

## DISSEMINATED CRYPTOCOCCAL INFECTION IN A KOALA (*Phascolarctos cinereus*) (Case 333.1)

### CASE HISTORY

A subadult female koala (*Phascolarctos cinereus*) was found with an acute onset of dyspnoea, depression, and lethargy. The dam of this koala was euthanased due to lymphoma, but also had disseminated cryptococcosis.

### GROSS PATHOLOGY REPORT

The koala is thin and has generalised lymphadenopathy. The skeletal muscle is very pale. Approximately 25 mL of clear, straw coloured fluid is evident within the thoracic cavity. Both lungs are pale, wet and firm. The myocardium appears pale. Clear, straw coloured fluid is evident within the abdominal cavity. The edges of the liver are pale, friable and rubbery. There are 1 mm firm, white nodules throughout the parenchyma of the spleen.

### HISTOPATHOLOGY

No visible lesions: adrenal gland, pancreas, small intestine, skeletal muscle.

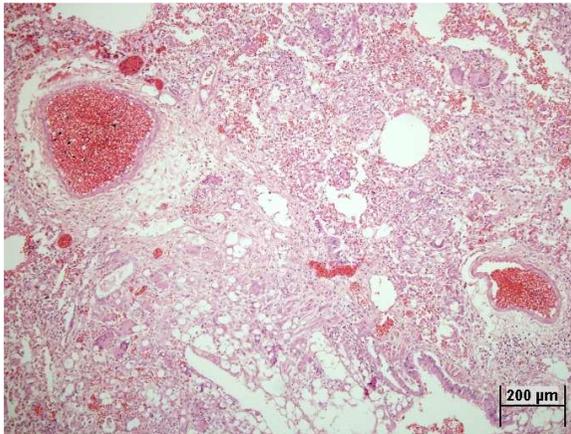


Fig 1. Lung. H & E 100x

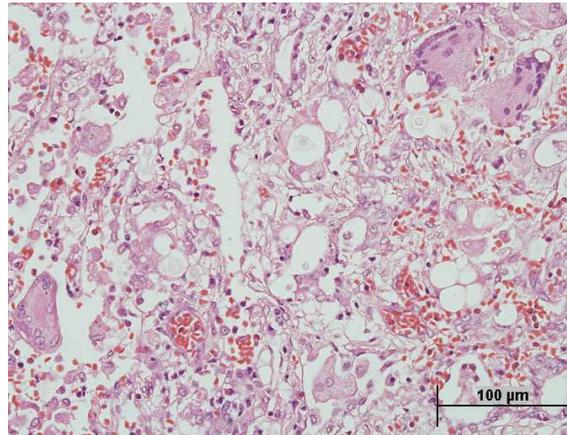


Fig 2. Lung. H & E 400x

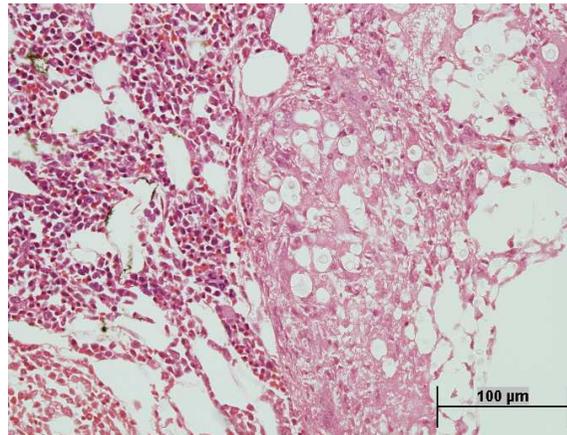


Fig 3. Bone marrow. H & E 100x

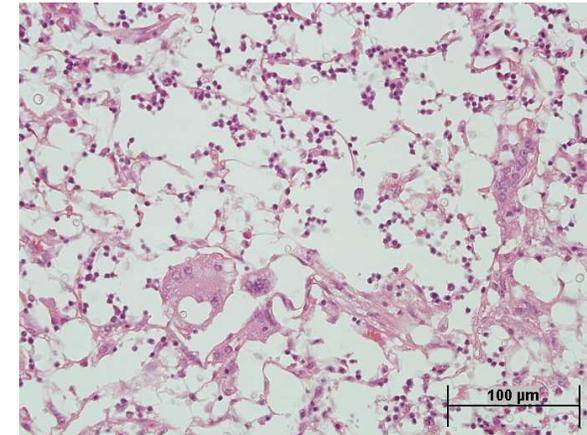


Fig 4. Lymph Node. H & E 400x.

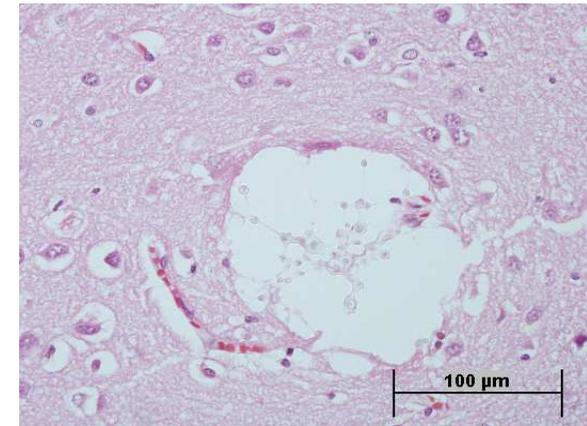


Fig 5. Brain. H & E 400x.

**Task: Describe the histological changes. What aetiological agent can you see in these? How would you confirm your diagnosis?**

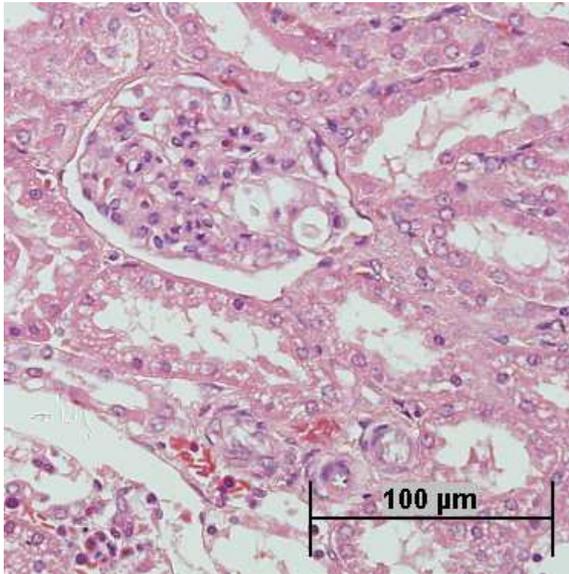


Fig 6. Kidney. H & E 400x.

The following observations are notable:

**Bone marrow:** The bone marrow is quite cellular. There is a large focal granuloma within the marrow. The granuloma consists of central basophilic round to oval organisms that have a thick, but very faint basophilic ring around them. These organisms are scattered amidst a cellular aggregate of lymphoid cells, macrophages, and multinucleate giant cells.

**Lymph node:** The normal structure of the organ has been obliterated. Organisms, as described above, are scattered throughout the sinusoids. Lymphoid cells, reticuloendothelial cells, and multinucleate giant cells are also scattered throughout the parenchyma.

**Lung:** The pulmonary parenchyma is diffusely consolidated due to a nodular pattern of granulomata within the interstitium and airways. These granulomata are morphologically as described above. Epithelialisation is evident throughout the airways.

**Kidney :** Multifocal glomeruli contain organisms as described above; however, there is very little cellular reaction.

**Myocardium:** Organisms, as described above, are scattered throughout the myocardium within fairly large vacuoles.

**Brain:** Virchow-Robin space is diffusely dilated and multifocally organisms, as described above, are evident within this space. There are several small foci of malacia, containing mononuclear cells (macrophages) and organisms. These organisms are also diffusely scattered throughout the meninges.

### MORPHOLOGICAL DIAGNOSIS

Multifocal mycotic granulomata - cryptococcosis

### COMMENTS

Disseminated yeast infection (cryptococcosis) is confirmed on microscopic examination of tissues. The organisms occur in many tissues with little tissue reaction. The most chronic lesions occur within the lung, bone marrow and brain.

*Cryptococcus neoformans* is subdivided into two varieties *C. neoformans* var. *grubii* (corresponds to serotype A) and *C. neoformans* var. *neoformans* (corresponds to serotype D). *Cryptococcus gattii* used to be referred to as *C. neoformans* var. *gattii* (corresponds to serotypes B&C).

Both species are associated with cryptococcal pneumonia, rhinitis, meningoencephalitis etc. Both species can be found as colonisers of upper respiratory tract mucosa and can cause subclinical disease in many different species (including cats, dogs, koalas, people, squirrels etc). There is no reported evidence of human-to human or animal-to human spread of these organisms; this disease is not a zoonosis.

*C. neoformans* is associated with disease in immunosuppressed patients and patients without apparent immunosuppression. It is an important cause of cryptococcosis in people and animals around the world. Classically this organism is found in association with weathered avian guano (especially pigeon droppings), however it has also been associated with rotting debris in some tree hollows (especially in Sth America). *C. gattii* is classically associated with patients of apparently normal immune function prior to cryptococcosis presentation. It is an important cause of disease in Australia (especially the Northern Territory amongst rural aboriginal populations), western Canada (since 1999). It has a more restricted

distribution than the worldwide distribution of *C. neoformans*. It is also an important cause of disease amongst animals. *C. gattii* is associated with debris of eucalypt hollows in Australia and various other tree substrates in Canada and Sth America. The strongest environmental association is with *E. camaldulensis* (river red gum) in Australia.

These organisms are PAS positive and can be further identified by culture, immunohistochemistry, or PCR.

### REFERENCES

- KROCKENBERGER M.B. CANFIELD P.J. MALIK R. (2003) *Cryptococcus neoformans* var. *gattii* in the koala (*Phascolarctos cinereus*): a review of 43 cases of cryptococcosis. [Journal article] *Medical Mycology*. 41: 3, 225-234. 42 ref. (REF ON FILE)
- KROCKENBERGER M.B. CANFIELD P.J. MALIK, R. (2002) *Cryptococcus neoformans* in the koala (*Phascolarctos cinereus*): colonization by *C. n.* var. *gattii* and investigation of environmental sources. [Journal article] *Medical Mycology*. 40: 3, 263-272. 24 ref. (REF ON FILE)
- KROCKENBERGER M.B. CANFIELD P.J. BARNES J. VOGELNEST L. CONNOLLY J. LEY C. MALIK R. (2002) *Cryptococcus neoformans* var. *gattii* in the koala (*Phascolarctos cinereus*): serological evidence for subclinical cryptococcosis. *Medical Mycology*. 40: 3, 273-282. 55 ref. (REF ON FILE)
- MAKIMURA K. KARASAWA M. HOSOI H. KOBAYASHI, T. KAMIJO N. KOBAYASHI K. HIRAMATSU H. AKIKAWA T. YABE T. YAMAGUCHI A. ISHIDA O. MURAKAMI A. FUJISAKI R. NISHIYAMA Y. UCHIDA K. YAMAGUCHI H. (2002) A Queensland Koala kept in a Japanese zoological park was carrier of an imported fungal pathogen, *Filobasidiella neoformans* var. *bacillispora* (*Cryptococcus neoformans* var. *gattii*). [Journal article] *Japanese Journal of Infectious Diseases*. 55: 1, 31-32. 5 ref.
- CONNOLLY J.H. KROCKENBERGER M.B. MALIK R. CANFIELD P.J. WIGNEY D.I. MUIR D.B. (1999) Asymptomatic carriage of *Cryptococcus neoformans* in the nasal cavity of the koala (*Phascolarctos cinereus*). [Journal article] *Medical Mycology*. 37: 5, 331-338. 37 ref. (REF ON FILE)
- MALIK R. MARTIN P. WIGNEY D.I. CHURCH D.B.

BRADLEY W. BELLENGER C.R. LAMB W.A. BARRS  
V.R. FOSTER S. HEMSLEY S. CANFIELD P.J. LOVE D.N.  
(1997) Nasopharyngeal cryptococcosis. [Journal article]  
Australian Veterinary Journal. 75: 7, 483-488. 32 ref.  
SPENCER A. LEY C. CANFIELD P. MARTIN P. PERRY R.  
(1993) Meningoencephalitis in a koala (*Phascolarctos  
cinereus*) due to *Cryptococcus neoformans* var. *gattii* infection.  
[Journal article] Journal of Zoo and Wildlife Medicine. 24: 4,  
519-522. 14 ref.

*Case interpretation: Karrie Rose. Case construction: Damien Higgins, Comment by Mark Krockenberger, University of Sydney*

The Australian Registry  
of **Wildlife Health**

