VITAMIN ANALYSIS RELIABILITY: A CASE STUDY TESTING SUPPLEMENTS AND SUPPLEMENTED MEAT PRODUCTS FOR VITAMIN LEVELS AT THREE COMMERCIAL LABORATORIES IN THE UNITED STATES

Kathleen Sullivan, MS,[1]* Shana Lavin, PhD,[1, 2] Eduardo V. Valdes, PhD[1, 2, 3]

[1]Disney's Animal Kingdom, PO Box 10,000, Lake Buena Vista, FL, 32830, USA
[2]Department of Animal Sciences, University of Florida, Gainesville, FL 32611, USA
[3]University of Guelph, Ontario, Canada
[4]University of Central Florida, Orlando, Florida

ABSTRACT

Regularly scheduled laboratory analysis of feed samples in zoological institutions is a necessary practice for maintenance of the highest levels of quality control. As such, factors such as cost, stability of product, and available storage environment may influence sampling protocols at each institution. The choice of laboratory used for analysis generally considers location and shipping concerns, availability of testing, methodology and most importantly, reliability. However, very little reference material can be found comparing the reliability of commercial laboratories in the United States beyond personal communications and experience. Labs describe their methodology according to Association of Analytical Communities (AOAC) procedures, often with slight variations based on published modifications. Multiple AOAC procedures may be considered acceptable, and without a thorough investigation of the chemical method, as well as consideration of animal physiology, it may be unclear which method provides a more biologically relevant analysis.

After a routine laboratory analysis of 2 commercial meat items and 3 food supplements at Disney's Animal Kingdom to test for vitamin A, vitamin E, and vitamin D, results appeared to be different from expected and guaranteed analysis. In order to investigate these spurious results, homogenous representative samples of each diet item subsequently were taken at the same time and shipped frozen overnight to 3 different feed analysis laboratories by the same person to minimize variability. An additional sample of inert mineral (supplement 4), similar in color and particle size to the other supplements, containing no vitamin was also submitted for analysis simultaneously as a control. The results of the initial routine analysis and the follow up testing are shown in Table 1. The vitamin concentrations were extremely variable across and within labs and none of the 4 laboratories produced results matching guaranteed or expected concentrations consistently. These inconsistencies may be due to differences in laboratory methodology, the feeds themselves, improper handling and storage, and/or human error. As it was not possible to determine which results were representative of the actual vitamin concentrations in the products, and the feeds' content was questionable, the intended quality control was invalid. Without the ability to interpret the results, quality testing is compromised. In order to test the legitimacy of these labs for quality control testing, a follow up study will be done by submitting industrial standardized samples to these laboratories.

Table 1: Analysis results of commercial meat products and supplements at two different sampling times from 4 laboratories with guaranteed and expected values shown. Concentrations are expressed on a dry matter basis (DMB).

Date Sampled[1]	**Mar-11**	**Apr-11**	**Apr-11**	**Apr-11**			
All Units in IU/ kg	**Lab A**[2]	**Lab B**	**Lab C**	**Lab D**	**SE of April**	**SE w March**	**Guaranteed analysis on bag (5/30/11)**
Commercial Meat Diet 1							
Vitamin A[3]	20882	3910	8100	19167	4551	4151	18000
Vitamin D_3	12403	15	840	920	289	2960	3540
Vitamin E	413	126	141	23	37	83	170
Commercial Meat Diet 2							
Vitamin A	9949	8960	8990	20027	3684	2692	23000
Vitamin D_3	10488	11	1630	980	470	2426	Not indicated
Vitamin E	294	108	117	28	28	56	560
Supplement 1							
Vitamin A	14703	4960	3730	< 166	502	3006	Not indicated
Vitamin D_3	5016016	1500	< 200	2997200	1222989	1261534	Not indicated
Vitamin E	30024	70644	43900	28325	12357	9783	50000
Supplement 2							**Expected**
Vitamin A	943881	300	1030000	1101221	355698	258195	1000000
Vitamin D_3	174765	2240	254000	222000	79128	56083	Unknown
Vitamin E	1110	636	655	751	36	110	420
Supplement 3							**Expected**
Vitamin A	358696	636100	149000	371462	140789	99779	140000
Vitamin D_3	< 20	5850	99400	82400	28772	24917	18000
Vitamin E	896	122	32	388	107	194	372
Supplement 4							**Expected**
Vitamin A	n/a[4]	n/d	n/d	n/d	n/d	n/d	0
Vitamin D_3	---	2170	n/d	n/d	n/d	n/d	0
Vitamin E	---	n/d	n/d	n/d	n/d	n/d	0

[1] March 2011 analyses were from the initial routine sampling; Analyses sent for follow up testing were sampled and sent on April 12, 2011.

[2]Lab A processed these samples, but they were analyzed by Lab D.

[3]Vitamin A values shown are retinol, Vitamin E values shown are as alpha tocopherol, and Vitamin D only included vitamin D_3 analysis.

[4]n/a = not analyzed; n/d = not detected