

## WHAT IS TRITIUM?

- **Radioactive** materials that decay spontaneously such as tritium produce ionizing radiation.
- Tritium is a radioisotope of hydrogen, with a specific activity of almost 10,000 curies per gram.<sup>5</sup>
- Tritium has the same chemical properties as hydrogen. Tritium can combine with oxygen to make water.<sup>5</sup>
- Tritium is depicted as hydrogen-3, and it is called tritium oxide or tritiated water. Tritium cannot be filtered out of the water.<sup>4</sup>
- Tritium contains two neutral particles called neutrons. These extra particles make tritium unstable. They emit low-energy beta radiation.<sup>4</sup>
- The large scale production of tritium is produced by irradiating lithium-6 with neutrons in a nuclear reactor resulting in the formation of tritium and helium.<sup>3</sup>
- Tritium is also produced as a by-product of nuclear power reactors.
- Tritium has a half-life of 12.35 years.<sup>3</sup>
- Most of the hydrogen in our body exchanges readily with tritium.<sup>2</sup>

## DID YOU KNOW THIS ABOUT TRITIUM?

- Tritium was discovered in 1932 by Lord Rutherford, Sir John Cockcroft, Ernest Lawrence, Luis Alvarez and Willard Libby.<sup>3</sup>
- Tritium is found in the leachate of landfills.
- Tritium will absorb onto the surface of most metals, such as stainless steel, copper or aluminum.<sup>1</sup>
- Tritium will absorb onto the surface of plastics and rubbers.<sup>1</sup>
- Water and heating can decontaminate but high temperatures may allow decaying tritium buildup of helium within the structure of the metal.<sup>1</sup>
- The most commonly encountered forms of tritium are tritium gas and tritium oxide. Some tritiated gases are methane and ammonia.
- The next most common form of tritium is tritiated pump oils and solvents.<sup>1</sup>
- Tritides of metals are titanium, niobium, and zirconium.
- Tritium is used as a tracer in medicine.<sup>3</sup>
- Tritium is used to make traffic exit signs.
- Industry wants to relax the standards on radionuclides and radiation protection for the public.<sup>5</sup>

## HOW CAN YOU BE EXPOSED TO TRITIUM?

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- Any health effects from tritium are the result of beta radiation emissions.<sup>4</sup>
- Beta radiation when it passes through the body can strip away electrons which can produce permanent changes in cells (cancer, genetic effects and effects on fetuses).
- Tritium's radiation cannot penetrate the skin, so exposure comes mainly from oral intake or inhaling.
- Once tritium is inside the body, it can do harm to the tissues and eventually the DNA.<sup>4</sup>
- Tritium oxide can enter the body in various ways. It can be inhaled as water vapor, absorbed through the skin or consumed.<sup>4</sup>
- Tritium oxide can mix with body fluids. The rate of elimination varies with the person.<sup>4</sup>
- Tritium can transform into other chemicals such as proteins that are needed by the body.<sup>5</sup>
- Tritium can become part of the DNA.
- Tritium water is processed by plants, animals, and humans.
- Studies show that tritium can be passed to the fetus and infant through the placenta and breast milk.<sup>2</sup>
- Inhaled tritium gas dissolves into the blood stream and circulates in the body before being exhaled.<sup>1</sup>
- If tritium reaches the body fluids, it is converted to tritium oxide within the intestinal tract.<sup>1</sup>
- Early experiments show an increase in tritium oxide (HTO) concentrations in the urine when exposed to tritium.<sup>1</sup>

## HEALTH EFFECTS

- **Some human health effects associated with tritium:**<sup>2,3,4</sup>
  - Changes in blood chemistry
  - Cancer
  - Genetic effects
  - Birth Defects
- **Some animal health effects associated with tritium:**<sup>2,3,4</sup>
  - Microcephaly
    - Reduction in brain weight and size
    - Retardation
  - Sterility
  - Stunting in males
  - Reduction of litter size

Decreased life span  
Marked bone marrow syndrome in mothers  
Still-born off-spring increased  
Birth Defects  
    Eyes  
    Ears  
    Mouth  
    Extremities  
Blood abnormalities  
Reduction of cells in the blastocyst

## **CHILDREN'S RISKS**

- Children grow more rapidly, and their cells are dividing more rapidly. There is a greater opportunity for radiation to disrupt the process.<sup>5</sup>
- Fetuses are highly sensitive to radiation.<sup>5</sup>
- Radionuclides contribute to health effects by replacing certain elements in the body.
- Teratogenic mutations have been associated with exposures radiation.
- Genetic effects are passed down from parent to child.
- Tritium can become part of the DNA.

<sup>1</sup><http://www.tis.eh.doe.gov/techstds/standard/hdbk1079/hdb1079b.html>

<sup>2</sup>[http://www.ccnr.org/tritium\\_2.html](http://www.ccnr.org/tritium_2.html)

<sup>3</sup><http://www.science.uwaterloo.ca/earth/waton/tritium.html>

<sup>4</sup><http://www.srs.gov/general/news/newpub-rel/factsheets/het.pdf>

<sup>5</sup><http://www.ieer.org/comments/tritstmt.html>

<sup>6</sup><http://www.cqs.com/news/rehw/>

#62 (02/01/88) Dangers of Radiation In Municipal Waste

#302 (09/09/92) Low-Level Radioactive Waste 50 years of Failure

<sup>7</sup><http://www.ecologia.org/newsletter/year94/sep94b.html>

*The information above is accurate, but some of the links may be unreliable in the future because web sites change periodically.*

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