Prevention is the Only Cure: Health Effects of the Uranium Cycle on Women, Fetuses and Children

Les effets sur la santé de l'exposition au cycle de l'uranium sur les femmes, les fœtus et les enfants : La prévention est le seul remède

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ABSTRACT

There are many sources of potential contamination throughout the uranium cycle, which can affect the health of families for generations to come. Children and fetuses are especially vulnerable due to rapid cell division during physical growth. This is documented internationally through outcomes such as increased incidence in spontaneous abortions, childhood leukemia and other childhood cancers. Research on this topic arose out of a local concern in eastern Ontario due to proposed uranium mines at the watershed of major rivers, which may pose a risk to midwifery clients who live near tailing ponds, in communities who rely on the rivers for their source of water, or who work in reprocessing and nuclear power plants. As Canada is the world's largest producer and exporter of uranium, the health impacts extend to the most recent use of depleted uranium in weapons abroad. As primary health practitioners, midwives can play a role in promoting public health through becoming better informed, and supporting local and international initiatives which address the threat posed to human and environmental health by the uranium cycle.

KEYWORDS

Radiation exposure, pregnancy, uranium cycle, children, fetuses, midwives, public health promotion.

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RESUMÉ

Il existe plusieurs sources de contamination potentielle à travers le cycle de production de l'uranium qui peuvent affecter la santé des familles et des générations futures. Les enfants et les fœtus sont particulièrement vulnérables à cause de la rapidité de leur division cellulaire durant leur croissance physiologique. Ce texte est documenté mondialement au moyen de résultats concrets comme l'augmentation de la fréquence des avortements spontanées, la leucémie et autres cancers infantiles. Les recherches autour de ce sujet ont pris naissance dans l'est de l'Ontario à partir de l'inquiétude provoquée par la présence des mines d'uranium dans les bassins versants de la majorité des rivières, un risque potentiel pour les patientes des sages-femmes qui vivent près des bassins de décantation, à l'intérieur de communautés qui dépendent des rivières pour leur approvisionnement en eau potable et dont certains des membres travaillent au retraitement des déchets nucléaires dans les centrales nucléaires. Comme le Canada est le plus grand producteur et exportateur d'uranium au monde, les impacts sur la santé s'intensifient avec l'usage très récent de l'uranium appauvri utilisé dans les armements de guerre à l'étranger. En tant que praticiennes importantes du domaine de la santé, les sages-femmes peuvent jouer un rôle important en faisant la promotion de la santé publique et pour cette raison, elles doivent aussi être mieux informées et encourager toutes les initiatives locales et internationales qui dénoncent la menace pour la santé humaine et

Legacy VII, *by Corin Ford Forrester (2008)*

Image page 46:
Legacy VII *by Corin Ford Forrester, 2008*, Base image: Second level of Creighton Mine [ca. 1905] (Archives of Ontario, RG 13-30-1-5) "

ABOUT THE ARTIST:
Corin Ford Forrester *studied traditional black and white photography at the Haliburton School of the Arts in Ontario in 2006, where she received the highest standing in the Photo Arts program. Since that time she has shown her work in numerous art festivals and galleries in Ontario. The artist's black and white photographs blend images of the feminine form with landscapes both natural and human-made. They explore the tremendous impact that human beings have on the planet and the beauty and value of what we stand to lose. To see more of her work please visit www.corinfordforrester.com.*

environnementale du cycle de production de l'uranium.

MOTS CLÉS
Exposition aux radiations, grossesse, cycle de l'uranium, enfants, fœtus, sages-femmes, promotion de santé publique.

Cet commentaire a été évalué par des pairs.

During my summer vacation of 2006, I went to the Blue Skies Folk Festival with my two daughters. The festival is situated on beautiful farmland surrounded by forests near Sharbot Lake, Ontario. We were looking forward to a weekend of good music in a relaxed and friendly atmosphere. While at the folk festival, I attended a workshop given by Bob Lovelace, former Chief of the Ardoch Algonquin First Nation. I was shocked to hear that 30,000 acres of unceeded Algonquin territory in the surrounding area had been staked for uranium mining exploration by a company called Frontenac Ventures Corporation. There had been no consultation before the Ontario government issued the licence. A blockade had been set up by the Ardoch Algonquin First Nation, the Shabot Obaadjiwan First Nation, and non-Aborinonal "settlers" and they worked hard to inform the public and petition the Ontario government. Bob Lovelace was later arrested and imprisoned for three months for his role in the blockade. He was compelled to abide with Algonquin Law which instructs to preserve Creation. He was charged for contempt of court for "failing to acknowledge" that the Crown has the ability to supercede Algonquin law. This decision has since been overturned at the Ontario Court of Appeal, and was later upheld at the Supreme Court of Canada.

During the period of Bob Lovelace's imprisonment, a "Citizen's Inquiry into the Impacts of the Uranium Cycle" was held in five cities. The inquiry was coming to Peterborough in April 2008. I wanted to contribute to the hearings from the perspective of a registered midwife. I began to do research on the health impacts of the uranium cycle on women, fetuses and children. This article is based on information I learned in preparation for the public inquiry.

As midwives, we work with families who live in both ends of the uranium cycle, in the vicinity of the mines and tailing ponds near Bancroft, Ontario an hour north of us, and living near or working in the reprocessing plant in Port Hope and nuclear power plant at Darlington, to the south. The watersheds that originate in the north and flow south connect us all.

As primary health care practitioners, midwives need to be concerned about the serious potential health threats posed to the public from uranium exploration, mining, tailings, processing, and nuclear power plants. Furthermore, the end products of depleted uranium in bomb-casings and nuclear weapons pose some of the most serious threats to humankind.

The uranium cycle is large and complex as are its impacts on the health of humans and the environment. The intent of this article is to raise awareness of these issues which will hopefully lead to further discussion and action by the midwifery profession. This paper will focus on the health concerns related to the cycle of uranium; specifically the health effects on pregnant women and children.

Children and fetuses are especially vulnerable to contamination because of rapid cell division during physical growth. In the 1950s, a British physician and epidemiologist, Dr. Alice Stewart established that

children born to women who received even one abdominal x-ray during pregnancy were 40% more likely to suffer childhood cancer.[1] This practice was discontinued.

There are many medical uses of radiation today. Although they can be life-saving both for diagnostic and treatment purposes, a recent study raised the concern that emergency physicians have not been tracking the cumulative amount of radiation their patients receive. This may lead to increased risk for cancer. For example, a single pediatric CT scan can range from about 5 mSV to 60 mSv. A third of children who have one CT scan have up to three CT scans.[2] For comparison purposes, the yearly limit for a nuclear energy worker is 50mSV. Pregnant workers are limited to 4mSv per year.[3]

The U.S. Center for Disease Control (CDC) states:

> *The human embryo and fetus are particularly sensitive to ionizing radiation, and the health consequences can be severe, even at radiation doses too low to immediately affect the mother. Such consequences can include growth retardation, malformations, impaired brain function, and cancer.*

The CDC also makes note of the effects of failure to implant and miscarriages for women.[4]

In addition to rapid cell division during growth, children are more susceptible to radiation than adults because their organs are closer to the ground. A child receives a 10-50% higher dose of gamma ground radiation than an adult.[5] This is an important factor, especially in instances when there has been soil contamination.

There are many sources of contamination throughout the uranium cycle, which can adversely affect the health of families for many generations to come. In the exploratory drilling stage, the Ontario Mining Act allows mining companies to excavate thousands of tons of material with no requirement for an environmental assessment or restoration of the land. Drill holes can contaminate the watershed and underground water aquifers that supply clean drinking water to communities. Drilling into the underground uranium ore releases it into the biosphere, where it changes in composition, releasing radioactive dust particles such as radon gas into the air.[6]

Seventy-five percent of uranium mines in Canada are open-pit mines. There is a well-established significant excess of mortality for uranium miners from cancer of the trachea, bronchus and lungs.[7]

Once harvested from the earth, the ore is crushed and leached using large quantities of water. The resulting powder is treated to remove the uranium. The remaining by-products are dumped into tailing ponds. These tailing ponds contain up to 85 percent of radiological elements contained in the original uranium ore and remain active for many years. For example, radium-226 has a half- life of 1,600 years, and thorium-230 has a half-life of 76,000 years.[8] Radon and its decay products are easily distributed over large areas, depending on weather conditions and can be inhaled.[8] This airborne radon can also contaminate local food sources and traditional foods.[9]

Due to the long-term toxicity of tailing ponds, they need to be maintained for perpetuity. So far, Ontario's track record is poor. In December 2005, the Ontario Auditor General's Report referred to 5,600 abandoned mine sites of which 4,000 are potentially hazardous to the public and "approximately 250 of these sites may pose environmental risk due to the potential for leaching minerals or other contaminants from mine tailings" The Ministry of Northern Development and Mines was strongly criticized over their failure to protect the environment.[10]

In Elliot Lake area, there have been over 30 breaches of uranium tailings dams, contaminating the Serpent River for 160 kilometres downstream.[11]

Closer to home, the former Madawaska mine near Bancroft, which was decommissioned in 1982, left four million tones of uranium tailings at the surface. Two mining companies, El Nino Ventures, and Bancroft Uranium Inc. have recently staked out thousands of acres for renewed uranium mining

efforts. Drilling has already begun near the Bancroft site. The proposed areas for uranium mines have the potential to contaminate two main watersheds which connect to the Trent River and eventually flow into Lake Ontario. In the case of the proposed Sharbot Lake area mine, it is at the headwaters of the Mississippi River watershed, which feeds into the Ottawa River. Clean water is a fundamental basis of public health. For this reason, there is a growing movement to call for a moratorium on uranium exploration and mining due to serious health concerns. So far in Ontario, 23 municipalities have passed resolutions calling for a moratorium, including the cities of Ottawa, Kingston, Peterborough, Lindsay, and Haliburton. Both British Columbia and Nova Scotia have renewed bans on uranium mining and organizations protesting uranium mining can be found across Canada, including Nunavut, Saskatchewan, and Quebec.

Ageing nuclear plants pose an increased threat to public health. Ontario is in the midst of a governmental review of energy plans for the next 20 years. Both Pickering B and Bruce B nuclear plants are scheduled for retirement beginning in 2013, to be shut down by 2019. In a report titled "Plugging Ontario Into a Green Future", six environmental organizations have endorsed a plan to take this opportunity to replace the power production through cost-effective, clean and sustainable means such as solar, wind, conservation and recycled energy.[12]

There are numerous studies worldwide about the health impacts on children caused by uranium cycle. With regard to uranium tailings, a study published in 1992 examined birth data for over 13,000 Navajo children born between 1964 and 1981 in Ship Rock, New Mexico, in a region where there are many uranium tailings. The study reported a statistically significant increase in birth defects, stillbirths, and illnesses during infancy.[13]

Further along in the uranium cycle, childhood disease clusters have been found in many communities in the vicinity of uranium processing facilities. According to a meta-analysis published in 2007 in the European Journal of Cancer Care, which reviewed studies representing 136 sites , there was an increase in childhood leukaemia near nuclear facilities. While the study showed an increase in the incidence of childhood leukaemia, it could not support a hypothesis to explain the excess.[14]

This pattern is being noted in many countries. For example:
In England:
- 200% increase in leukaemia in children of atomic workers.[15]
- 287% increase in cancer incidence in children of nuclear workers who received internal radiation.[16]

In France:
- 500% increase in childhood leukaemia in children visiting the beach once a week near the French nuclear reprocessing facility at La Hague
- 760% increase in childhood leukemia if they ate local fish regularly
- 345% increase in childhood leukemia associated with drinking well water from the vicinity of the nuclear facility.[17]

In Scotland:
- 1000% increase in leukemia incidence in children living near a nuclear reprocessing facility compared to children of the same age in the same area prior to the facility's operation.[18]

In case of nuclear plant accidents, there are disastrous health effects.
Chernobyl:
- 500% increase in thyroid cancer in Ukraine children
- 200% increase in birth defects
- 200% increase in spontaneous abortions[19]

Three Mile Island, Pennsylvania:
- 300-400% increase in lung cancer in the general population within the plume of the Three Mile Island accident releases
- 600-700% increase in leukemia in the general population within the plume of Three Mile Island accident releases[20]
- 50% increase in childhood cancer incidence the in Three Mile Island area for each 10 millirem increase in radiation exposure per year[21]

The final issue in the uranium cycle is the links to

nuclear weapons, which "threaten the continued existence of mankind."[22] Considering that 85 percent of Canada's uranium is exported, Canada plays a role in the spread of this destructive capability. It was Canadian uranium that went into the Atomic bomb that brought massive destruction to Hiroshima and also Canadian uranium that was part of the plutonium bomb that destroyed Nagasaki in 1945. The human tragedy and horror that occurred in Hiroshima and Nagasaki is beyond description. I have personally visited the Peace Memorial Museum in Hiroshima, and the images of devastation and human suffering are forever seared in my mind.

Canada is the largest supplier of uranium worldwide, accounting for 40% of all uranium by 1992, with 45% of the uranium going to the US.[23] The most recent military use of uranium is with depleted uranium warheads to increase penetration. These weapons were first used in Iraq during the US invasion of Iraq in 1991 where a total of 500 tones of uranium were deployed. In the 2003 attack on Iraq by US and Britain, it is estimated that between 500 - 2000 tonnes were dropped through use of depleted uranium weapons.[24] The uranium bursts into flames, producing a metal fume between 3,000 and 6,000 degrees Celsius. At such high temperatures, uranium oxide, which is of the nano particle size range, becomes ceramic-like and once inhaled is insoluble in the body. These ceramic particles can circulate in the blood and lymph fluid irradiating surrounding tissues. It can also penetrate the blood-brain and reproductive barriers, contaminating brain tissue, seminal fluid, or the uterus and damage the developing embryo or fetus. Furthermore, it can damage the immune system, leaving those exposed vulnerable to other viral, bacterial, electromagnetic, radiological and toxic metal exposures.[25]

A study done at the University Hospital in Basra, Iraq, reported a surge in birth defects from 11/100,000 in 1989 to 116/100,000 in 2001, and this trend continues.[26] Childhood leukemia in southern Iraq has increased by 100% between 1990 and 1999[27] Uterine cancer has increased 160% and breast cancer has also increased 102%. Not surprisingly, there was also a shift in age distribution of cancer cases, with many younger age groups experiencing cancer related illnesses.[28] Dr. Jawad Al Ali, director of the Oncology Centre at the largest hospital in Basra, Iraq has reported that there are now double and triple cancers in one patient. He has also observed clustering of cancer in families, and cancers rarely seen before age 12 are also common.[29]

Depleted uranium (DU) weapons have also been used in the Balkans in the late 1990's, in Kosovo in 2000[30], in Afghanistan,[31] with serious implications for long-term health effects in each of these regions. Investigations are under way to determine if DU weapons were used by Israel in the recent bombardment in Gaza.[32] A UN sub commission initiative to ban DU weapons which was initiated in 1996 has so far been blocked.

With the proliferation of nuclear weapons internationally, this remains one of the most urgent threats to human health, and the survival of the planet earth. In conclusion, the uranium cycle from beginning to end poses a serious threat to human health and has long-lasting environmental hazards, which are incompatible with sustainability. Infants and children are especially vulnerable. As health care practitioners, Canadian midwives need to add our voice in demanding a moratorium on uranium mining and ban on the use of uranium in weapons. The threat to human and environmental health posed by uranium cannot be reversed once unleashed. Prevention is the only cure.

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