



Cigar Lake Draft Screening Report

Comments by Bill Adamson of Saskatoon for CNSC
Hearings

on June 10th, 2004 at LaRonge, Saskatchewan.

1. Effects of Ionizing Radiation --of Alpha Radiation

A. On the Biota New science, new discoveries, and fresh insights are being achieved regarding alpha radiation. This shows forth in the "Priority Substances List--II, Assessment Report, Releases of Radionuclides from NuclearFacilities (Impact on Non-Human Biota), July 2001."

The report was sponsored by Environment Canada and Health Canada. It was reviewed and approved by noted international micro-biologists --Drs. Pentreath and Woodhouse (United Kingdom), Whicker and Kocher (USA--Colorado and Oakridge), Amiro and Hines (Canada). Larson and Bergman (Sweden).

Other related studies are the following:

Amiro, B. D. and S.C. Shepard. 1994. Effects of ionizing radiation on boreal forest. Sci. Total Environ. 157: 371-382..

Amiro, B.D. 1997. Radiological dose conversion factors for non-human biota and for screening

potential ecological impacts. *J. Environ, Radioact.* 35: 37-51.

Pentreath, R. J. 1998. Radiological protection criteria for the natural environment. *Rad. Prot. Dosim.* 75: 175-179

Pentreath, R.J. and **D.S. Woodhead.** 2000. A system for environmental protection: reference dose models for fauna and flora. *J. Health Phy.Society*

Whicker, F. W. and **L. Fraley, Jr.** 1974. Effects of ionizing radiation on terrestrial communities. *Advances in Radiation Biology* 4. Academic Press. 317 pp.

Whicker, F. W. and **V.Schultz.** 1982. *Radioecology: Nuclear energy and the environment.* Vols. I and II, CRC Press, Boca Raton, Florida.

Woodhead, A.D. and **V. Pond.** 1987. Effects of radiation exposure on fishes. Vol. I. *Biological processes and wastes in the ocean*, Robert E. Krieger Publishing, Malabar, Florida. pp. 157--180.

Woodhead, D. S. 1984. Contamination due to radioactive materials. Vol. 5. *Ocean Management.* John Wiley. Chichester. pp. 1111--1287.

Dr. Ward Whicker has made some significant statements in e-mail messages to colleagues:

"Another fundamental problem is that we have very little data on the actual or relative concentrations of the alpha-emitting radionuclides in the tissues responsible for reproductive performance in the vast number of plants and animals we are trying to protect. This means therefore, that we are very ignorant when it comes to estimating the dose rates to the germ cells and tissues, and we are also ignorant about how to interpret the effects from a given dose rate produced by the alphas." (Nov. 26, 2001).

Again Whicker writes: "We now have a lot of new tools from molecular biology that can be used to understand ecological impacts better, and my

colleagues and I have been trying hard to sell such proposals--but so far without success." (Oct. 8, 2002)

It has become apparent that alpha radiation is potent enough to damage the genetic and somatic chromosomes and cells of plants and animals as well as humans. In its Draft Screening Report Cameco incorporates the RBE of 40 (relative biological effect) as recommended in the Priority Substance List II (pp. 53, 60, and 66). Otherwise, Cameco and CNSC appear to give little attention to these recent discoveries about alpha radiation. There is little reference to these new insights in its proposals, its procedures, and its potential mitigation measures.

Cameco mentions "radiation protection for personnel," (pp. 10 & 27) but makes no mention of the effects of alpha radiation on the biota. It mentions gamma radiation, and radon transported by water (p. 10), but neglects to deal specifically with alpha radiation.

For mine ventilation it is proposed to install bigger and better fans to blow the radon and dust downwind to the east at the rate of 200 m³/s. (pp. 18 & 32). There is not a word of what will happen to the plants, trees, and animals downwind from this blast. The charts on pp. 46-47 give no estimate or measurement of radon gas in the atmosphere downwind from the mine, but merely give an estimate of radon concentration of 10Bq/m³ to represent ambient air quality. We need to know more than the ambient reading!!

The CNSC needs to exercise its authority, and get up-to-date in its science and oversight by **requiring** Cameco to initiate studies of the genetic effects on the biota of alpha radiation, using the recent tools of microbiology referred to by Dr. Whicker! Present measurements and estimates in the Screening Report only indicate the ingestion and concentration of chemicals in plants and fish tissue.

B. On Mining Personnel

There is a serious neglect and lack of care for the health of mine and mill workers in Saskatchewan resulting from exposure to alpha radiation. The predicament is that there is a latent period of 4 to 15 years before damage to the chromosomes and cells by a highly charged particle of alpha radiation turns into cancer. Some assessment needs to be done through a backward looking mirror.

For instance, in a 10 year period from 1974--1984. some 656 miners from the Elliot Lake uranium mines died from lung cancer. All this mining was done under government regulations. So, what was missing in the regulations? Was it the potency and delayed results of alpha radiation?

From 1955 to 1986 out of some 21,346 male uranium miners, some 4993 miners (13%) had died. It was found that "exposure to short lived radon progeny occurs five to 14 years before death." (Kusiak, Ritchie, Miller, Springer, Mortality from lung cancer in Ontario uranium miners. British Journal of Industrial Medicine. 1993; 50: 920-928, pp. 920, 922, 927).

Another study found that in comparison to the general population of Ontario, lung cancer mortality and incidence rates were markedly elevated. "Mortality rates were 2.4 higher than expected and lung cancer incidence rates were 3-fold higher than expected." (p.i). It was noted that "the important exposures in this cohort appear to be in the vicinity of the current occupational exposure limit, a dose rate of 4 WLM per year." (pp. iii & 33). This study also found that " exposure to lower dose rates is more hazardous than exposure at higher dose rates." (p. 1) (M. Finkelstein and Robert Kusiak, Clinical Measures, Smoking, Radon Exposure and Lung Cancer Risk Among Elliott Lake Uranium Miners, Ontario Ministry of Labour, May 1995.)

Still another study was done of 8, 487 miners in the Beaverlodge cohort of miners in the Eldorado Beaverlodge mine from 1950--80 in which 65 men had died with lung cancer. For a higher exposure group (5+ WLM) a total of 46 lung cancer deaths were observed compared with 15.88 expected, a

highly significant excess." (p. 359) (JNCI.Vol 77, No. 2, August, 1986). All told some 20,000 workers of the Eldorado mines from 1932 to 1967 were also surveyed. Regarding death by cancer of the trachea, bronchus, and lung, some 30.63 were expected and 112 observed. In the same category for the Beaverlodge cohort, some 60.87 were expected and 112 observed. (R. C. Nair et al. Mortality Experience Among Workers in the Uranium Industry.).

I have serious questions about the present day monitoring of uranium miners and mill workers for alpha radiation. Each worker wears a dosimeter to detect this radiation. At the end of each month, the film pad is sent in to the Radiological Institute of Canada Laboratory in Saskatoon. There it is assessed for the "tracks" that the highly charged particles have made on the sensitive film. At the end of another month the results are sent back to the mine. So, if a miner receives an extra large dose of radiation, it is two months before it is even known!

Moreover, since alpha consists of small, highly charged particles floating in a spontaneous, random fashion in the air, the dosimeter film might register the intensity or concentration of a wave of particles, but could not tell if a stray particle floated into the windpipe or lung of a miner. The effects will be known only after the latency period of 4 to 15 years. Hence, I doubt that this system gives the safety that is claimed. It is a sort of "Russian roulette" system. When the retrospective study of uranium miners turns up a 2 or 3 fold increase in lung cancer over the general population, then one has to wonder what is being missed and why it is being missed.

After 22 years of mining, Cogema has prepared a Comprehensive Study Report towards the decommissioning of the uranium mine at Cluff Lake. Many estimates and test results are given for the impacts on the environment, but nothing has been said about what has happened to the mine and mill workers over that period of time.

In 1997, Dr. Donald Lee, chairperson of the Joint

Federal--Provincial Panel;. was quite pleased that an interdisciplinary team was to be formed for a Saskatchewan Uranium Miners Cohort study to do an epidemiological study of 5000 miners. He mentions it four times in his Report. (Executive Summary, p23; Midwest, p. 23; Cigar Lake p. 45; Cumulative Observations, p. 16).

What has happened since 1997? Very little of significance has happened! In seven years, the SUMCS has spent \$100,000 to review and to revise the Beaverlodge study of 1950--1980. It proposes to spend the next \$130,000 to revise the health/mortality records of recent Saskatchewan mine and mill workers. However, a feasibility study was done by SENES, and a report in the Northern Mines Monitoring Secretariat of Jan--Feb, 2004, p. 3 stated:

"Epidemiology Study Hard To Do--- Senes' research concluded that there was only a slim chance that the relatively low numbers of workers, and low known exposures, could be used to generate a **statistically accurate study**. Given this, the steering committee has opted to look at smoking patterns among uranium miners instead." Several previous studies have already worked over the issue of smoking.

It appears that the SUMCS and the CNSC are afraid of what they might find has happened to the health/mortality of uranium mine and mill workers over the last 22 years. It appears to me that this is the worst case of stalling and stonewalling that one could imagine! The Consultants and SUMCS do not care about the effects of alpha radiation on the workers, but only whether it would be a "**statistically accurate study**" !!

2. Emergency Water Handling Capacity

The Draft Screening Report states that the facility at Cigar Lake has been designed to handle a potential mine water inflow of up to 550 m³/hr. Obviously, there is some memory of the unexpected flood of water out of the sandstone formations at McArthur River. It is mentioned in

several places. (pp.20,21,22,59).

However, it is not clear why the capacity is set at 550m³/hr when the McArthur flood was coming in at 1000 m³/hr !Moreover, the statement on page 20 is very unclear about how the water treatment system will cope with an unexpected flood of contaminated water, other than it will increase or decrease according to the flow! That is not sufficiently specific. On p. 22 it mentions contingency ponds and increased pumping rates. But how many days can these ponds take on a heavy overflow? How and when will the water become treated? How will Cameco remove the radium in such an emergency overflow of water?

Moreover, the Screening Report says nothing about how it will monitor alpha radiation from such emergency floods of water. At the McArthur River flood, one worker was exposed to a dose of 14.7 mSv, ten miners were exposed to doses between 5 and 10 mSv, and ten miners were exposed to radiation doses greater than 10mSv, when the agreed upon level is set at 20 mSv for a whole year! Did the industry really learn from this incident?

3. Chemicals of Concern, Sediments, and Residual Effects.

In the chart on chemical concentrations of the effluent from the mill, 5 mg/L of arsenic is not going to help the creatures in the waterways downstream from the mill. (p. 21). Moreover, 150 mg/L of chloride and 730 mg/L of sulphate will be severe pollutants to the environment. And why would 28 mg/L of the radionuclide, uranium, be allowed to poison the natural environment? Tougher regulations are needed in this regard.

What does Cameco propose to do about the 105 ug/g of nickel, and the 80 ug/g of zinc in the soil conditions of Cigar Lake? These are dangerous metals to release into the water systems and environment. (p. 35). Again, the sediment qualities are high for Lake B and East Brown Bay for cobalt, copper, nickel, and then zinc at 55 ug/g. (p. 38) Why are there no estimates or test results for

selenium? Why are there not estimates for radionuclides in water and in sediments ? (p.52)

In the Comprehensive Study Report for the Cluff Lake Decommissioning Project it was found that the selenium in the sediments of Snake Lake and Island Lake was causing abnormalities in the fish, and further studies were to be done. (Dec. 2003, pp. 6-51 to 6-52).

The pollution of copper, molybdenum, and especially zinc shows up in the tissue of northern pike, and white sucker (pp.39--40), and in blueberries and elder. (p.41). How can Cameco say that these chemicals and metals will not affect the 222 bird species, 45 mammal species, 4 amphibian species, and 1 reptile species of the area? (p. 42). It is a revealing understatement to say."Levels of confidence in CTVs also vary depending on the underlying evidence from the toxicological literature, which is often based only only a few key studies on laboratory animals." (p. 54)

What are the "radium mitigation" measures as listed on p. 57?

It is admitted that there could be adverse residual effects to the health and reproductive systems of scaup and chironomid due to Po-210, and to beaver, mink, and muskrat populations in Aline Lake due to molybdenum concentrations. (pp. 56, 66, 67). But then it is stated that in 45 years the hazard to the muskrats will lessen when the discharges of mill effluents cease. This is a totally unacceptable approach to the care of the environment!

In respect to a cumulative effect of the overlapping of toxic effects of the Cigar Lake mine and the McArthur River mine the screening report take the easy way out-- ". . . it is necessary only to show that the estimated effect is acceptable compared to regulatory standards and other criteria." An EA is not required to precisely predict the exact magnitude of effects." (p.63) Hence, from 1995 levels and from data it is concluded: "The cumulative impact of the six uranium mining operations on the receiving waters of Wollaston

Lake, Fond du Lac River and Black Lake is negligible." (p. 64)

This sweeping conclusion does not correlate with the various studies reported in the Priority Substance List II--(see pp. 37,43, 74, 49--64).

The Screening report states:" The results show that, based on the implementation of proposed mitigation measures, no plants will be affected by the project. . ." (p..66). To what mitigation measures are they referring? I find no basis for such a general statement. The IAEA in its publication TECDOC--1091, p. 8, found that in the wake of the Chernobyl radiation disaster that the conifer trees in the region were affected. This finding about conifers is mentioned also in the Priority Substance List II, at p. 61.

I find no evidence that Cameco has used the new tools of microbiology to ascertain the genetic and somatic effects of alpha radiation on the black spruce and plants of the area. It is too early to make the sweeping statement "that the project is not likely to result in any significant adverse effects on the environment." (p. 67)

Regarding the CNSC licensing and compliance program, the Screening Report states: "The program will be based on regulatory principles of compliance, adaptive management, reporting and analysis." (p.73) When and why did CNSC switch to "adaptive management"? Sweden has adopted the "precautionary principle," originating from the documents of the Earth summit in Rio de Janeiro in 1992. (IAEA--TECDOC--1091) Is the CNSC more interested in facilitating the uranium industry than in safeguarding humans and the environment?

Conclusions

The Cigar Lake Project will be the most dangerous mine in the world! Earlier uranium mines had an ore grade of 3--5 %. Cigar Lake now will have an ore grade of some 21%. A great deal of radium and radioactivity will be associated with the ore and

brought to the surface of the earth.

The CNSC needs to update its science in keeping with the science in the PSL-II document, and the discoveries of present day microbiologists. The CNSC needs to take actions correlating with these recent discoveries about alpha radiation. CNSC needs to require Cameco to begin using the new tools of microbiology to ascertain what is really happening with the genetic and somatic effects on plants and animals in the wake of the ventilation fans of the mine.

As well as the effects of uranium mining on the environment, CNSC needs to discover specifically and soon what has been happening to the mine and mill workers in Saskatchewan who have received alpha radiation. Enough time has elapsed now for the latency period to be over. How many lung cancers have shown up? It is no use waiting 50--75 years and then discover--Oops! something was missed! The stalling tactics of the SUMC study need to be remedied immediately!. We cannot afford the health results experienced by the Ontario uranium miners.

In regard to the Cigar Lake mine, the CNSC needs to be very cautious and wary, that it is not helping to send a number of uranium workers to their death with lung cancer! It is a delayed action process, but a horrible way to die!

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