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.\(^5\)
- Tritium has the same chemical properties as hydrogen. Tritium can combine with oxygen to make water.\(^5\)
- Tritium is depicted as hydrogen-3, and it is called tritium oxide or tritiated water. Tritium cannot be filtered out of the water.\(^4\)
- Tritium contains two neutral particles called neutrons. These extra particles make tritium unstable. They emit low-energy beta radiation.\(^4\)
- 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.\(^3\)
- Tritium is also produced as a by-product of nuclear power reactors.
- Tritium has a half-life of 12.35 years.\(^3\)
- Most of the hydrogen in our body exchanges readily with tritium.\(^2\)

**DID YOU KNOW THIS ABOUT TRITIUM?**

- Tritium was discovered in 1932 by Lord Rutherford, Sir John Cockroft, Ernest Lawrence, Luis Alvarez and Willard Libby.\(^3\)
- Tritium is found in the leachate of landfills.
- Tritium will absorb onto the surface of most metals, such as stainless steel, copper or aluminum.\(^1\)
- Tritium will absorb onto the surface of plastics and rubbers.\(^1\)
- Water and heating can decontaminate but high temperatures may allow decaying tritium buildup of helium within the structure of the metal.\(^1\)
- 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.\(^1\)
- Tritides of metals are titanium, niobium, and zirconium.
- Tritium is used as a tracer in medicine.\(^3\)
- Tritium is used to make traffic exit signs.
- Industry wants to relax the standards on radionuclides and radiation protection for the public.\(^5\)

**HOW CAN YOU BE EXPOSED TO TRITIUM?**
• Any health effects from tritium are the result of beta radiation emissions.\textsuperscript{4}
• 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.\textsuperscript{4}
• Tritium oxide can enter the body in various ways. It can be inhaled as water vapor, absorbed through the skin or consumed.\textsuperscript{4}
• Tritium oxide can mix with body fluids. The rate of elimination varies with the person.\textsuperscript{4}
• Tritium can transform into other chemicals such as proteins that are needed by the body.\textsuperscript{5}
• 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.\textsuperscript{2}
• Inhaled tritium gas dissolves into the blood stream and circulates in the body before being exhaled.\textsuperscript{1}
• If tritium reaches the body fluids, it is converted to tritium oxide within the intestinal tract.\textsuperscript{1}
• Early experiments show an increase in tritium oxide (HTO) concentrations in the urine when exposed to tritium.\textsuperscript{1}

**HEALTH EFFECTS**

- **Some human health effects associated with tritium:**\textsuperscript{2,3,4}
  - Changes in blood chemistry
  - Cancer
  - Genetic effects
  - Birth Defects

- **Some animal health effects associated with tritium:**\textsuperscript{2,3,4}
  - 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.\(^5\)
- Fetuses are highly sensitive to radiation.\(^5\)
- 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.

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2. [http://www.ccnr.org/tritium_2.html](http://www.ccnr.org/tritium_2.html)
3. [http://www.science.uwaterloo.ca/earth/waton/tritium.html](http://www.science.uwaterloo.ca/earth/waton/tritium.html)
5. [http://www.ieer.org/comments/tritstmt.html](http://www.ieer.org/comments/tritstmt.html)
   #62 (02/01/88) Dangers of Radiation In Municipal Waste
   #302 (09/09/92) Low-Level Radioactive Waste 50 years of Failure

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