



Smithsonian
Institution

Smithsonian Conservation Biology Institute & National Zoological Park, Washington, D.C.

Using the Smithsonian Milk Repository: Compositional Changes in Lactation

Thao Nguyen, Michael Power, Elizabeth Himschoot, Elizabeth Wenker.

UNIVERSITY of
HOUSTON

Background

Smithsonian Milk Repository:
Largest collection of exotic animal
milks in the U.S. with over 15,000
samples from 185 species.

Characteristic of mammals is the
presence of specialized glands that
secrete milk – mammary glands. Milk
acts as the primary source of nutrition
for neonates and additionally
populates the infants' microbiota.

Through studying the nutrient
composition of milk and its
longitudinal changes, we can
understand critical components as
they relate to infant development.

This allows for meaningful
contributions towards improving the
dietary husbandry of animals,
especially in cases of hand-rearing
where milk substitutes may be needed.

Methodology

Cryo-preserved samples were
analyzed for dry matter, crude
protein, sugar, fat, gross energy, and
ash content.

Acknowledgements

I would like to thank Dr. Power & the
Nutrition Lab for their mentorship and
Professor Leland & the Honors College for
providing the opportunity and funding for
this experience.

Results

Table 1. The composition of armadillo milk at different stages of lactation

<u>Animal Name</u>	<u>DPP</u>	<u>DM (%)</u>	<u>Fat (%)</u>	<u>CP (%)</u>	<u>Sugar (%)</u>	<u>GE (kcal/g)</u>	<u>Ash (%)</u>
Aava	2	19.93	6.28	9.84	2.35	1.15	1.20
Aava	8	27.78	9.99	6.36	2.51	1.31	1.36
Aava	12	27.43	8.21	9.99	3.09	1.54	1.54
Aava	19	31.10	11.62	9.63	2.57	1.60	1.60
Aali	22	30.08	10.66	11.93	3.87	1.74	1.87
Aali	43	34.05	11.50	13.88	2.71	2.15	2.31
Aali	57	36.68	13.04	14.66	2.81	2.36	2.22
Aali	71	39.96	20.09	14.33	2.34	2.74	2.29
Aali	85	38.48	17.87	14.40	2.11	2.60	2.10
Aali	99	38.75	19.74	13.14	2.28	2.72	1.86

Table 2. The composition of Malayan chevrotain, Eld's deer, and Pere David deer

<u>Species</u>	<u>DPP</u>	<u>DM (%)</u>	<u>CP (%)</u>	<u>Sugar (%)</u>	<u>Fat (%)</u>
M. Chevrotain	6	29.08	12.16	3.82* (3.12, 4.52)	10.55
M. Chevrotain ×	7	46.06	15.09	2.30	21.30
Eld's Deer	Unknown	23.87	7.20	4.51	9.83
Eld's Deer	Unknown	24.46*	5.34*	3.24	13.04
Eld's Deer	Unknown	25.90	7.98	4.03	16.43
Pere David Deer	2	29.31	11.40	3.18	12.97
Pere David Deer	4	30.29	10.95	3.03	19.08
Pere David Deer	6	28.43	11.89	3.37	14.30

*Coefficient of variation value >10%

*Sample appeared to have been evaporated within the freezer

Conclusions

The armadillo milk data provides a good reference point for formulating milk replacement, as "70% of calves require hand-rearing" (Stetter, 2003) and no such data had been published since 1985. The Malayan chevrotain, Eld's deer, and Pere David deer data formed the basis for responding to the Bronx Zoo's request to analyze their milk replacer formula for Malayan chevrotain.

Reference: Stetter, M. D. 2003. Tubulidentata (Armadillos). In: Fowler, M. E., and R. E. Miller (eds.). Zoo and Wild Animal Medicine, 5th ed. Elsevier Science, St. Louis, Missouri. Pp. 538-541.