# LYMPHOSARCOMA IN A KOALA (*Phascolarctos cinereus*) (CASE 1671.1)

**CASE HISTORY**

Five year old male koala (*Phascolarctos cinereus*) with previous bouts of weight loss and systemic circulation of atypical lymphocytes. The koala was found 3-7-00 ataxic, weak, thin and dehydrated with a soiled perineum and wet face. The koala was treated with fluid therapy, baytril, Vit B complex, and nutritional supplements, but debility progressed. Faecal wet preparations revealed many yeast cells and fungal hyphae. The animal was found dead 10-7-00.

**SAMPLE HISTORY**

Ante mortem faecal sample collected 7-7-00:
Wet prep - yeasts 2+, fungal hyphae 2+. - *Candida famata*
Gram stain: yeasts 2+, hyphae 2+, gram positive rods 2+, gram negative rods 1+
Occult blood +ve
Culture - no enteric pathogens isolated.

**HAEMATOLOGY**

| | 24/3/00 | 4/7/00 | 24/8/00 |
|---|---|---|---|
| **PCV (%)** | **26** | **41** | **39** |
| **WCC (x10 ^9/L)** | **5.8** | **5.2** | **5.8** |
| **Lc (%)** | **75** | **19** | **29** |
| **Lc atypical (%)** | **8** | **4** | |
| **Np (%)** | **16** | **72** | **69** |
| **Mc (%)** | **1** | **5** | **2** |
| **TPP (g/L)** | **56** | **35** | **59** |
| **Alb (g/L)** | **39** | **23** | **39** |

Serum biochemistry results were unremarkable

**GROSS PATHOLOGY**

**External findings**: The fur surrounding the mouth is soaking wet. The perineal fur is coated with faeces. The abdomen is markedly distended.
Hydration: poor
Muscle mass: reduced
Fat deposits: absent
**Internal examination**: The inguinal lymph nodes are enlarged. The inguinal subcutaneous tissues are moderately oedematous. The thyroid glands are bilaterally pale and large. The trachea and bronchi contain small quantities of brown tinged mucous with flecks of ingesta. There is bilateral hilar pulmonary congestion and consolidation. The myocardium is mottled with pale streaks and there are small 2 - 3 mm white subendocardial masses within the left ventricle.
The abdominal cavity is filled with approximately 200 mL of straw coloured fluid that has a specific gravity of 1.013 and a urea concentration of 18 mmol/L. The bladder contains a small quantity of urine, which can be easily manually expressed through the penis. A discrete 1 cm diameter mass is evident within the perirenal fat and another similar, firm, white mass is evident adjacent to the ureter 1 cm distal to the caudal pole of the kidney. The pyloric portion of the stomach is multifocally adherent to the capsule of the liver by white strands of fibrous tissue. A 2 - 4 mm wide annular mass is evident within the serosal surface of the pylorus. There are multiple large, occasionally coalescing 4 - 5 cm diameter and 1cm high submucosal masses that markedly disrupt the gastric wall. These masses bear central umbilicated ulcerations of various sizes. The masses are most extensive, and centrally necrotic, near the pars oesophagea and the pylorus. The stomach is devoid of ingesta. The caecum is markedly distended with gas. The colon contains foul smelling liquid. The omentum has a granular serosal surface.

**BACTERIOLOGY**

**Liver**: 3 colonies of coagulase negative *Staphylococcus*
**Lung**: 3+ coagulase negative *Staph*, 2+ *Pantoea* spp. (gram negative rod)
**Large intestine**: 3+ *Pantoea* spp., *Strep. bovis*

**HISTOPATHOLOGY**

Lesions are not evident within the following tissues: kidney, salivary gland, eyelid, tongue, small intestine (autolytic), forebrain, brainstem and cerebellum.

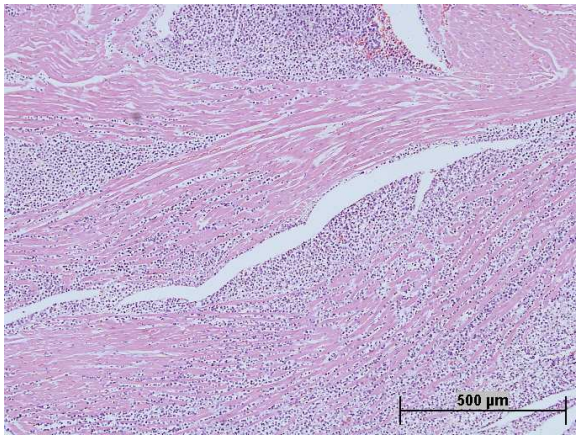

Fig 1. Myocardium H & E 100x

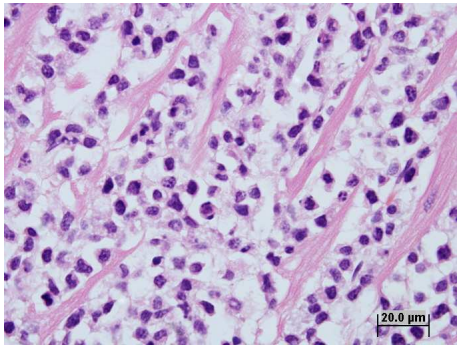

Fig 2. Myocardium H & E. 1000x

*Case interpretation: Karrie Rose. Case construction: Damien Higgins*

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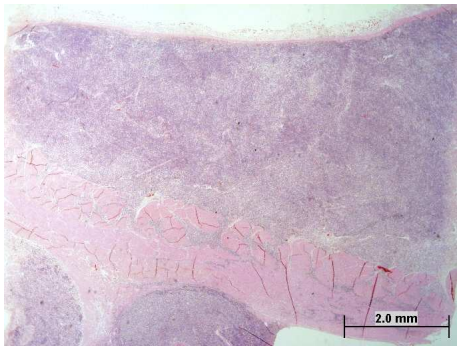

Fig 3. Gastric pylorus H & E 20x

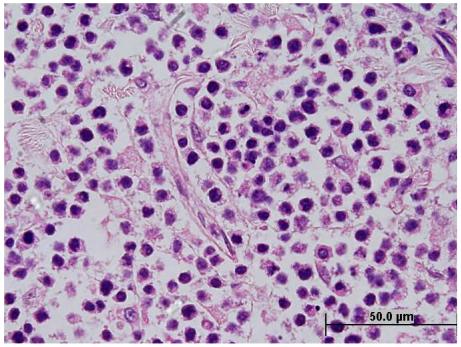

Fig 4. Gastric pylorus H & E 1000x

**Lung**: Alveolar macrophages are prominent throughout the airways.
**Bladder**: The lamina propria contains a focal mononuclear cell infiltrate.
**Stomach** - Pyloric Annular Ring: The serosa is markedly distended with an extensive uniform population of mononuclear cells that are scattered throughout a light connective tissue stroma. The cells appear to be medium-sized lymphocytes, with small quantities of eosinophilic cytoplasm. Scattered neutrophils and necrotic cells are evident throughout the tissue. Multifocal clusters of these cells are also evident within the muscularis externa. The cellular infiltrate markedly thickens the submucosa. The mucosa is autolytic.
**Spleen**: The splenic parenchyma contains numerous lymphoid follicles.
**Inguinal and Facial Lymph Nodes**: The nodes are markedly depleted of lymphocytes, with no discrete follicles and a very thin mantle zone.
**Omentum, abdominal and perirenal fat pads**: The adipose tissue is markedly distended or replaced with multifocal large aggregates of mononuclear cells, as described above.
**Pancreas**: The tissue is autolytic and contains a focal small mononuclear cell infiltrate. A large cluster of mononuclear cells is also evident within either a vein or a lymphatic vessel adjacent to this lymphoid aggregate.
**Thyroid Gland**: The thyroid follicles contain variable quantities of colloid and have low cuboidal epithelium. Larger thyroid follicles have mildly papillary epithelium.
**Myocardium**: The myocardium is transmurally nearly replaced with an infiltrate of mononuclear cells, as described above. This infiltrate distorts and distends the epicardium and endocardial surfaces and only a small number of muscle fibres remain intact within this section of the tissue. Scattered neutrophils and necrotic cells are evident throughout the infiltrate.
**Liver**: Hepatocytes contain small quantities of brown cytoplasmic pigment. Kupffer cells contain small quantities of basophilic cytoplasmic pigment. Scattered hepatocytes have vacuolated cytoplasm. Moderate numbers of Hepatocytes are binucleate. Neutrophils are mildly prominent throughout the sinusoids.
**Oesophagus**: There are multiple invaginations of the stratified squamous epithelium. One invagination forms a lumen filled with cell debris and filamentous bacteria. The base of this invagination is ulcerated and the underlying lamina propria contains moderate numbers of mononuclear cells, macrophages and scattered necrotic cell debris.
**Stomach** - Pyloric and Cardiac: There is a transmural infiltrate of uniform mononuclear cells, as described above. The mucosa is segmentally necrotic in one section, and is segmentally ulcerated in the other. Only the muscular externa remains intact and identifiable.

**MORPHOLOGICAL DIAGNOSIS**
Extensive multisystemic lymphosarcoma - myocardium, stomach, omentum
Terminal aspiration pneumonia and sepsis (*Staph*. sp.)

**COMMENT**
Lymphoid neoplasia is common in koalas. An unusual endogenous retrovirus of koalas has been identified, but occurs in virtually 100% of koalas examined, suggesting that the virus may not be the sole cause of this disease. Recently, however, real time polymerase chain reaction based studies have described an association between retroviral titre and the prevalence of lymphoma and, to a lesser extent, clinical chlamydiosis. Whether this relationship is causal, however, remains to be proven.

Ante mortem and post mortem diagnosis of lymphosarcoma in koalas can be challenging. As in other species, the clinical presentation can be vague. The clinical signs may reflect the site and extent of the neoplasm. Haematological findings are variable, from normal to leukaemic (with or without abnormal lymphocytes).

Histological diagnosis of lymphoma in koalas can also be difficult. Lymphoproliferative disease in koalas does not conform to the anatomical categories used for cat and dogs. Neoplastic infiltrates can resemble inflammatory infiltrates, since these neoplasms often exhibit less pleomorphism than other tumours. Diagnosis relies upon other characteristics, such as loss of structure (especially of lymphoid organs), presence of less non-lymphocytic inflammatory cells than occurs in inflammation, and identification of a single cell type by immunohistochemistry. Koala lymphoid tumours can be of either T or B cell immunophenotypes.

*Case interpretation: Karrie Rose. Case construction: Damien Higgins*

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**REFERENCES (abstracts on file)**

TARLINTON R. MEERS J. HANGER J. YOUNG P. (2005) Real-time reverse transcriptase PCR for the endogenous koala retrovirus reveals an association between plasma viral load and neoplastic disease in koalas. [Journal Article] Journal of General Virology. 86(Pt 3):783-7.

CANFIELD P.J. HEMSLEY S. (1996) Thymic lymphosarcoma of T cell lineage in a koala (Phascolarctos cinereus). [Journal article] Australian Veterinary Journal. 74: 2, 151-154.

SPENCER A.J. CANFIELD P.J. (1996) Lymphoid neoplasia in the koala (Phascolarctos cinereus)-a review and classification of 31 cases. [Journal article] Journal of Zoo and Wildlife Medicine. 27: 3, 303-314. 32 ref.

CANFIELD P.J. (1987) A mortality survey of free range koalas from the north coast of New South Wales. [Journal article] Australian Veterinary Journal. 64: 11, 325-328. 21 ref.

MCKENZIE R.A. (1981) Observations on diseases of free-living and captive koalas (Phascolarctos cinereus). [Journal article] Australian Veterinary Journal. 57: 5, 243-246. 20 ref.

CONNOLLY J.H. CANFIELD P.J. HEMSLEY S. SPENCER A.J. (1998) Lymphoid neoplasia in the koala. [Journal article] Australian Veterinary Journal. 76: 12, 819-825. 24 ref.

HANGER, J.J. BROMHAM, L.D. MCKEE, J.J. O'BRIEN, T.M. ROBINSON W.F. (2000) The nucleotide sequence of koala (Phascolarctos cinereus) retrovirus: a novel type C endogenous virus related to gibbon ape leukemia virus. [Journal article] Journal of Virology: 74: 9, 4264-4272. 63 ref.

CANFIELD P.J. HEMSLEY S. (2000) The roles of histology and immunohistology in the investigation of marsupial disease and normal lymphoid tissue. Dev Comp Immunol. 24(5):455-71 **(paper on file)**

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