

From: Jay Beaumont
To: Alexeeff, George
Date: 8/7/2001 7:33:39 PM
Subject: Zhang and Li 1997

George-

Attached is my review of the Zhang and Li 1997 study of cancer and Cr6 contaminated drinking water. I attempted to obtain their 1987 publication, and the OEHL library is still working on it, but I've since found out that it is entirely in Chinese. The 1997 paper finds the same result for the same analysis, so I don't think we need the 1987 paper.

Let me know if you have any questions. -Jay

CC: Howd, Bob; Sandy, Martha; Zeise, Lauren

Review of Zhang and Li 1997
By Jay Beaumont 8/7/01

Zhang and Li in 1997 published an update to their previous analysis of cancer rates in five villages with varying levels of Cr+6 contamination of drinking water from a chromium ore processing facility. Their previous analysis, printed in a Chinese medical journal in the Chinese language [Zhang 1987], concluded that there was "a significant excess of overall cancer mortality in five Cr+6 contaminated villages combined" [Zhang 1997]. However, in the updated analysis the authors conclude that the additional analyses "do not indicate an association of cancer mortality with exposure to Cr+6 contaminated groundwater."

The authors presented several analyses in their 1997 paper, as follows.

Total cancer:

- The rate of total cancer in the five villages combined was compared to the rate in the province containing the villages. The rate in the five villages combined was found to be significantly higher ($p=0.04$). This is the same finding as in the 1987 paper.
- The rate of total cancer in each of the five villages was compared to the rate in the province. None of the individual village rates was found to be significantly higher than the rate in the province.
- The rate of total cancer in the three villages combined that were closest to the contamination source was compared to the rate in the province. The rate in the three closest villages combined was non-significantly higher than the rate in the province ($p=0.25$).
- The rate of total cancer in the two villages combined that were most distant from the contamination source (and that had the lowest levels of Cr+6 in the groundwater) was compared to the rate in the province. The rate in the two villages combined was non-significantly higher than the rate in the province ($p=0.1$) and higher than in the three villages closest to the contamination source (no p given).

Stomach and lung cancer: (Note- stomach and lung cancer rates were not available for the province, so the five villages were compared to each other.)

- The rates of stomach cancer in each of the five villages were regressed against the proximity of each village to the contamination source (the proximity ranged from 1.4 to 5.0 km). The regression analysis resulted in a non-significant ($p>0.05$) negative association, indicating that villages closest to the contamination source had lower stomach cancer rates.
- Lung cancer rates were not analyzed statistically, but the authors noted that "lung cancer mortality rates were highest in the more distant villages."

There were several notable limitations and oddities in the Zhang and Li 1997 paper:

- Average levels of Cr+6 in the drinking water in each of the villages at the beginning of the observation period (1965) were available (and given in a table), yet these values were not used in the epidemiologic analyses. Distance from the industrial source, "a surrogate for exposure" as stated by the authors, was used instead. Reasons for not using the Cr+6 levels were not given. Presumably the measured Cr+6 levels would be a better measure of dose than distance from the source.
- Some of the villages are more than a kilometer in width, so it would be helpful to know the geographic point at which the distance from the industrial source was measured and whether the method of distance calculation was consistent for the five villages. The paper does not address this issue.
- The authors describe their study as "retrospective mortality" of a "cohort" for which "follow-up" was performed. However, none of these epidemiologic terms is used correctly. The study was actually an ecological analysis of rates in geographic populations, with no follow-

up of individuals.