British Society of Veterinary Pathology
Advancing Education in Veterinary Pathology

Hepatic B cell lymphoma in a wild European Badger (*Meles meles*): an unusual finding during tuberculosis surveillance in the United Kingdom.

Hilton, S., Bennett, M., Ortiz, A., & Bianco, C.

School of Veterinary Medicine and Science, University of Nottingham, Nottingham, LE12 5RD, UK

Neoplasms are a rare finding at postmortem examination in wild European Badgers (Meles meles). A literature search found one report of pelioid hepatocellular carcinoma, and four of lymphoma. The latter comprised one report each of mediastinal low histologic grade T-cell lymphocytic lymphoma with local invasion of the aorta; multicentric nodal and hepatic low histologic grade small cell T-cell lymphoma; multicentric nodal lymphoma of unknown cell type; and an unclassified lymphoma. Here we report a primary hepatic nodular, small-cell low-to-medium histologic grade B-cell lymphoma.

An elderly male wild European Badger was found dead in a cattle barn in the English Midlands, in April 2023, and submitted to the University of Nottingham as part of an APHA-led tuberculosis survey.

The carcass was received fresh, with an estimated postmortem interval of less than 48 hours, and postmortem examination and sampling for tuberculosis was performed in a class 1 MSC following a standard sampling protocol.

On external examination, the badger was determined to be elderly due to the poor state of dentition, weighed 8.39Kg, and had a body condition score of 1/5 (cachexic), with significant muscle and fat atrophy. The skin and mucus membranes were diffusely icteric. Internally there were multifocal-to-coalescing bosselated white-to-cream firm nodules throughout the parenchyma of the liver, and similar nodules multifocally within the kidney, and spleen. Due to the extensive infiltration the liver was considered the primary site. All peripheral and tracheobronchial lymph nodes were macroscopically unremarkable, and there was a mild lymphadenopathy of the mesenteric lymph nodes. Lymph nodes were collected for microbiology as part of the tuberculosis study, but apart from mesenteric lymph nodes, not for histological examination.

On histological examination, the liver, kidney, and splenic parenchyma were multifocally effaced, replaced and compressed by an unencapsulated, infiltrative, and densely cellular neoplasm made up of monomorphic sheets of round cells supported by a fine, pre-existing fibrovascular stroma. Cells have indistinct cell borders, contain a scant amount of pale eosinophilic homogeneous cytoplasm, with an intermediate nuclear to cytoplasmic ratio, central to eccentric small round nuclei (diameter 1 erythrocyte), finely stippled to clumped chromatin, and inconspicuous nucleoli. There was mild anisocytosis and anisokaryosis. There were 56 mitotic figures per 2.37mm2 (hotspot count, 40x objective, OFN25, range 5-11 per high power field) in the liver; lower numbers were seen in kidney (23, range 3-4 per HPF), and spleen (15, range 1-4 per HPF). The mesenteric lymph node showed no evidence of neoplastic cells. There was a mild, concurrent, parasitic enteritis, colitis, and lymphadenitis in the mesenteric lymph node.

Adopting the WHO classification in domestic animals for lymphoid neoplasms, this lymphoma is consistent with a primary hepatic nodular, small-cell B-cell lymphoma with a low-to-medium histologic grade.

Immunohistochemistry was performed on liver tissue using antibodies routinely used in small animal oncology. Neoplastic cells stained positive with antibody against human CD79a, CD20, and PAX-5 and negative for CD3. To the best of the authors' knowledge CD3 and CD79a antibodies have previously been used in the badger, whilst Pax-5 and CD20 have not previously been used in this species. The in-silico cross-reactivity was predicted via BLASTP. The similarity ranged from 57.14% (CD3) to 100% (CD79a), supporting the positive immunolabelling. The similarity range identified is in line with a previously suggested threshold of 60%.

Mycobacterial cultures were negative and no further ancillary testing was performed. The cause of death in this case was determined to be hepatic insufficiency and paraneoplastic cachexia.

The apparent low incidence of lymphoma and other neoplastic diseases, despite increasing postmortem surveillance of the wild European Badger population, is likely due to the short (~2.5 years) life expectancy in the wild and would therefore be unlikely to significantly affect overall population dynamics. However, despite being rare, neoplasia should still be considered in cases of space occupying lesions and lymphadenomegaly, particularly in older badgers.

The similarity between badger and human proteins and the positive immunolabelling in this case, supports the use of anti-CD20 and anti-PAX-5 antibodies, as B-cell markers in future badger pathological research. The in-silico investigations for cross reactivity also provide support for the previously used anti-CD3 and anti-CD79a antibodies.

To the best of the authors' knowledge in this case we have diagnosed the first primary hepatic nodular, low-to-medium histologic grade small cell B-cell lymphoma, with involvement of kidney and spleen, in the absence of a peripheral lymphadenopathy in a wild European Badger (*Meles meles*)