

BACKGROUND

What we know about tritium in the Ottawa Valley

Answers to Three Questions

1. How much tritium was actually released into the environment in the period December, 2008, to February, 2009 ?

On December 5, 2008, 47 kilograms of heavy water leaked from the core of the NRU reactor. Of this amount, 4.5 kilograms was vented almost immediately into the atmosphere as steam, 14 kilograms was recovered and stored in sealed drums, and 28.5 kilograms entered the sump and was pumped to an on-site treatment facility for radioactive liquids.

But radioactivity is measured in becquerels, not kilograms. A becquerel indicates that one radioactive disintegration is taking place every second.

Each kilogram of the non-radioactive heavy water that leaked from the NRU reactor contained about a trillion becquerels (a million million becquerels) of radioactive tritium as a contaminant. Tritium is created inside the reactor as an unwanted byproduct. It is radioactive hydrogen. Tritium forms water molecules as easily as ordinary hydrogen does, but those water molecules are radioactive.

So the contaminated heavy water that was vented into the atmosphere as radioactive steam on December 5, 2008, included 4.5 trillion becquerels of tritium in the form of water vapour molecules. Tritium in the form of water vapour is 25,000 times more toxic than “elemental tritium” (that is, tritium all by itself, which is a radioactive form of hydrogen gas).

For the record: all the tritium that was released to the air on December 5 was in the form of water vapour – the most dangerous form of tritium in the atmosphere.

Since tritium forms radioactive water molecules that are chemically identical to ordinary non-radioactive water molecules, the radioactive treatment facility at Chalk River is unable to remove the tritium from the liquid wastes. Therefore all 28.5 trillion becquerels of tritium were eventually dumped into the Ottawa River in the form of “controlled releases”, so that certain regulations governing the permissible concentration of tritium in drinking water are not exceeded.

In the nuclear age, it appears that “dilution” is still considered the “solution” to “pollution”. The science behind this reasoning is specious, however, because medical research has found that the number of cancers caused by any exposure to a carcinogen is proportional to the number of people exposed, and in this case, that is a very large number.

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2. What are the actual tritium levels in the Ottawa River?

Table 14: Radioactivity in Ottawa River water – annual average concentrations 2002-2007

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Tritium (Bq/L)	2002	2003	2004	2005	2006
Rolphon – 28 km upstream - monthly composite of daily samples	5	3	3	3	<3
Deep River – 9 km upstream – monthly composite of daily samples	5	3.2	3	3	<3
Chalk River intake well – quarterly composite of weekly samples	14	5.3	39	11	14
Pointe au Bapteme – CRL downstream boundary – monthly composite of weekly samples	218	120	137	209	114
Harrington Bay – 9 km downstream – quarterly grab sample	8	9	6	8	9
Fort William – 14 km downstream – quarterly grab sample	8	12	5	7	8
Petawawa – 18 km downstream – monthly composite of daily samples	12	9	6	7	6
Pembroke – 28 km downstream – monthly composite of daily samples	12	8	6	7	6

3. How are those who drink treated water from the Ottawa River impacted?

Tritium is radioactive hydrogen. It forms water molecules just as easily as ordinary hydrogen does, except that these “tritiated” water molecules are radioactive.

Because tritiated water is chemically identical to ordinary water, it cannot be filtered out or removed from municipal drinking water.

Anyone who drinks Ottawa’s municipal water will be ingesting about six becquerels of tritium in every litre of water. Calculations show that an adult who drinks this water regularly will have hundreds of radioactive disintegrations going off inside his or her body every second. That’s nearly a million disintegrations per hour.

Each disintegration releases a very high-velocity electron that is sufficiently energetic to break many molecular bonds. Animal experiments have verified that cancers, damage to genetic material, and abnormalities in fetuses can result from chronic exposure to elevated tritium levels.