UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D C 20460

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OFFICE OF
THE ADMINISTRATOR
SAB-EHC-88-037

Honorable Lee M. Thomas
Administrator
U.S. Envorinmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Subject: Science Advisory Board's review of the SELENIUM health criteria document

Dear Mr. Thomas:

The Metals Subcommittee of the Science Advisory Board's Environmental Health Committee has completed its review of the Drinking Water Health Criteria Document for Selenium dated December 1986. The review was conducted January 14-15, 1988 at the St. James Hotel in Washington, D.C. The Subcommittee made two recommendations; viz, that more information was needed in the document on the studies on which the standard is based and that the DWEL should be 200 micrograms/L based on an uncertainty factor of 10.

The conclusion in the criteria document that the Drinking Water Equivalent Level (DWEL) should be 107 micrograms/L is based mainly on the Yang et al (1983) study and the National Academy of Sciences (NAS) 1980 conclusion that the safe and adequate range of daily selenium intake is 50-200 micrograms. One justification for setting the DWEL at this level is that drinking an average of 2 liters per day would provide close to the upper limit of 200 micrograms per day. To arrive at this conclusion it was necessary to set the uncertainty factor at 15, a somewhat unusual value but the only one that would allow both the use of the Yang et al study and also give an allowable intake close to the upper limit of the NAS recommendation.

The report properly focuses on the selenium dilemma: the apparently narrow margin between minimal daily intakes required to maintain health and intakes associated with toxicity. The primary source of data for establishing the DWEL is the report of Yang et al (1983). The Subcommittee recommends that this report be discussed at greater length because of the reliance placed upon it. For example, the authors discuss two areas labelled as high selenium areas. In one, selenosis was common in livestock and toxic signs were apparent in humans. In the other, selenosis

has never been reported. In the tables, however, the first area is seen to be associated with hair and blood levels about eight times higher that measured in the second. If 3.2 mg/day of selenium is estimated as the LOAEL, based on the first area, then 400 ug/day would represent a level below the NOEL. To be consistent, then, the language in the document should reflect the concept that the National Academy of Scieces figures may overestimate the uncertainty margin. Morever, even in high selenium areas, drinking water seems to be an insignificant contribution to total intake. If Yang et al are correct in their assertion that the ratio of toxic to minimal blood levels is about 16, a figure not too deviant from the NAS value, then the uncertainty factor could be set to 5-10 without compromising safety and without jeopardizing a possibly useful source of this essential element. Also, the 70 kg standard EPA human is probably not representative of the Chinese population, another margin in the uncertainty calculation.

Because the Yang et al study and the NAS recommendation play such an important role in the development of the DWEL, it is recommended that more detail be provided regarding the studies. The Yang et al study is not clearly described in the criteria document and it is not clear what the minimum daily intake of 3200 micrograms/day (LOEL) used in deriving the DWEL refers to. Does the study deal with individuals or geographic areas? How many people were involved? How was selenium intake measured? Also more information is needed on how the NAS arrived at its recommendation of 50-200 microgram daily intake value.

A second recommendation is that the USEPA consider raising the DWEL to 160 micrograms/L by using an uncertainty factor of 10 instead of 15. Rounding off to one significant figure could lead to a DWEL of 200 micrograms/L. The reasons for this are as follows:

1. In the Yang et al study the LOEL was 3200 micrograms per day and no lower values have been reported.

2. A statement on page VI-30 that chronic human ingestion of 200 micrograms per day may be related to increased incidence of symptoms is not supported by any of the data presented other than the NAS report.

3. A daily intake of 214 micrograms (107 micrograms/L x 2 L/day) is too close to the value needed for human nutrition (50-200 micrograms per day) and too far from the lowest value at which human symptoms occur.

4. There is little or no evidence for proposed human health effects such as cancer or teratogenic effects. Selenium (SeS_2+) is not regarded as a human carcinogen.

5. Uncertainty factors should reflect likely beneficial effects as well as harmful effects. There is limited evidence that selenium deficiency is related to cancer and perhaps cardiovascular disease.

Sincerely,

Norton Nelson, Chairman
Executive Committee

Richard A. Griesemer, Chairman
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Bernard Weiss, Chairman
Metals Subcommittee

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