

Final Report:

Review of Cape Breton District Health Authority New Waterford Consolidated Hospital Test Results – Urine and Blood Specimens

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We have reviewed the entire Cape Breton District Health Authority contaminants and biomonitoring database and have the following comments.

1. For the elements for which erythrocytes were determined, the correction factors relative to whole blood range from 1.0 (arsenic, As), 1.4 (thallium, Tl) to around 2.0 (for the remaining elements (cadmium, Cd; mercury, Hg; nickel, Ni; lead, Pb; and antimony, Sb). After a literature survey, I estimate the following erythrocyte concentrations to represent expected upper limits in nmol/L: total As (≤ 600 , depending on seafood consumption); Cd (20-160, smokers and/or consumers of crustacea/shellfish); mercury (150 as a level of concern); nickel (70); lead (960 or $0.96 \mu\text{mol/L}$); antimony (60); thallium (4).
2. In terms of the urinary levels, I do not see any consistent elevation of concern, with inconsistency occurring between repeat collections. This is often explained in terms of dilution effects, although analytical or analytical reporting errors may have contributed. Examples that stand out are aluminium (3 employees), arsenic (4 employees) and barium (3 employees). For arsenic (e.g., 3 employees) and mercury (2 employees) differences in consumption of seafood most likely was an additional factor, perhaps also for cadmium (e.g., 1 employee); similarly, smoking for cadmium (5 employees) and calcium-rich diets and supplements as barium sources (3 employees).
3. In terms of the erythrocyte data, I do not see any consistent elevation of concern, with inconsistencies occurring between repeat analyses. Values fall within the ranges expected taking into account the reported existence of risk factors such as cadmium and smoking (7 employees) and consumption of seafood and arsenic (4 employees), or mercury (4 employees).
4. I question the reference intervals suggested and the concentrations reported for erythrocytes in case of thallium and antimony, as well as for the urinary antimony concentrations. For thallium, the observed erythrocyte levels are also inconsistent with the urinary concentrations found. Most of the urinary thallium concentrations are in the expected range, although the nearness of the residences of donors 7 employees to the coal-based electricity generating plant ought to be investigated; of course potassium-rich foods such as fruits, vegetables and milk can be sources as pointed out previously.
5. Clearly beryllium, lead, silver and uranium are not at issue, since levels are in the normal ranges. I feel the same about antimony.
6. For the symptoms reported, there is no consistent association with the body fluid levels found (e.g., heart arrhythmias and barium; neurological symptoms and aluminium, lead or mercury).
7. The building material substances for which there is more than at least one analysis with results over 1000 ppm ($> 0.1\%$), namely aluminium (11

instances), antimony (1), and barium (3), there is no consistent evidence that these are sources determining the observed body fluid concentrations.

8. As reported previously, the measured air and drinking water concentrations do not pose a concern.
9. My conclusion is that the most prevalent complaints (symptoms) reported are those associated with inadequate ventilation. Under separate cover I have faxed the appropriate pages from a current occupational medicine textbook. According to Dave Verma, our resident Occupational Hygienist, the CO₂ levels found in your indoor air survey are relatively high by comparison to more recent guidelines, and the relative humidity numbers low. I wholeheartedly believe that this is the route to pursue. The team of Verma and Ted Haines as the physician might be consulted.
10. For the current blood collection, you should send whole blood and urines to the London Laboratory. In addition, for continuity you should have the samples analyzed for all the previous elements. For arsenic in blood ask for "total arsenic"; for the urines ask for "total arsenic", as well as "inorganic arsenic and its metabolites". It is important that a detailed questionnaire that focuses on dietary issues (especially seafood and supplement consumption), location of residence, personal information (e.g., age, sex, job, hobbies, etc.) is completed at the time of sample collection.
11. I cannot in good conscience recommend further testing beyond that in progress. The additional anxiety and unrest this will create cannot be ethically justified. It constitutes false hope.
12. Nevertheless, if you decide to pursue further biomonitoring after the current batch, I strongly recommend that you switch to the Quebec laboratory. I am willing to act as the liaison on your behalf to set this up.