eosinophil per 3 high power fields (600X) was noted in 8 of 13 (62%) samples.

### Discussion

The morphology of normal ferret mesenteric lymph nodes has not been reported. The first anatomic description of the ferret mesenteric lymph node is reported here, based on frozen anatomic sections and necropsy observations.

The large mesenteric lymph node was easily found using ultrasonography. With moderate pressure the lymph node could be displaced dorsally causing confusion with adrenal gland. Cautious application of pressure should preclude any

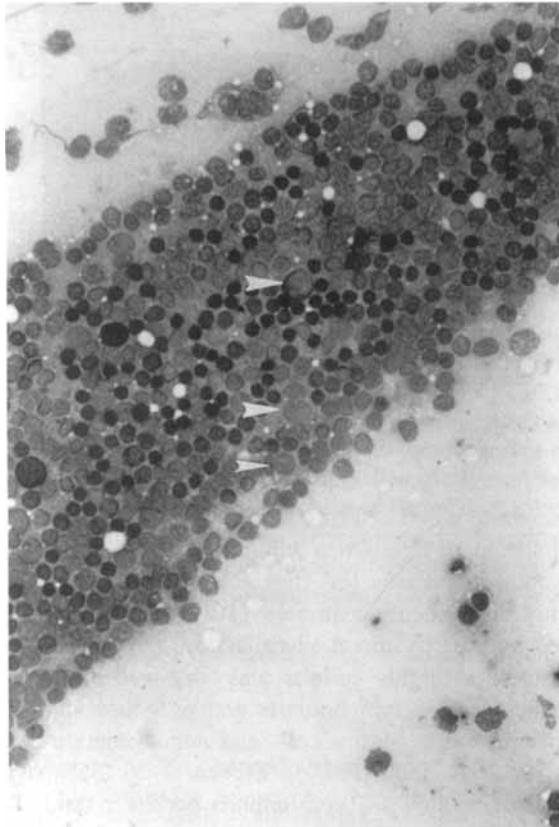


FIG. 3. Cells from a fine needle aspirate sample taken from the mesenteric lymph node of a mature ferret and stained with Wright's stain. A moderate number of eosinophils (arrowheads) are present. Note the multilobulated nuclear morphology of the eosinophils compared with mononuclear lymphoid cells (200 $\times$  field).

misdiagnosis of the lymph node as an adrenal gland mass. Gross and sonographic lymph node measurements were similar. Statistical comparison of gross and ultrasonograph-

ic measurements was not done because measurements were obtained from different animals.

Lymph node enlargement is common in ferrets with gastrointestinal disease or lymphosarcoma. Fine needle aspirate samples are useful as a diagnostic tool. The linear transducer used in this study did not have a biopsy guide device, so fine needle aspirates were obtained in lieu of core biopsies. Fine needle aspirate specimens of normal ferret mesenteric lymph nodes were highly cellular. Fifty percent of the cytology samples contained more eosinophils than are seen in normal dogs and cats.<sup>4</sup> There was no concurrent peripheral eosinophilia even when samples from the same animal were compared. The histologic description of the mesenteric lymph node biopsy includes small numbers of eosinophils. This correlates with eosinophils identified in needle aspirate samples and is evidence of lymph node origin rather than contamination from blood. In three ferrets both fine needle aspirates and surgical biopsy tissue were obtained, and in 2 of the 3 lymph nodes similar eosinophil characteristic was present in both cytology and histology. The cause or significance of the eosinophilia was not determined as part of this study. The small numbers of eosinophils did not resemble the focal eosinophilic granulomas characteristic of eosinophilic gastroenteritis.<sup>5</sup>

Based on our results, normal mesenteric lymph nodes can be evaluated sonographically and easily differentiated from surrounding structures. Knowledge of the normal anatomic placement and ultrasonographic measurements can be used as criteria for determining lymph node enlargement. The presence of eosinophils is normal in the ferret mesenteric lymph node.

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