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[illegible]

Comments on Health and Welfare Canada report - "Arsenic Exposure in
Workplace Areas of Yellowknife Gold Mines & Mills, Northwest Territories"

The numbers of workers involved is given for staff, mine workers, mill workers and surface workers, but the definition of these groupings are omitted. What for example, is the difference between surface workers and mill workers? The same omission is made when the workers are categorized according to their likely exposure to arsenic trioxide. In this section, the population at risk for each category is not given. Both of the above systems of categorization are not continued on in the report and become irrelevant for the remainder of the report. This is because the results are expressed by site of sampling and no clarification of the sampling site and its relationship to the categories is given. There are no results included for the mine areas.

The method used is not adequately described. No rationale is given for use of the portable personal air sampling method and the errors of the method are not discussed.

There are too many sample sites included in the survey and not enough samples drawn at each site. Most sites are represented by one or two samples. In my opinion, at least 10 samples should be taken at a site to arrive at a reliable reading. If methods exist using a larger pump and filter, then more samples at one site could have been obtained over a shorter time period. The samples obtained in this report had sampling times of one to three or more hours.

No results for total arsenic are included in the results. Soluble arsenic is measured by leaching the soluble forms out from the filter with distilled water. The filter is then dissolved in a second method for determining the insoluble arsenic. The total of the two could represent the total arsenic. This assumption is not supported in the report by analysis of some filter samples for total arsenic content and no correction factor, if any, for the possible loss of arsenic during the procedures, is developed. It should not be assumed that the sum of the soluble and insoluble arsenic values is the total arsenic present.

The report gives the theory that soluble forms of arsenic are more dangerous to health than insoluble forms and bases much of the discussion on this assumption. For example, the arsenic levels in mines where workers are exposed to arsenic pyrites, an insoluble form of arsenic salt, are not measured. Emphasis is placed on roasting of the ore where soluble salts are created and a ratio between soluble and insoluble salts is developed. They state that only those workers exposed to roasted arsenic dusts are potentially at risk.

This may have some foundation in history where acute occupational toxicity was first considered important but the present problem deals with possible carcinogenicity of arsenic, a slow process with a long latent period. All the so-called insoluble salts of arsenic are probably soluble to some degree in the lungs over long periods of contact. In fact the body may be able to cleanse itself of the soluble forms more quickly than of the insoluble forms, leading to the theory that insoluble forms are more dangerous to health in the context of modern occupational exposure levels.

This is the opposite of the authors theory. Some examples of the danger to workers of insoluble substances are silica in the case of silicosis and asbestos in the case of lung cancer.

The concentrations of arsenic found are unreliable because of the exclusion from the report of any discussion on the error inherent in the methods used. These would include the error of sampling, the effects on the results by the filters used and the error in the arsenic determination. How accurate is the silver diethyldithiocarbonate method for determining arsenic at the low levels reported? Why was this method used as opposed to atomic absorption analysis?

The error in the methods used should be considered from two points of view. The first is in relation to the safe exposure limits for workers which is currently taken as the value of 50 ug/m^3 recommended by the Threshold Limit Value Committee of ACGIH. In relation to this value, the error involved is probably very small and insignificant. The second point of view is from the standpoint of a research project exposing the levels of arsenic in all its forms and correlating with the health effects observed on all groups of workers over extended periods of time. In this case, the error of the methods chosen is very significant since the levels of arsenic being detected are very low.

The investigators found that filters, carried with the filters used in the study, gave a relatively high reading for arsenic. However, the authors fall into additional possible error by anticipating results since they considered the error introduced would be on the safe side.

It would also be of interest to have seen included some values of arsenic for ambient air outside the gold smelters as well as values for points of impingement of the stack emissions.

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