



**KENTUCKY REGIONAL POISON CENTER**  
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July 2, 2001

Delta Pathology Associates Medical Group  
Attn: Albert Siu, M.D.  
2291 W. March Lane  
Suite 179E  
Stockton, CA 95207

Re: Linda Adanalian

Dear Dr. Siu,

I am writing to clarify and comment on two letters to Venu Gopal, M.D. The first from Raymond F. Burk, M.D. dated April 16, 2001, and the second from Kern Nuttall, M.D. dated May 7, 2001.

I have several concerns with Dr Burk's letter. I will address each issue separately.

- Dr Burk states he has been involved in selenium research for over 30 years.

COMMENT

\*\* I have reviewed Dr. Burk's published works and virtually all of it has to do with selenium deficiency and the effects of selenium deficiency, not toxicity. This is understandable since Dr. Burke is not a toxicologist.

- Dr Burk's second paragraph states "Normal tissue levels of selenium are generally in the range of 0.2 micrograms to about 2-3 micrograms per gram of wet tissue."

COMMENT

\*\* The medical literature does not support this statement. In fact, to the contrary, all published works report wet tissue levels below 1 microgram per gram. Dry tissue levels have been reported in the .2 micrograms to about 2-3 micrograms per gram range. However, dry tissue references cannot be used to evaluate wet tissue assays.

Dr. Burk groups all wet tissue levels into one reference range (.2 to about 2-3 mcg/g). This fails to recognize that different tissues have different selenium retention levels. Evidencing this is the fact that the published selenium reference tables provide different reference ranges for different organ tissues. Using one reference range to evaluate all tissue selenium levels allows for potential errors in judgement.



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- Dr Burk States, "Wet kidney samples were .53 micrograms per gram and 1.02 micrograms per gram." He further states "Selenium is volatilized from the body when it is present in high concentrations."

#### COMMENT

\*\* Dr. Burk does not discuss the Baylor Toxicology Service wet tissue result of 3.2 micrograms per gram. This omission is important because, as Dr Burk correctly states, the selenium content is volatilized from tissue samples with the passage of time. The Baylor sample was the earliest wet tissue sample and as such is the most reliable, having the least volatilization loss. In addition, Dr. Burk does not discuss the June 13, 2000, Mayo Clinic Laboratory results, which were also assayed during the early investigation, showing elevations more than 10x higher than normal. The results he does reference were performed in February and March of 2001, approximately 8-months after the Baylor and Mayo Clinic results and more than one year after Ms Adanalian's death. When the results from the different laboratories that have reported tissue concentrations are viewed in the proper time line, it is clear that the results show a decreasing concentration of selenium as time passes, as is expected from volatilization. Reviewing this case without analyzing the Baylor and Mayo laboratory assays allows for potential critical errors in judgment.

I have no knowledge of why Dr. Burk was apparently not provided with the Baylor and Mayo Laboratory results.

My concerns with the Letter of Dr Kern Nuttall are as follows:

- Dr Nuttall states "The antemortem plasma specimen is the most reliable."

#### COMMENT

\*\* This sample was assayed more than one year after Ms. Adanalian's death. In addition, this assay was performed on the last .5 milliliter of plasma remaining in the laboratory vile. I have spoken with the laboratories that handled this specimen and it was not stored or handled in a manner consistent with preserving its integrity. In a previous letter to you, I discussed in greater detail my concerns with volatilization from this specimen due to the multiple handlings, the extended time between retrieval and assay, and the storage conditions of the sample. These factors render the antemortem plasma sample an unreliable specimen.

- Dr Nuttall, recognizing that Ms. Adanalian's tissue levels are elevated, states, "The elevated selenium concentrations in the tissue specimens are most likely due to exogenous contamination."

#### COMMENT

\*\* The tissue concentrations in the case of Ms. Adanalian are consistent with an acute selenium exposure with the highest tissue concentration in the kidney. Exogenous contamination would not provide the selective distribution of selenium to the tissues as has occurred in Ms. Adanalian's case. The evidence does not support his contention.

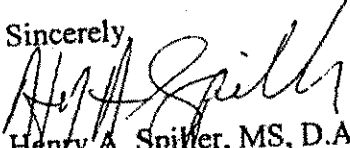
- Dr Nuttall states "Concerning the clinical presentation, I believe the relatively slow onset of symptoms makes acute selenium poisoning unlikely." He cites a single case report (Koppel *et al.*) for the proposition that acute selenium toxicity is characterized by a more rapid progression.

#### COMMENT

\*\* The case referred to, Koppel *et al.*, describes a suicide victim who is discovered in full cardiopulmonary arrest (respiratory arrest and asystole). After 45 minutes of an unsuccessful resuscitation attempt he is declared dead. The clinical presentation in Koppel, *et al.*, provides no description of onset. The literature provides other case reports that present a mixed picture of the onset of symptoms. Pentel, *et al.* describes a difficult case with a presentation more similar to Ms. Adanalian, with a protracted course and ultimately a fatal outcome. A close reading of the literature demonstrates that we do not know the smallest dose capable of producing a fatal outcome. While a massive overwhelming dose may indeed produce a more rapid onset and demise, a smaller dose may produce a fatal outcome with a more delayed onset and slower progression of symptoms. Ruta, *et al.* presents a case of attempted murder by selenium, where a patient remained prostrate for 48 hours, unable to move, but ultimately survives.

Dr. Siu, please contact me should you have questions or concerns. I am available to discuss this case at your convenience.

Sincerely,

  
Henry A. Spiller, MS, D.ABAT, D.ABFE  
Director, Kentucky Regional Poison Center

#### References

- Ruta DA, Haider S. Attempted murder by selenium poisoning. *BMJ* 1989;299:316-317
- Pentel P, Fletcher D, Jentzen J. Fatal acute selenium toxicity. *J Forensic Sci* 1985;30:556-562
- Koppel C, Baudisch H, Koppel I. Fatal poisoning with selenium dioxide. *J Toxicol Clin Toxicol* 1986;24:21-35