



## Diagnostic Exercise

From the Latin Comparative Pathology Group and the Davis-Thompson Foundation

# Granulomatous hepatitis associated with plant material in a cat

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**History:** A three-year-old, female, mixed-breed, FeLV-positive cat, with a history of suture dehiscence and evisceration following a previous ovariohysterectomy at an unspecified time, was presented with dyspnea, prostration, decreased level of consciousness, and abdominal distension, in addition to pleural and pericardial effusion. Cytological evaluation of the pleural fluid revealed high cellularity composed of neoplastic lymphoid cells. Thoracic radiographs demonstrated increased volume and opacity of the mediastinum, associated with dorsal tracheal displacement. Due to the presumptive diagnosis of lymphoma, the severity of the clinical signs, and the lack of response to supportive treatment, euthanasia was elected.

**Necropsy findings:** Multiple white, non-encapsulated, poorly demarcated nodules were observed in the mediastinum, lymph nodes, and small intestine. Microscopically, these lesions were characterized by a neoplastic proliferation of monomorphic, intermediate-sized round cells arranged in a mantle pattern, with scant, slightly basophilic cytoplasm and large, round to irregularly folded nuclei measuring approximately 1.5–2 erythrocytes in diameter. The chromatin was homogeneous and finely stippled, with no evident nucleoli. Twenty-two mitotic figures were observed in 2.37 mm<sup>2</sup>. The morphologic diagnosis was lymphoblastic lymphoma. No gross lesions were observed in the liver. Tissues fixed in 10% formalin were retrospectively evaluated in histologic sections stained with hematoxylin and eosin (H&E) and periodic acid–Schiff (PAS).

### Follow-up questions:

- *Morphologic diagnosis:*
- *Etiology:*

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## ANSWERS

### Histologic description:

Liver: Six well-circumscribed granulomas of variable size were randomly distributed throughout the parenchyma and subcapsular region (Figs. 1–5). The mild to moderate granulomatous inflammatory response was composed predominantly of epithelioid macrophages, with occasional foreign body–type multinucleated giant cells and scant lymphocytes (Figs. 1–5). The hepatic capsule overlying the largest granuloma (located 0.4 cm beneath the capsule) was thickened and exhibited a focal, mild lymphoplasmacytic and histiocytic infiltrate, with occasional macrophages containing granular brown intracytoplasmic pigment, consistent with hemosiderin. Larger granulomas exhibited centrally located lamellar structures with longitudinal striations, as well as acellular, hyaline, ring-like structures arranged in a honeycomb pattern, containing intraluminal eosinophilic granular material and delimited by thin walls (Figs. 1–3). These exogenous materials were birefringent under polarized light (Figs. 2–3). Additionally, tangential and cross-sections of polygonal to hexagonal structures with clear halos were identified, containing eosinophilic, amorphous intraluminal material and multiple, round basophilic structures, morphologically consistent with plant parenchyma, supporting tissues, and vascular bundles (Figs. 4–5). The cell walls and intraluminal contents were strongly PAS-positive (Figs. 6–7). In one smaller granuloma, a spiculated, birefringent, PAS-positive structure, morphologically suggestive of plant epidermis, was observed (Fig. 7). Collectively, these foreign bodies were interpreted as structures morphologically consistent with plant-derived material.

### Morphologic diagnosis:

Liver: mild to moderate, multifocal granulomatous hepatitis with foreign body–type multinucleated giant cells and intralumenal structures compatible with plant material.

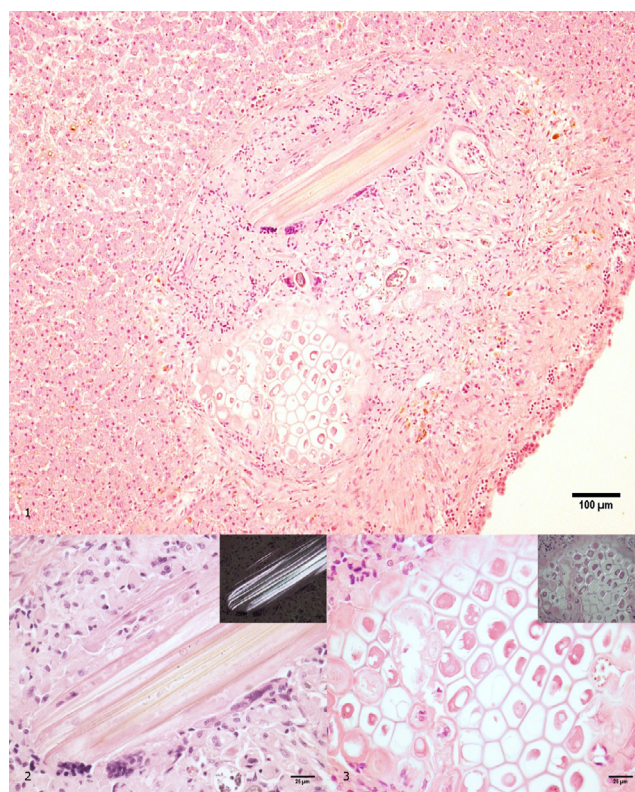
Etiology: plant material.

### Comments:

Granulomatous hepatitis (hepatic granulomas) is a morphologic pattern of chronic inflammation that may develop in response to bacterial, viral, fungal, or algal infections; parasitic infestations; pigment deposition; metal toxicity; idiopathic conditions; or inert foreign bodies, and histopathologic evaluation can help determine the underlying etiology (3,5,7).

In the present case, the hepatic granulomas were composed predominantly of epithelioid macrophages and occasional foreign body–type multinucleated giant cells surrounding acellular lamellar and hyaline structures containing eosinophilic material and round basophilic elements. The birefringence observed under polarized light, together with strong PAS positivity of the cell walls and intraluminal contents, supports a plant-derived, cellulose-rich origin. Collectively, these microscopic features are characteristic of foreign body–type granulomas induced by plant material in both human and veterinary pathology (7,8,10).

The main etiologic agents associated with hepatic granulomas in cats include infectious organisms (e.g., mycobacteria, mutated feline coronavirus, systemic fungi, and parasites). In the present case, the identification of PAS-positive,



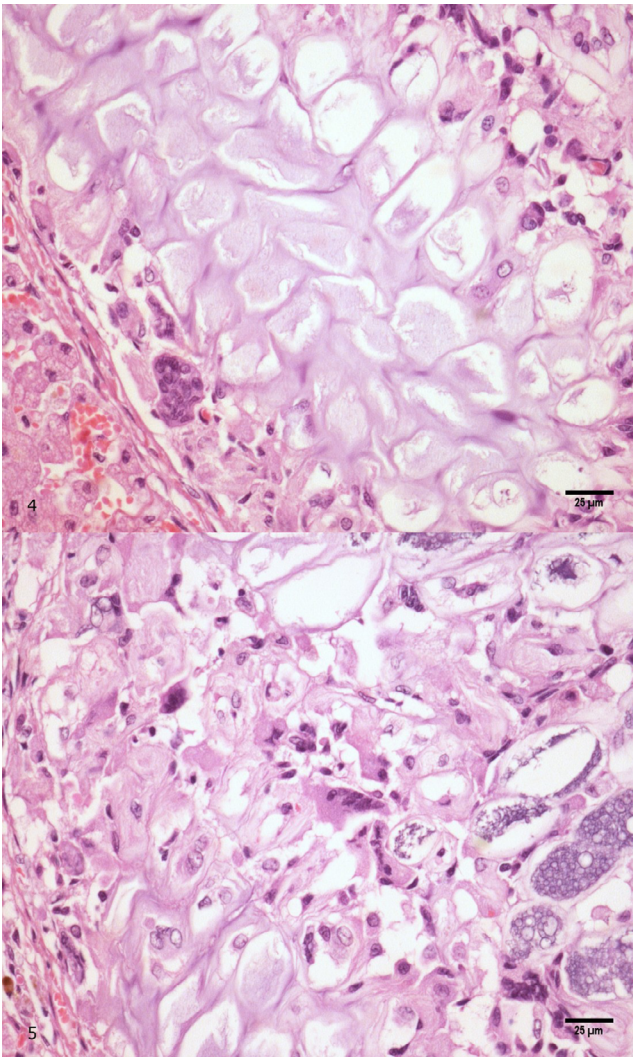
**Figures 1-3.** Liver. 1) Well-circumscribed subcapsular granuloma composed of moderate numbers of epithelioid macrophages and occasional foreign body–type multinucleated giant cells. Centrally, a large tangential section of plant-derived material with a lamellar structure exhibiting longitudinal striations and acellular, hyaline, ring-like structures arranged in a honeycomb pattern. Note mild thickening of the hepatic capsule associated with a mild focal lymphoplasmacytic and histiocytic infiltrate. 2) Higher magnification of tangentially sectioned plant-derived material (inset: birefringence under polarized light). 3) Higher magnification of plant-derived structures arranged in a honeycomb pattern (inset: birefringence under polarized light). H&E.

birefringent, structurally organized intralesional material morphologically consistent with plant tissues supports the interpretation that the granulomas were induced by plant-derived material.

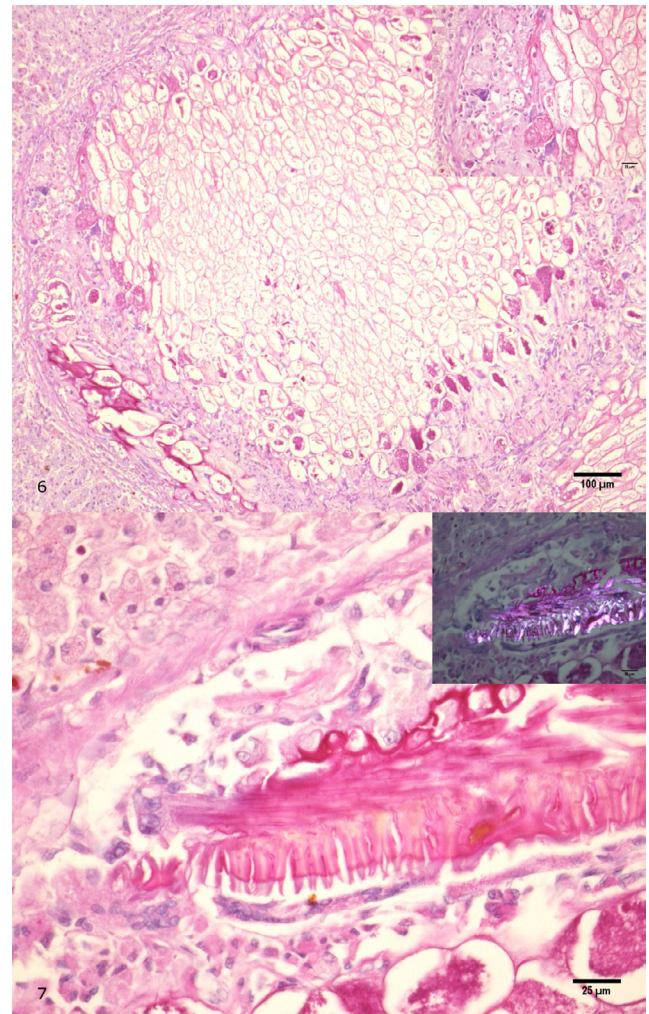
In small animals, vegetal foreign bodies (particularly grass awns) are well recognized for their ability to penetrate epithelial barriers and migrate through soft tissues, leading to pyogranulomatous or granulomatous inflammation in various anatomic locations (1,2). In domestic dogs and cats, plant foreign bodies have been reported in the skin, skeletal muscle, respiratory tract, thoracic cavity structures (pleura, pericardium, and mediastinum), abdominal cavity (peritoneum and retroperitoneal space), eyes, and urinary bladder (1,2,4,6).

The absence of gross hepatobiliary lesions, together with the lack of clinicopathologic abnormalities indicative of hepatic dysfunction, supports a chronic and likely clinically silent process. Furthermore, the hepatic granulomas appeared unrelated to the concurrent lymphoma and were therefore interpreted as an incidental microscopic finding.

The history of previous abdominal surgery complicated by dehiscence and evisceration suggests that trans-coelomic implantation of exogenous plant material through traumatic contamination is the most plausible etiopathogenic mechanism in this case. Although extrahepatic biliary tract obstruction associated with plant foreign bodies has been reported in domestic cats due to retrograde migration through



**Figures 4 and 5.** Liver. 4) Cross and tangential sections of plant-derived foreign material showing polygonal to hexagonal structures with clear halos and eosinophilic, amorphous intraluminal material, surrounded by epithelioid macrophages and a foreign body-type multinucleated giant cell. 5) Plant-derived material containing numerous round basophilic structures. H&E.



**Figures 6 and 7.** Liver. 6) Large granuloma containing abundant PAS-positive plant-derived material centrally. The cell walls and intraluminal contents are strongly PAS-positive (inset: higher magnification). 7) Spiculated, birefringent, PAS-positive structure morphologically consistent with plant epidermis (inset: birefringence under polarized light). PAS.

the duodenal papilla (9), the relatively large size of the hepatic intralesional fragments and the absence of gross lesions in the gallbladder and extrahepatic bile ducts suggest that an ascending biliary route is unlikely in the present case. Alternatively, ingestion followed by transmural gastrointestinal migration has been proposed in cases of migrating vegetal foreign bodies in small animals; however, this mechanism is unlikely here due to the absence of gastrointestinal perforation, adhesions, or peritonitis—changes typically associated with such migration.

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