

**NRCREP Resource**

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**From:** Lea Foushee [lfoushee@comcast.net]  
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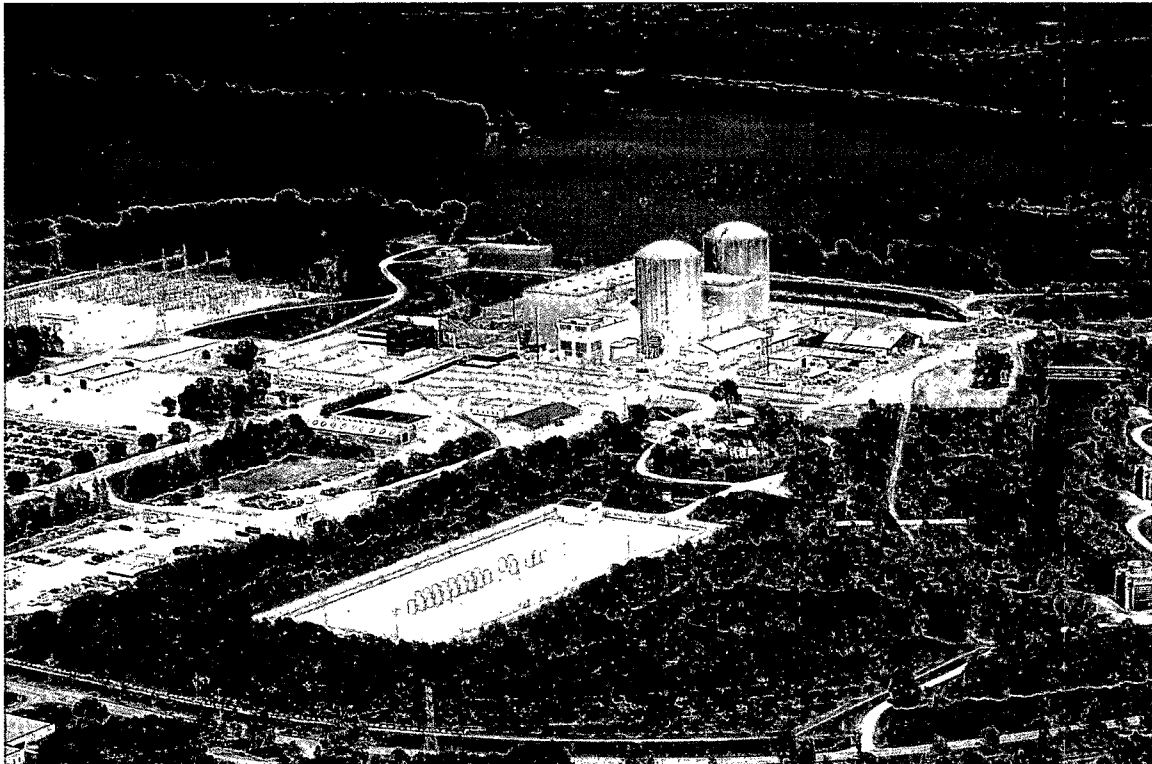
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## **Health Risks of Tritium**

**Prairie Island Nuclear Reactors  
23 Casks on the pad**

**"There is no safe dose of radiation." BEIR VII  
(Biological Effects of Ionizing Radiation)**

## Health Risks of Tritium

*The EPA considers it the simplest radionuclide, and low-risk to health.*

**Yet.....**

***They do not consider organically bound tritium  
in their assessment. Read on.***

- With a relatively short half-life of 12.3 years, tritium is highly radioactive.

Prairie Island Nuclear Reactors  
Tritium (Gaseous and Liquid) Releases in Curies<sup>1</sup> by Year

1996	1997	1998	1999	2000	2001
**	**	**	569.4	603.96	718.61
2002	2003	2004	2005	2006	2007
517.37	598.54	765.78	528.78	817.05	731.99

\*\* Annual Radioactive Effluent Release Report not available on  
NRC ADAMS electronic website.

- Half of all the tritium released by the Prairie Island Nuclear Reactor into the Mississippi River in 1994 is still available to plants, animals and humans.
- The majority of Minneapolis and Saint Paul's *drinking water*, along with many suburbs, comes from the Mississippi River.

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<sup>1</sup>. Curie (Ci): Defined as the amount of radioactive material in which 37,000,000,000 atoms are decaying each second.

- One ounce of tritiated water would contaminate the entire annual flow of the Upper Mississippi River Basin (est. annual flow of 12,000 cubic feet/second) above the present drinking water limit. One gram (the weight of a quarter of a teaspoon of salt) of tritium in tritiated water will contaminate almost 500 billion gallons of water up to the current drinking water limit of 20,000 Pico curies per liter set by the U.S. Environmental Protection Agency (EPA).
- One to five percent of the tritiated water ingested by mammals is incorporated into organic molecules in the body referred to as organically bound tritium, replacing non-radioactive hydrogen in other types of chemicals. This synergism with other chemicals, especially endocrine disrupting chemicals, increases health risk factors for women, embryos/fetuses, and developing children.

**SUMMARY OF KNOWN NON-CANCER  
HEALTH RISKS OF TRITIUM<sup>2</sup>**

**EARLY MISCARRIAGES  
GENETIC DEFECTS  
MULTI-GENERATIONAL GENETIC DEFECTS**

**MALFORMATIONS  
AUTO IMMUNE DYSFUNCTION  
NEUROLOGICAL EFFECTS**

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<sup>2</sup>SCIENCE FOR DEMOCRATIC ACTION, Vol. 14, No. 4, Feb. 2007. HEALTH RISKS OF TRITIUM: THE CASE FOR STRENGTHENED STANDARDS Arjun Makhijani, Brice Smith, and Michael C.Thorne.

## HEALTH RISKS OF TRITIUM

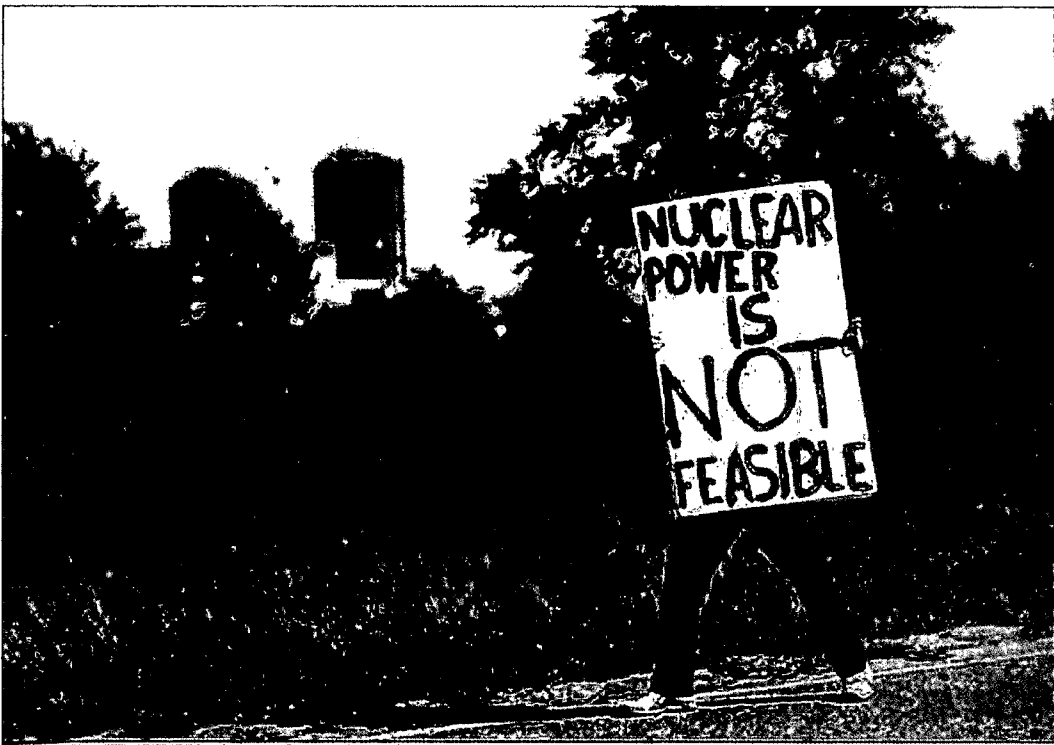
- Organically bound tritium ingested through food is more likely to be incorporated into bio-molecules than by drinking tritiated water.
- Organically bound tritium is more dangerous because it is generally retained in the body longer than tritiated water. Human studies indicate that half of the tritiated water in the body is removed every 10 days, whereas removing half of the organically bound tritium takes 21 to 76 days. For certain molecules with very slow turnover rates, this time can grow to 280 to 550 days. The longer retention times are of a particular concern if the tritium is incorporated into tissues such as neurons (the main cells of the nervous system) or oocytes (immature egg cells).
- Tritiated water and organically bound tritium can cross the placental barrier, incorporating into an embryo/fetus and irradiate rapidly dividing cells. This raises the risk of birth defects, early miscarriages, and other problems.
- Tritiated water is likely to be present in higher average concentration in fetal tissues.
- If organically bound tritium becomes incorporated into the DNA, it does not uniformly irradiate the whole cell; it preferentially irradiates the nucleus. Hence, the risk of damage to the DNA and of adverse health effects, including cancer but not only cancer.
- Damage to a fetus from organically bound tritium is more than four times that done to an adult from tritiated water and nearly ten times bigger than that assumed by current models.

## How does Tritium affect us?

- Current standards set by the U.S. NRC and EPA fall well below standards currently in place in other countries such as France and the U.K.
- We do not monitor routine releases of tritium and other radioactive wastes through the Prairie Island nuclear power plant vents and discharge pipes in a manner that will find where the radiation goes after it is released: where it may settle on our skin, on our croplands and our gardens, or be inhaled as we breathe.
- We simply do not take into account the accumulation of tritium that has been released during the past 40 years, and we are not taking into account any public health impacts that will occur as a result of the additional 20 years of plant operation being proposed.
- Historically in the 1990's<sup>3</sup>, at Prairie Island the tritiated water discharge pipe was directed to an un-named drainage ditch contaminating groundwater and private wells in the Prairie Island Mdewakanton Dakota Community. The radiation levels (1,300-1,500 picocuries) were "all within USEPA drinking water standards allowing 20,000 pico curies<sup>4</sup> per liter of water". The Tribe was forced to pay for its own water treatment facilities. NSP did however change the direction of the discharge pipe directly into the Mississippi River.
- There were ten abnormal radiation releases during the refueling outage of 2006 at the Prairie Island Reactors.
- The 2007 Radioactive Effluent Release Report identifies that a radioactive gaseous leak went undetected for 6 months.

<sup>3</sup> Radioactive tritium found in ground water, Star Tribune April 4, 1990.

<sup>4</sup> A picocurie, or one trillionth of a curie, emits 2.22 radiation particles and/or rays per minute.



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