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CANDIDIASIS IN YOUNG HAND-REARED KANGAROOS

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Abstract: Necropsies conducted on four young eastern grey kangaroos *(Macropus giganteus)* revealed white encrustations adherent to the mucosa of the lips, gums, tongue and oesophagus. The non-glandular stomach was impacted with similar white curd-like material, much of which was adherent to the mucosa. Histopathology revealed fungal mycelia and blastospores invading the stratified squamous epithelium resulting in focal erosion, ulceration and venous thrombosis. A predominantly neutrophilic leucocytic infiltration was produced in intra-epithelial and submucosal tissues. *Candida albicans* was isolated from the upper alimentary tract lesions of all cases. Failure to thrive on milk diets, prolonged episodes of diarrhoea and antibiotic therapy during hand-rearing were considered to be significant predisposing factors to infection.

INTRODUCTION

Upper alimentary tract candidiasis has been reported in a variety of hand-reared young marsupials.[1,2,4] Kangaroo pouch-young or joeys appear to be particularly susceptible to this infection under orphan rearing conditions. This paper describes the clinical history, gross and microscopic pathological findings and discusses the predisposing factors in four cases of candidiasis in young hand-reared kangaroos.

HISTORY

Four eastern grey kangaroo *(Macropus giganteus)* orphan joeys were submitted to the Veterinary Clinical Centre, Werribee, Victoria for necropsy. The animals had been hand-reared by persons licensed by the Victorian Division of Fisheries and Wildlife, Ministry for Conservation. In all four cases, difficulties in rearing such as failure to thrive on milk diets, weight loss, prolonged episodes of diarrhoea and periods of non-specific illness were experienced. In three cases, antibiotics had been given in an attempt to treat suspected enteric and pulmonary disorders. One or two days prior to death, the animals became depressed, refused to eat or drink and had fetid diarrhoea.

MATERIALS AND METHODS

Thorough necropsies were performed on all kangaroos. The oral cavity, esophagus and non-glandular stomach were cultured aerobically on blood agar and Sabouraud's agar. Pure yeast subcultures were identified using the Uni-Yeast-Tek kit.[1] Tissue samples were fixed in 10% formol saline, paraffin embedded, sectioned at 5 μm and stained with hematoxylin and eosin. Representative sections of the upper alimentary tract were also stained with periodic acid-Schiff (PAS) and Grocott's stains to demonstrate fungi.

RESULTS

Joeys were aged according to body measurements.[3] All were considered to be between 8 and 9 months of age and normally would still be entirely pouch dependent. All joeys weighed less than wild joeys of comparable age.

[1] Corning Medical Diagnostic, Corning Glass Works, Roslyn, New York 11576, USA.

Gross Necropsy

Joeys were in poor nutritional condition and had fecal soiling around the cloaca. The lips were swollen and white encrustations were present on the lips, gums, tongue and occasionally the hard palate (Figs. 1 and 2). Similar white encrustations were evident along the longitudinal folds of the esophagus (Fig. 3). The non-glandular stomach was enlarged and firm with evidence of serosal oedema and injection of subserosal blood vessels (Fig. 4). The non-glandular stomach contained white curd-like ingesta, of which a considerable amount adhered to the mucosa (Fig. 5). On exposed and cut surfaces, the adherent encrustations were associated with focal hemorrhage and ulceration. The remaining stomach content was mucoid and watery.

The intestinal content of all joeys was greenish, mucoid and watery; no formed feces were present in the distal colon.

FIGURE 1. Lateral view of the muzzle depicting the swollen lips and the accumulation of adherent white material on the buccal mucosa (arrow).

FIGURES 2 and 3. Upper alimentary tract candidiasis in kangaroo joeys. FIG. 2. White encrustations on the dorsum of the tongue. FIG. 3. Similar encrusted plaque adherent to the esophageal longitudinal folds.

Focal pulmonary consolidation consistent with aspiration pneumonia was noted in one joey. A duodenal intussusception with ulceration was present in another joey. The associated focal peritonitis produced localized adhesions between the ulcerated duodenal region and the adjacent psoas muscle.

Histopathology

Blastospores and mycelia were seen invading the stratified squamous epithelium of the oral mucosa, esophagus and non-glandular stomach. Mild lesions consisted of hyperkeratosis and parakeratosis. A meshwork of proliferation hyphae produced large adherent accumulations of desquamated epithelial cells and food material. No inflammatory response was noted in

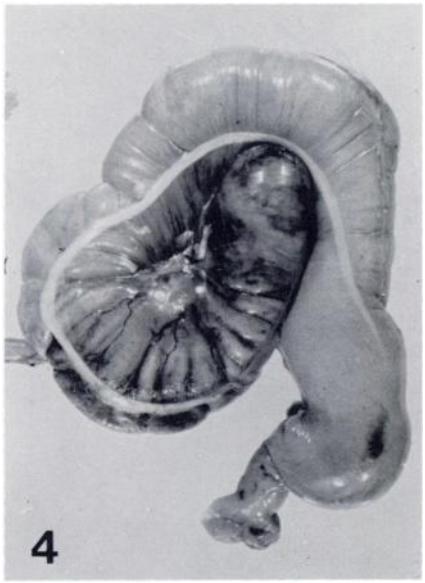

FIGURE 4. Ventral view of the kangaroo stomach depicting enlargement of the anterior stomach with evidence of serosal congestion.

areas where mycelial invasion only involved superficial epithelial layers.

Mycelial invasion of deeper epithelial layers was associated with the accumulation of inflammatory cells in the intraepithelial and occasionally submucosal tissues (Fig. 6). A mixed leucocytic infiltration of predominantly polymorphonuclear cells and occasional lymphocytes and macrophages was noted in these incipient abscesses (Fig. 7). Focal erosions were seen in areas where mycelial invasion occurred without any host response. Mycelia appeared to invade the basal epithelial layers and proliferate in submucosal tissues (Fig. 8). In all non-glandular stomachs fungal invasion was accompanied by mucosal hyperplasia featuring numerous basal epithelial cells in mitosis.

Venous thrombosis and necrosis of the stomach wall associated with mycelial invasion was noted in one joey. Little inflammatory response accompanied this invasion and secondary bacterial colonization of ulcerated areas also occurred.

In the ulcerated duodenal intussusception there was extensive invasion of submucosal tissues by fungal mycelia. Mycelial invasion of the psoas muscle also had occurred, resulting in focal necrosis unaccompanied by an inflammatory response.

Mycology and Bacteriology

Candida albicans was isolated from the oral cavity, esophagus and non-glandular stomach of all joeys. *Torulopsis glabrata* also was isolated from the esophagus and stomach of one joey.

Non-hemolytic *Escherichia coli* and non-hemolytic streptococci were cul-

FIGURE 5. Impacted contents of the kangaroo anterior stomach showing areas of haemorrhage related to ulcerated mucosa.

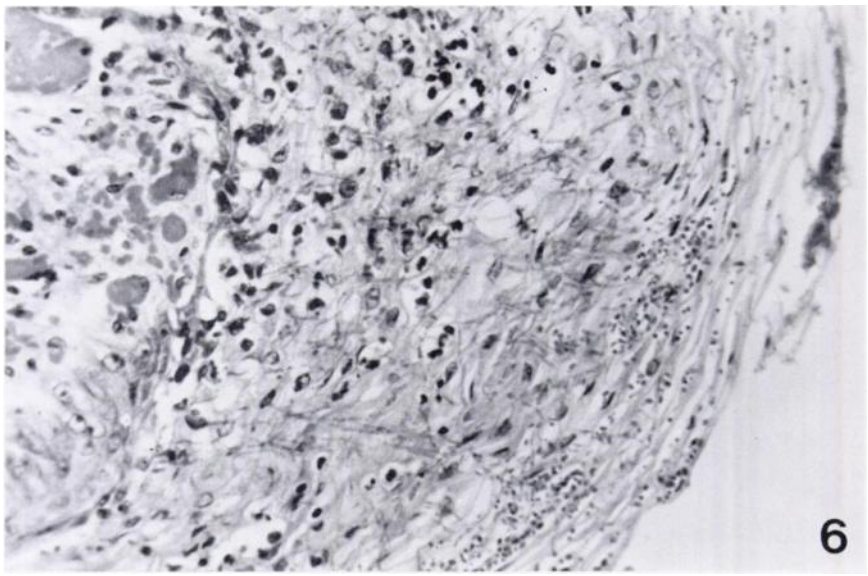

FIGURE 6. Mycelia and blastospores invading the stratified squamous epithelium of the anterior stomach, with evidence of polymorphonuclear cell infiltration H&E × 940.

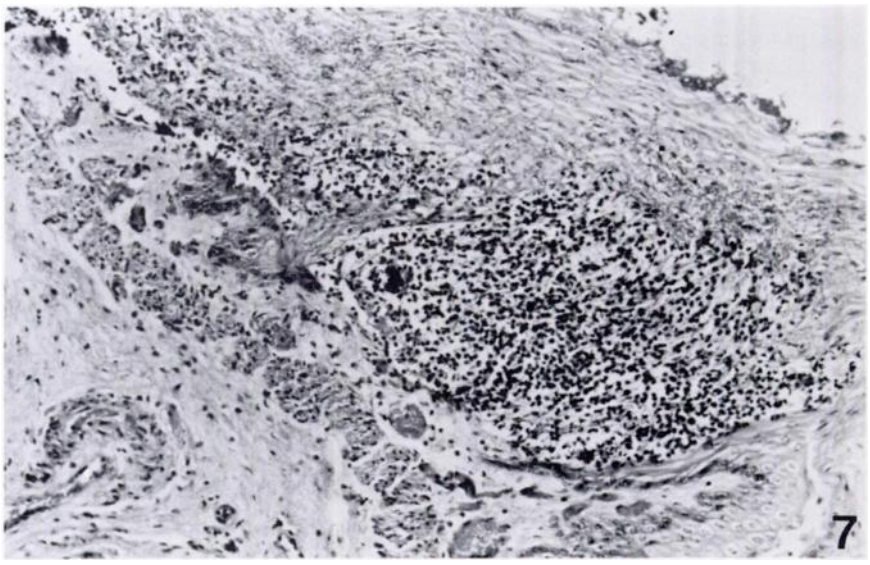

FIGURE 7. Infiltration of predominantly polymorphonuclear cells into intraepithelial tissues in response to fungal invasion H&E × 380.

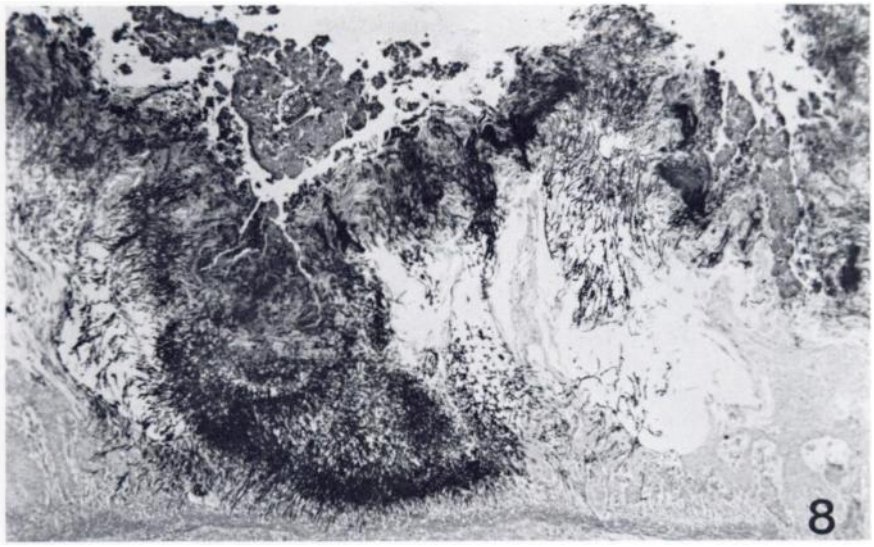

FIGURE 8. Mycelial invasion of deep mucosal layers and submucosal tissues P.A.S. × 150.

tured from the same sites in all joeys. *Proteus* and *Pseudomonas* spp. also were cultured from the esophagus and stomach of two joeys which had been given oral fecal-derived infusions during their rearing.

DISCUSSION

Candida albicans is an ubiquitous yeast considered to be a normal inhabitant of the upper alimentary tract, but it is recognized as an opportunist pathogen capable of invading and proliferating in the stratified squamous epithelial tissues of numerous vertebrates. Removal of the autochthonous bacteria, in particular the lactobacilli, has been shown to allow indigenous yeast to colonize and invade these tissues.[5,6]

Antibiotic therapy and prolonged debilitation are two factors predisposing animals to the establishment of *C. albicans*. Similar factors may be significant in the pathogenesis of candidiasis of kangaroo joeys. It is suggested that the condition in kangaroo joeys may be related to difficulties encountered during hand-rearing and to alteration in the resident microflora with antibiotic therapy.

Escherichia coli and streptococci have been isolated from the upper alimentary tract of healthy wild kangaroo joeys and probably represent normal bacterial flora (author unpubl.). *Pseudomonas* and *Proteus* spp. probably were derived from the fecal infusions administered to two joeys. *Torulopsis glabrata*, which is considered another commensal of the alimentary tract, may act as an opportunist saprophytic yeast as a result of increased nutrient sources derived from accumulations of adherent epithelial cells and food material.

The cause of death could not be specifically determined, however, dehydration caused by terminal diarrhoea, hypoglycaemia as a result of terminal anorexia and possible toxemia due to gastric ulceration and secondary bacterial invasion are thought to be significant.

Acknowledgements

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LITERATURE CITED

1. FINNIE, E.P. 1976. Husbandry and diseases of orphaned pouch-young marsupials. Aust. Vet. Pract. 6: 19-28.
2. ———. 1978. Marsupial therapy. pp. 619-622. In: Proceedings No. 36 Fauna-*Part B.* Post-graduate Committee in Veterinary Science, University of Sydney.
3. KIRKPATRICK, T.H. 1965. Studies of Macropodidae in Queensland. Age estimation in the grey kangaroo, the red kangaroo, the eastern wallaroo and the red-necked wallaby, with notes on dental abnormalities. Queensl. J. Agric. Anim. Sci. 22: 301-317.
4. POELMA, F.G. 1975. *Pneumocystis carinii* infection in zoo animals. Z. Parasitenk. 46: 61-68.
5. TANNOCK, G.W. and J.M. SMITH. 1970. The microflora of the pig stomach and its possible relationship to ulceration of the pars oesophagea. J. Comp. Path. 80: 359-367.
6. WINTER, H.I. and R. HURLEY. 1964. *Candida albicans.* J. and A. Churchill Ltd., London.

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