

Retrovirus-related Disease in Zoo-based Koalas (*Phascolarctos cinereus*) in North America

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ABSTRACT. Koala retrovirus (KoRV)-related disease is a major suspected cause of death in koalas (*Phascolarctos cinereus*) in zoos in North America. There are currently eleven zoos exhibiting koalas in North America. A mortality survey of these institutions indicated that mortalities directly related to KoRV (e.g., lymphoma, leukemia, anemia, bone marrow hypoplasia, osteochondromatosis) and mortalities suspected to be KoRV-related (e.g., immunosuppression, unusual opportunistic infections [e.g., Coccidioidomycosis], potentially other neoplasia) account for 41% of deaths. Testing of the living North American koala population for a recently reported, exogenous koala retrovirus variant (KoRV-B) identified four KoRV-B-positive individuals in a population of 54 koalas (7.4%).

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Koalas (*Phascolarctos cinereus*) have been exhibited in North America since 1925 with the North American regional studbook tracking koalas since 1971. Koala retrovirus (KoRV) has been suspected to be a major cause of mortality in some zoo-based koala populations in south-eastern Queensland, Australia, where it has been reported anecdotally to cause up to 80% of mortalities (Hanger *et al.*, 2000). The incidence of mortality related to KoRV in US-based koalas has not been previously reported. In 2011, a novel variant of KoRV (KoRV-B) was reported following a number of malignant cancers and deaths related to KoRV in koalas at the Los Angeles Zoo (Xu *et al.*, 2011; Xu *et al.*, 2013). KoRV-B appears to be exclusively exogenous, unlike the originally sequenced endogenous KoRV-A which is both exogenous and endogenous (Xu *et al.*, 2013). The prevalence of KoRV-B has not been previously reported in the US and is currently unknown in Australia.

Methods and materials

A KoRV mortality survey was emailed in February 2013 to veterinarians at nine of the eleven institutions in North America currently exhibiting northern koalas. Two zoos were not emailed surveys due to only recent acquisitions of northern koalas with no deaths. All nine emailed-institutions responded (Table 1).

Fresh-EDTA treated blood samples were collected from koalas currently living in ten zoos in the US. One zoo (Miami Metro Zoo) was excluded due to the geriatric, non-reproductive age of their two koalas. Samples were sent at room temperature overnight and tested for the presence of KoRV-B by PCR using plasma and peripheral blood mononuclear cell DNA (Table 2).

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