COMPARISON OF PROXIMATE COMPOSITION OF DOMESTIC CAT (*FELIS CATUS*), CLOUDED LEOPARD (*NEOFELIS NEBULOSA*), AND AFRICAN LION (*PANTHERA LEO*) MATERNAL MILK WITH EXOTIC CAT HAND-REARING FORMULAE

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Introduction

The ability to produce milk is a trait unique to mammalian mothers. Milk acts as an external pathway of communication between mother and offspring, continuing the vital exchange of nutrients that was previously facilitated in utero by the placenta. The composition of maternal milk directly impacts the development trajectory of a nursing offspring as any milk constituent deficiencies could result in developmental pathologies such as nutritional cataracts (Cooley, 2001) and inadequate or inappropriate growth. Thus it is important to recognize that even amongst closely related species, differences in lactation strategies often produce differences in milk composition.

Animals born in captivity sometimes require nutritional intervention if maternal milk is not an option. In such a situation, the knowledge of that species' milk composition is integral in producing comparable milk replacer formulae. The domestic cat (*Felis catus*), a well-studied species in the commercial industry, is typically used as a model for exotic felids (Bell et al., 2011). Commercial hand-rearing formulae developed for the domestic cat are therefore commonly employed for captive exotic felids. However, little is known about the actual maternal milk composition of exotic felids and how it compares to the composition of hand-rearing formulae.

The aims of this study are (1) to compare proximate composition of milks of three felids, the domestic cat (*Felis catus*), clouded leopard (*Neofelis nebulosa*) and African lion (*Panthera leo*) to establish if there exist species-specific differences in felid maternal milk composition, (2) to conduct proximate analyses on three commercial hand-rearing formulae commonly used by zoological institutions for clouded leopards and African lions, (3) to compare the maternal milk compositions of the before-mentioned felids against the compositions of the selected hand-rearing formulae, and (4) to provide hand-rearing formulae recommendations to the zoological community for clouded leopards and African lions.

Methods

Proximate analyses of milk and formula samples will be performed at the Smithsonian Conservation Biology Institute's Nutrition Lab. A survey will be distributed through the Nutritional Advisory Group forum asking zoo professionals willing to assist in this study to provide their clouded leopard and African lion hand-rearing formulae and recipes. Three hand-rearing formulae will be selected from the survey responses and subsequently replicated and analyzed in the Smithsonian Conservation Biology Institute's Nutrition Lab. Proximate analyses on KMR® (Kitten Milk Replacer), a commonly used commercial hand-rearing formulae used for

exotic felids (Grant, 2005) and one that is routinely employed by the National Zoo, have already been completed (Table 1).

Results and Discussion

Our preliminary results from the proximate analyses of KMR® liquid formulae agree with those of Edwards and Hawes, 1997 (Table 1). Additionally, we expect our results for the proximate composition of domestic cat milk to reflect the well-established averages for domestic cats reported in Jacobsen et al., 2004 (Table 1). From the domestic cat milk and KMR® liquid formula results illustrated in Table 1 we note a discernible difference in the average fat content of domestic cat milk to that of KMR® liquid formula as well as a slightly higher crude protein value in milk versus the formula. Fat and protein content of milk are associated with body growth rates for developing offspring (Hinde and Milligan, 2011) and disparities in these nutrients between maternal milk and hand-rearing formulae could account for the slower growth rates sometimes observed in hand-reared felids (Grant, 2005).

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Table 1. As-fed basis comparison of the maternal milk composition of the domestic cat and KMR® liquid formula. Jacobsen et al. (2004)[1]; Edwards and Hawes (1997)[2]; Murtough, Power, and Maslanka (2012)[3].

	Domestic Cat[1]	KMR® Liquid [2]	KMR® Liquid [3]
Dry Matter, %	27.9	19.30	18.51
Crude Protein, %	8.7	7.70	7.58
Fat, %	12.7	4.68	4.68
Carbohydrate, %	4.2	4.74	4.74
Ash, %	1.3	1.18	1.59