INTERPRETING VITAMINS AND MINERAL CONCENTRATIONS IN SERUM OF EXOTIC SPECIES: LAB VALUES ARE NOT INFALLIBLE

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Abstract

The prospect of trust and laboratory analysis is often so frightening a concept, scientists in the zoo field, including nutritionists and veterinarians, do not discuss it as more than a side note. Often we trust that specialists in biochemistry and new analysis technologies ensure proper verification of lab methodology, and would inform the consumer of any difficulties or questionable data. In a field where species' serum normals are generally not well established, serum data from animals under human care can be one of the major indicators used to judge health. Supplementation plans are developed and medical actions taken, based on serum indices-generally taken as fact and at face value as truth. Correct interpretation of nutritional serum parameters is one layer of possible error. However, commercial laboratories are not without human and instrumentation error as well. Use of equipment such as inductively coupled plasma emission spectrometer (ICP-ES) for mineral analysis, and high performance liquid chromatography (HPLC) for vitamin analysis need not only automated systems, but skilled technicians. Communication regarding samples (frozen, level of hemolysis, use of dilution, etc.), and general attention to detail in results is paramount for animal caretakers to interpret results accurately. Interpreting samples requires knowledge of best method of analysis, and factors affecting meaning – such as whole red blood cell manganese being the best indicator of Mn levels. Therefore, while lab error may be a consideration, other factors such as hemolysis may be affecting the wide range of seemingly improbably high levels observed (normal levels of Mn in cattle: 5.0 – 6.0 ng/ ml; sheep: 1.8 – 2.0 ng/ml; pig: 3.0 – 4.0; (Underwood and Suttle, 1999); horse: ~6.0 (Puls, 1994; Figure 1 and 2).

Any academic and scientifically rigorous study requires controls – often both positive and negative controls, as indicators that assays remain within specific coefficients of variance and tell an accurate story – that repeated measures can be trusted. In exotic animal health, controls are often forgotten, but they can be easily tested. This can be done with a lab standard or a large blood draw where a repeat sample is sent with each batch. In a preliminary set of elephant serum samples sent to two different commercial laboratories for vitamin E analysis, with each sample split from the same sampling tube after centrifugation, some startling differences could be seen (Table 1).

While often taken for granted, laboratories that we invest in for analysis will be open and honest with their methodologies, communicate regarding irregular samples, and discuss the issues regarding retests, and often the samples themselves. When serum values received affect treatment plans and dietary supplementation, it is well worth the time and scrutiny to evaluate all factors, including the reliability of the laboratory. It is difficult for professionals to make

decisions about proper treatment (e.g. supplementing or not) for animals under their care when questions remain regarding the validity of results obtained.

Literature Cited

Puls, R (1988) Mineral levels in animal health. Diagnostic data. Sherpa International.

Underwood, EJ, and Suttle, NF (2004) "Manganese" The mineral nutrition of livestock. Pp. 397 – 420.

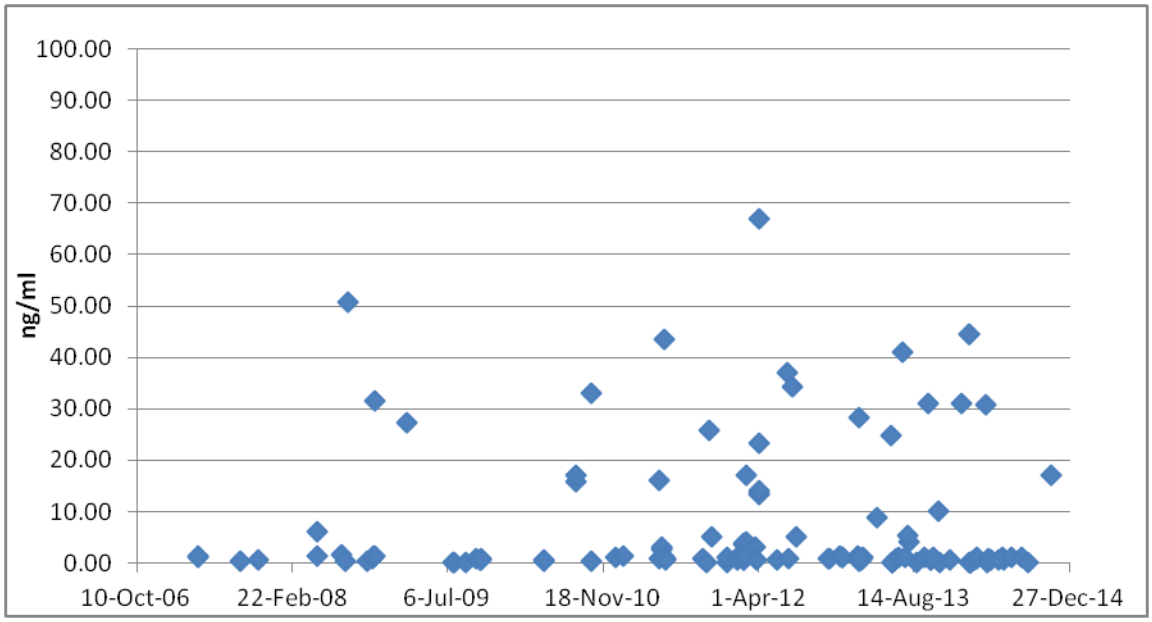

Figure 1. Serum Mn (ng/ml) in Zebra species across 8 years at Disney's Animal Kingdom.

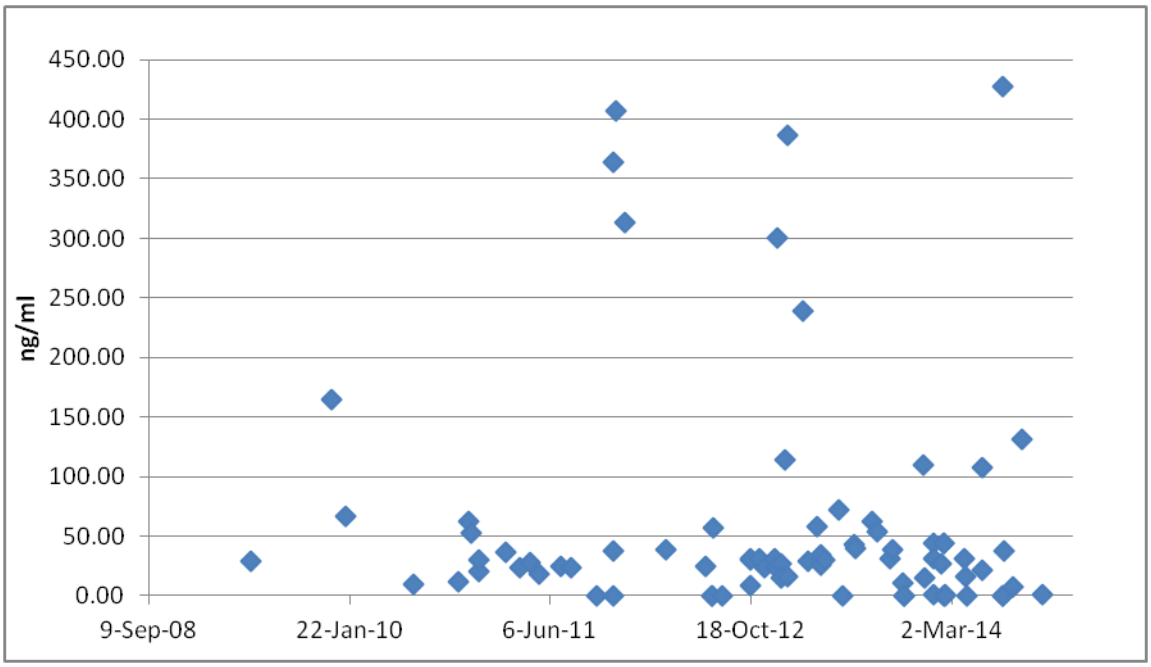

Figure 2. Serum Manganese (ng/ml) across multiple species over 6 years at Disney's Animal Kingdom.

Table 1. African Elephant Vitamin E values on the same samples sent to 2 commercial laboratories in 2015 from Disney's Animal Kingdom

	Vitamin E (ug/ml) Lab 1	**Vitamin E (ug/ml) Lab 2**	**Difference (Lab2 minus Lab 1 values)**
Average ± SEM	0.47 ± 0.07	0.74 ± 0.08	0.27 ± 0.06*
Minimum	0.18	0.32	-0.09
Maximum	0.87	1.09	0.49
N	10	10	10

*$P < 0.05$ between Lab 1 and Lab 2