



Latin Comparative Pathology Group

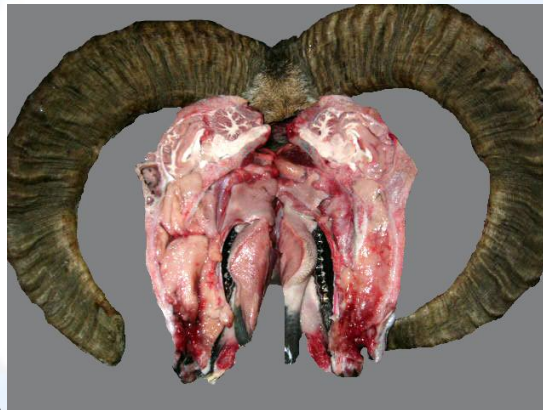
The Latin Subdivision of the CL Davis Foundation

Diagnostic Exercise

Case #: 42 Month: March Year: 2014

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Signalment/history/clinical signs: A free-ranging 3-year-old male agrino or Cypriot mouflon (*Ovis orientalis ophion*) found dead by game wardens in a forest in northwest Cyprus. The Cypriot mouflon is a wild sheep species inhabiting forested mountainous areas.



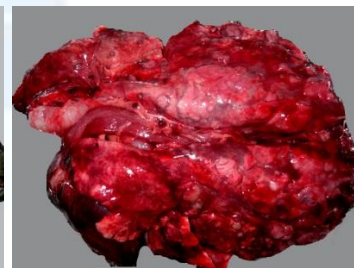
A



B



C



D

(a) **Morphologic diagnoses:**

a1- Nasal granuloma or adenocarcinoma, bilateral, severe with maxillary bone invasion and osteolysis ;

a2- Pneumonia, granulomatous, multifocal, severe, with pulmonary congestion.

(b) **Likely differentials/etiology:**

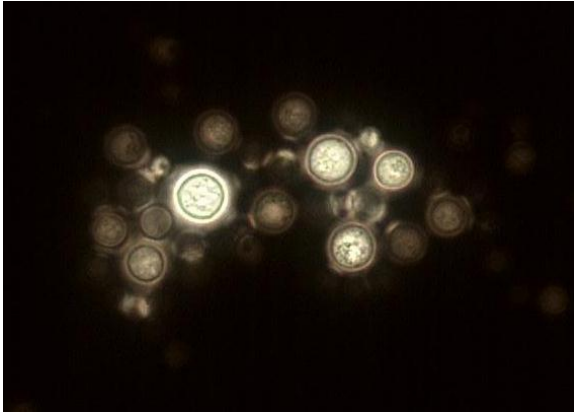
1- Nasal adenocarcinoma metastatic to the lungs;

2- Disseminated granuloma of fungal, algal, bacterial or other etiology.

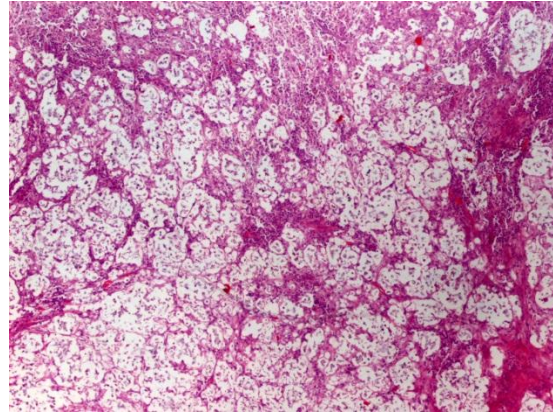
Gross findings. The animal was cachectic and had a 3 cm³ swelling on the right maxillary area. Large quantities of whitish tumour-like tissue occupied most of the nasal cavity (Fig. A, B). Erosion of the right maxillary bone was noted (Fig. C). Similar diffuse or multifocal to coalescing nodules were observed throughout the lungs (Fig. D), together with parasitic pneumonia lesions. The mediastinal lymph nodes were markedly enlarged.

Histochemical, histologic and molecular findings. India Ink (Fig. E) and Nigrossin stained smears revealed the presence of spherical yeasts surrounded by a thick unstained capsule, characteristic of *Cryptococcus* species. Histologically, the intranasal (Fig. F), lung (Fig. G) and lymph node lesions contained large clusters of intracellular and extracellular thin-walled fungal organisms surrounded by a wide halo; the nasal and lymph node lesions in particular had the characteristic “soap-bubble” appearance of *Cryptococcus neoformans* infection, the result of the presence of yeasts with thick capsule in large clusters.

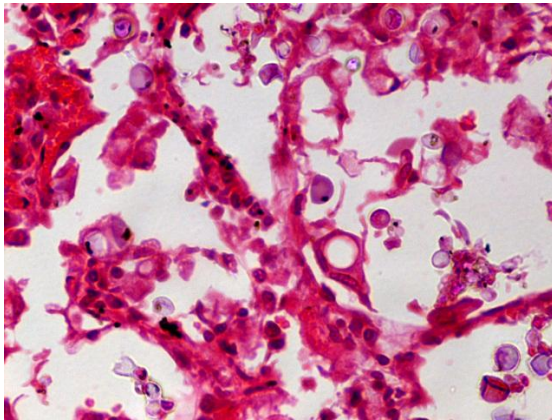
In Mucicarmine stained sections (Figure H), the shrunken fungal capsule, not visible in HE sections, stained pink or red, again a finding diagnostic of *C. neoformans* infection. Based on the above, the diagnosis of severe, multifocal rhinitis and pneumonia due to *C. neoformans* infection was established. PCR amplification of a partial genomic region from two different capsule associated genes classified the strain as *C. neoformans var. neoformans* serotype D.



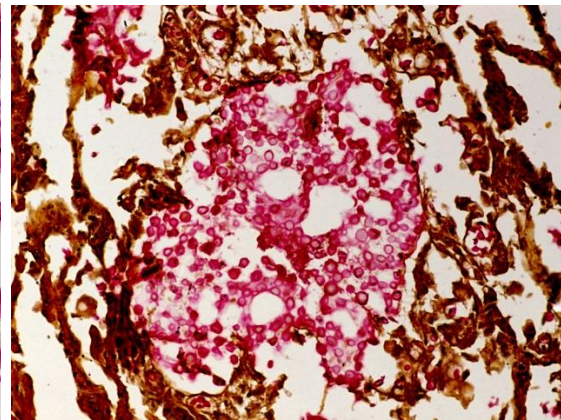
E



F



G



H

Discussion. This was a case of disseminated cryptococcosis. *Cryptococcus neoformans* is a basidiomycetous encapsulated yeast that may cause life-threatening infections. The pathogen presents two biovars, *C. neoformans* var. *neoformans* that is commonly associated with avian excreta and had worldwide distribution, and *C. neoformans* var. *gattii* that is ecologically associated with plant debris, particularly from eucalyptus trees [1]. Based on the strain classification, the absence of Eucalyptus trees and the presence of wild pigeons in the area sharing the same water supplies with the mouflon, the animal was most likely infected from avian excreta. Cryptococcosis has been reported in sheep [2], goats [3-6], elk [7] and llama [8], but is overall uncommon in small ruminants.

We would be interested to hear from colleagues that have diagnosed this condition in ruminants in South America or elsewhere (email: ploukopoulos@cahfs.ucdavis.edu).

References:

- [1] Ellis D H. *Cryptococcus neoformans* var. *gattii* in Australia. J Clin Microbiol 1987; 25: 430-431.
- [2] Lemos et al. Pulmonary cryptococcosis in slaughtered sheep: Anatomopathology and culture. Vet Microbiol 2007; 125: 350-354.
- [3] Gutierrez and Garcia Marin. *Cryptococcus neoformans* and *Mycobacterium bovis* causing granulomatous pneumonia in a goat. Vet Pathol 1999; 36: 445-448.
- [4] Baró et al. First identification of autochthonous *Cryptococcus neoformans* var. *gattii* isolated from goats with predominantly severe pulmonary disease in Spain. J Clin Microbiol 1998; 36: 458-461.
- [5] Aller et al. Criptococcosis pulmonar en cabras. Rev Patronato Biol Anim 1971; 15: 387-297.
- [6] *Dacorso and Chagas*. Criptococose pulmonar em caprino. Anales Col Anat Brasil 1957; 3: 55-70.
- [7] Hamir et al. Meningoencephalitis and pneumonia associated with *Cryptococcus neoformans* infection in a free-ranging elk in the USA. Vet Rec 2002; 151: 332-3.
- [8] Bildfell et al. Cryptococcosis in a llama (*Lama glama*). J Vet Diagn Invest 2002; 14: 337-339.

Acknowledgements:

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Please send your comments/questions to the whole LCPG list by hitting "reply to all".

A final document containing this material with answers and a brief discussion will be posted on the C. L. Davis website by the end of the current month (http://www.cldavis.org/lcpg_english.html).