Environmental Defense Institute

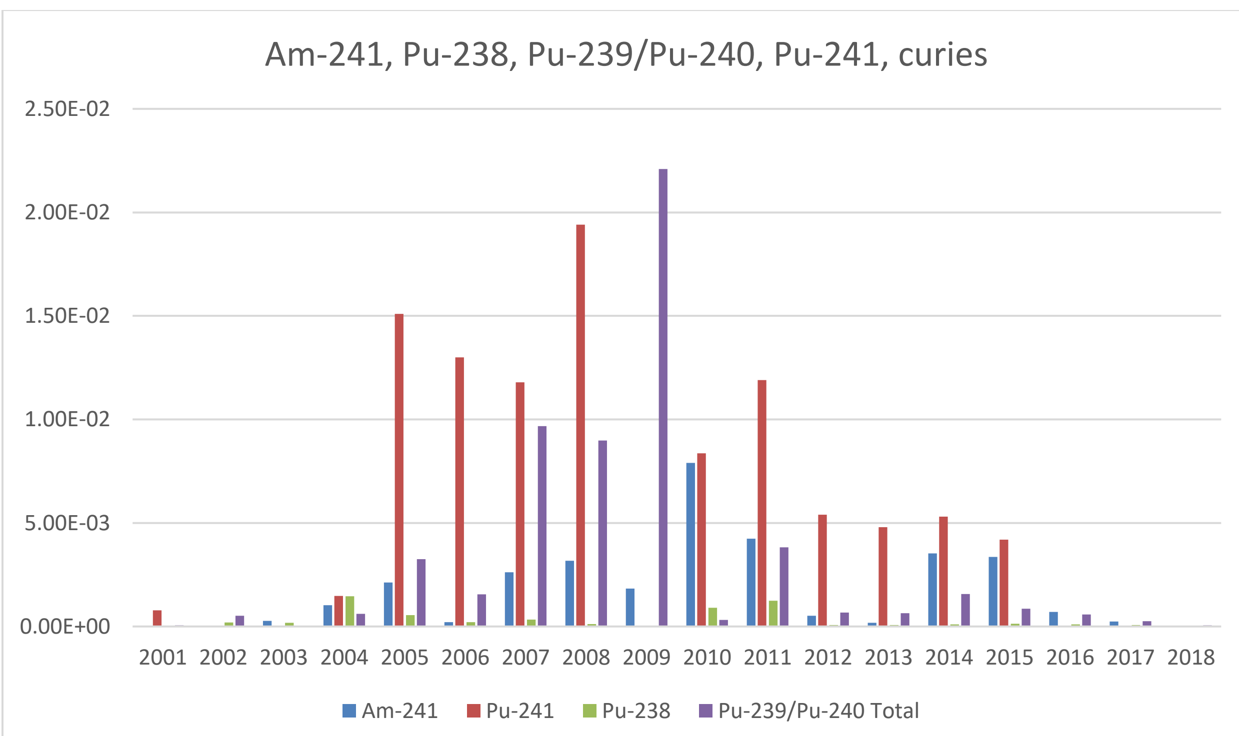
News on Environmental Health and Safety Issues

July 2020 **Volume 31** **Number 6**

Idaho Department of Environmental Quality hiding more than its INL Oversight program reveals

Radiological monitoring by the Idaho Department of Environmental Quality began in 1989. Despite that, now the Idaho DEQ displays only the most recent five years on INL environmental monitoring data. [1] There's a reason for this. The radiological releases between 2000 and 2015 were amazingly high. And it appears to me that the State of Idaho wanted to hide just how large the releases were.

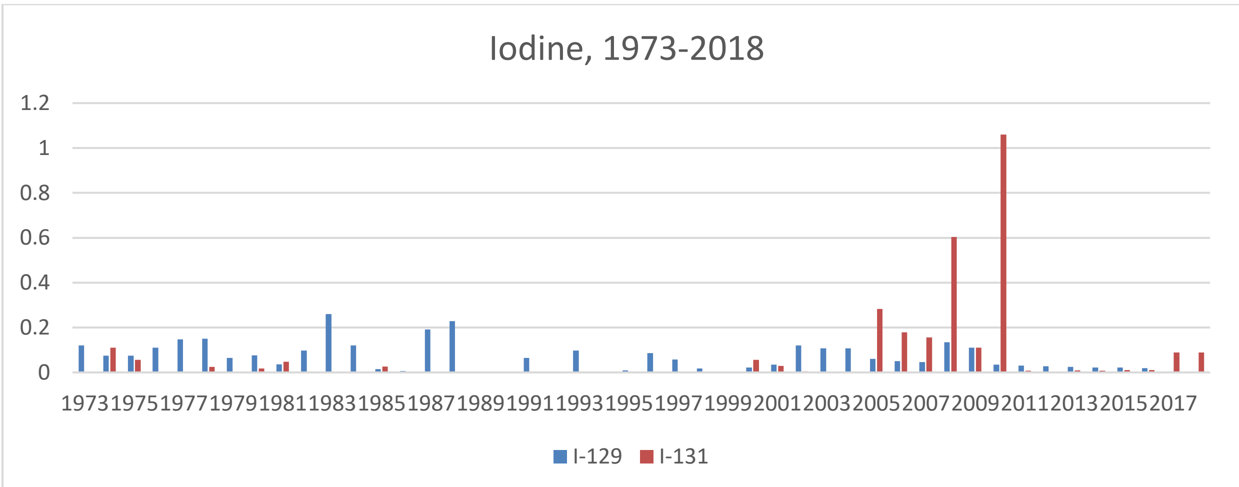
Take a look at the plutonium and americium-241 releases from the Idaho National Laboratory between 2001 and 2017 based on Department of Energy environmental monitoring reports. [2] The State of Idaho DEQ does not display, report or trend any data before 2013….and I can see why. The huge releases from the INL between 2004 and 2013 are shocking and certainly would not fit well with a tourist brochure for visiting Idaho.



[1] Idaho Department of Environmental Quality, INL Oversight Program Monitoring Reports, accessed July 7, 2020 at https://www.deq.idaho.gov/inl-oversight/monitoring/reports/ .

[2] Department of Energy's environmental monitoring reports, see idahoeser.com and inldigitallibrary.inl.gov.

Then let's take a look at the iodine-129 and iodine-131 releases between 1973 and 2017, in curies. The State of Idaho DEQ went from displaying all of their environmental monitoring reports to displaying ten years of the reports, to know displaying only six years of annual reports and only 4 years of quarterly data reports from 2013 to 2018. **Again, here you can see why the Idaho DEQ didn't want to display INL monitoring data before 2013.**



The plutonium and americium-241 and the iodine-129 and iodine-131 are not the only radionuclides with elevated releases from the INL. But these radionuclides might have influenced the elevated thyroid cancers in Bonneville County reported for 2013 to 2017.

Iodine-129 with its 16-million-year half-life has higher inhalation and ingestion dose conversion factors than iodine-131 with its 8-day half-life. While iodine-131 does give a higher air emersion and ground shine dose, the iodine-129 dose often is a dominant dose contributor for INL airborne releases. In 2002, iodine-129 was estimated by the Department of Energy's environmental monitoring report to be over 71 percent of the airborne dose. Using the dose conversion factors for iodine-129, the estimated whole-body effective dose of 0.0288 mrem from I-129 would roughly correspond to a thyroid dose of 0.9 mrem, using the dose conversion factors from the historical dose evaluation for the Idaho National Laboratory, the INEL HDE, for inhalation. [3] In Table 1, below, the dose conversion factors for iodine-129 and iodine-131 for thyroid and whole-body doses are shown. The dose conversion factors are combined with estimates of radionuclides in air, water and milk. The iodine-129 dose conversion factors for

[3] US Department of Energy Idaho Operations Office, "Idaho National Engineering Laboratory Historical Dose Evaluation," DOE-ID-12119, August 1991. Volumes 1 and 2 can be found at https://www.iaea.org/inis/inis-collection/index.html

inhalation and ingestion are higher for iodine-129 than for iodine-131. The other thing to notice is that the dose conversion factors yield a higher thyroid organ dose than whole body dose.

Table 1. Dose conversion factors for dose equivalent from inhalation and ingestion of iodine-129 and iodine-131 for adults and children, rem per microcurie intake.

Adult/Child	Iodine-129 DCF, rem per uCi	Iodine-131 DCF, rem per uCi
Inhalation, thyroid, adult	5.9	1.1
Inhalation, thyroid, child	8.8	2.41
Inhalation, whole body, adult	0.18	0.032
Inhalation, whole body, child	0.266	0.074
Ingestion, thyroid, adult	9.30	1.8
Ingestion, thyroid, child	14.1	4.07
Ingestion, whole body, adult	0.28	0.053
Ingestion, whole body, child	0.407	0.118

Source: US Department of Energy Idaho Operations Office, "Idaho National Engineering Laboratory Historical Dose Evaluation," DOE-ID-12119, August 1991. Appendix C. Units are rem per microcurie (uCi).

The annual environmental monitoring reports for the INL at Idahoeser.com and other locations include an estimate of the whole-body effective dose. The radionuclides contributing to that dose used to be stated. But more recent INL annual environmental monitoring reports leave it a mystery what radionuclides are being released by the INL and in what curie amounts.

With estimated whole body effective equivalent radiation doses less than 1 mrem per year, something close to a thyroid dose of 1 mrem per year is still suggested by the INL environmental monitoring reports. People would laugh at such a small dose. But, these internal radiation doses from INL airborne effluents are underestimated in a number of ways. For one thing, the low-dose, slow dose rate factor has been applied despite strong human evidence that no dose reduction factor should be applied. The actual risk of the internal emitters is underestimated by the assumptions made to relate the internal emitter to an external dose like a medical x-ray. The chemical form of the radionuclides is not researched for its effects. The airflow patterns assessed for the annual averages don't predict where intermittently released emissions will go. And for many years, the stated airborne releases have been incomplete and underestimated.

A 1982 study found elevated iodine-129 levels in rabbits on the Idaho National Laboratory site near the Idaho Chemical Processing Plant, larger than rabbits from a control area. The dose rates from iodine-129 to the thyroids of the INEL rabbits varied from 0.01 to 26 millirad/year. [4] Another study published in 1984 evaluated iodine-129 in muscle tissue of wild waterfowl all

[4] L. Fraley Jr et al., *Health Physics*, "Iodine-129 in Rabbit Thyroids Near a Nuclear Fuel Reprocessing Plant in Idaho," August 1982. https://pubmed.ncbi.nlm.nih.gov/7129881/ (Note that milli-rad is equivalent to millirem for gamma and beta radiation and I-129 is a beta emitter.)

exposed to high iodine-129 levels at the Idaho National Laboratory and found high levels in muscle tissue in birds near a radioactive waste pond ***and*** also in birds not near the ponds. It did not assess thyroid concentration in the birds. [5]

Iodine-129 and iodine-131 are not the only radionuclides people living near the INL are constantly exposed to from INL radionuclide airborne releases. The americium-241 has been released from the INL for years and often completely omitted from environmental reports or assumed to be disposed of into the aquifer rather than be included as an airborne release. Authors of the annual environmental monitoring reports continued to assume that waste water flushed to open-air percolation ponds were sending all of the radionuclides to the groundwater. Perched water and the aquifer are both "groundwater" and the INL often claim that all the waste water stayed in the perched water.

For several years, the INL was still claiming that the radionuclides in radioactive waste water were completely sent to groundwater, and not the air, even after the lined evaporation ponds were installed in the 1990s at the ATR Complex, formerly known as the Test Reactor Area. Because the retention basin was found to be leaking and some water was leaking to groundwater, the INL did not include any of the waste water radionuclides in the airborne release estimates. But most of the radioactive waste water was going to the open-air lined evaporation ponds for several of these years in the 1990s. The reported airborne radionuclide emissions were significantly underestimated. And the releases in the INEL HDE to estimate doses to the public from 1952 and 1989 are also incomplete and known to underestimate the airborne emissions.

The only data available on the Idaho Department of Environmental Quality website for radiological air monitoring are sparse data for 2013 to 2018 even though the Idaho DEQ has been monitoring radionuclides at the Idaho National Laboratory since 1989. Gross alpha, gross beta and tritium concentrations in air are provided in Tables 2 and 3 and radiological air monitoring of strontium-90, americium-241, plutonium-238 and plutonium-239 are provided in Table 4. I am including these tables not because the data are so interesting, but because it is so sparse and it is the only data there is available for the Idaho DEQ pertaining to INL environmental air monitoring despite an Idaho DEQ monitoring program since 1989.

The radionuclide air monitoring from the Idaho DEQ's air monitoring include action levels based on 10 percent of the value from Appendix E, Table 2 of 40 CFR 61, National Emissions Standards for Hazardous Air Pollutants. The NESHAPs law permits 10 mrem/yr to the public. Specifically, the § 61.102 Standard states: (a) Emissions of radionuclides, including iodine, to the ambient air from a facility regulated under this subpart shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr. (b) Emissions of iodine to the ambient air from a facility regulated under this subpart shall not exceed those amounts that would cause any member of the public to receive in any year

[5] D. K. Halford and O. D. Markham, *Health Physics*, "Iodine-129 in Waterfowl Muscle From a Radioactive Leaching Pond Complex in Southeaster Idaho," June 1984. https://pubmed.ncbi.nlm.nih.gov/6724936/

an ***effective dose equivalent*** of 3 mrem/yr. Note that this is a whole body dose rather than an actual thyroid organ dose. The thyroid doses are higher than the whole-body doses.

I have added the Department of Energy Derived Concentration Guidelines (DCGs) for air concentrations for those radionuclides in Tables 2 through 4. I found the DCGs used in DOE's INL environmental monitoring reports have shifted over the years due to changes in the DOE's estimation of the concentration to result in a 100 mrem/yr dose. I have included the DCG values from a 2013 Idahoeser.com INL environmental monitoring report that are based on the 2011 version of the DOE Standard DOE-STD-1196-2011. The DOE believes that it can release 100 mrem/yr which would be far higher than current releases, and given the currently elevated cancer rates, would be a health disaster.

A warning about radionuclide air concentration units — the units can make your head spin. The units often used by the Idaho DEQ are femtocuries/m^3 and by the Department of Energy, 1.0E-15 microcuries/mL and they are actually equal. It can be helpful to know that femto is 1.0E-15, that micro is 1.0E-6 and often symbolized with a u or Greek letter μ, that there are 1000 milliliters in a liter, and there are 1000 liters in 1 cubic meter or m^3.

1.0 fCi/m^3 = 1.0E-15Ci/m^3 = 1.0E-15 microcuries/mL

Similarly, concentrations in air of a particular radionuclide are often expressed in attocuries, or 1.0E-18 curies/m^3 which equals 1.0E-18 microcuries/milliliter.

1.0 aCi/m^3 = 1.0E-18 Ci/m^3 = 1.0E-18 microcuries/mL

Table 2. Gross alpha and gross beta air monitoring by the Idaho DEQ, 2013 to 2018, the only years data available on the Idaho Department of Environmental Quality website despite monitoring since the 1989.

Analyte	**Date**	**Min (fCi/m^3)**	**Max (fCi/m^3)**	**Average (fCi/m^3)**	**MDC (fCi/m^3)**	**40 CFR 61 [DOE DCG] (fCi/m^3)**
Gross Alpha	2013	0.01	2.97	0.95 ± 0.12	?	[DOE DCG 40]
Gross Alpha	2014	0.12	4.98	0.95 ± 0.12		
Gross Alpha	2015	0.10	5.79	0.99 ± 0.12		
Gross Alpha	2016	-0.32	4.35	0.89 ± 0.12		
Gross Alpha	2017	-0.03	4.8	0.9 ± 0.2		
Gross Alpha	2018	0.1 fCi/m^3	4.0	1.0 ± 0.1		
Gross Beta	2013	8.35	116.6	31.1 ± 0.6	?	[DOE DCG of 240]
Gross Beta	2014	6.58	95.97	25.95 ± 0.59		
Gross Beta	2015	5.58	155.21	26.90 ± 0.58		
Gross Beta	2016	6.46	86.71	25.62 ± 0.59		
Gross Beta	2017	3.0	109.8	26.9 ± 1.2		
Gross Beta	2018	9.2	77.2	27.9 ± 0.6		

Table notes: MDC is minimum detectable concentration. Units: fCi/m^3 is femtocuries per cubic meter or 1.0E-15 Ci/m^3

Table 3. Tritium air monitoring by the Idaho DEQ, 2013 to 2018.

Analyte	Date	Min	Max	Average (pCi/m^3)	MDC (pCi/m^3)	[DOE DCG] (pCi/m^3)
Tritium, EFS	2013, July 22 through August 22	-	-	1.09 ± 0.45		[DOE DCG of 210,000]
Tritium, EFS	2014, August 7 through August 22	-	-	1.97 ± 1.14	?	
Tritium, EFS	2015, July 20 through August 11	-	-	0.86 ± 0.86	?	
Tritium, Van Buren	2015, June 23 through July 2	-	-	1.18 ± 0.55	?	
Tritium, EFS	2017, August 4 through September 7	-	-	0.88 ± 0.42	0.63	
Tritium, EFS	2018, August 27 to September 25	-	-	1.25 ± 0.77	0.77	

Table notes: MDC is minimum detectable concentration. Units: pCi/ m^3 is picocuries per cubic meter or 1.0E-12 Ci/m^3. According to quarterly reports, tritium air monitoring by the Idaho DEQ has an action level of 150 pCi/m^3 which corresponds to 150,000 fCi/m^3 or 150,000 E-15 Ci/m^3.

Table 4. Strontium-90, americium-241, plutonium-238 and plutonium-239 air monitoring by the Idaho DEQ, 2013 to 2018.

Analyte/ Location	Date	Min	Max	Average (aCi/m^3)	MDC (aCi/m^3)	40 CFR 61 (aCi/m^3)	DOE DCG (fCi/m^3)
Sr-90, Rest Area	2013	-	-	23.2 ± 9.1	14.3	1900	25,000 fCi/m^3 or 25,000,000 aCi/m3
Sr-90, EFS	2014	-	-	16.4 ± 7.6	13.2		25,000 fCi/m^3
Sr-90, Atomic City	2018	-	-	18.8 ± 8.2	13.5		25,000 fCi/m^3
Sr-90, Mud Lake	2018	-	-	19.8 ± 8.1	13.0		25,000 fCi/m^3
Sr-90, Craters of the Moon	2018	-	-	14.2 ± 6.6	10.7		25,000 fCi/m^3
Sr-90, Fort Hall	2018	-	-	19.1 ± 7.3	11.4		25,000 fCi/m^3
Am-241, Van	2013	-	-	2.3 ± 1.6	2.1	190	41 fCi/m^3

Analyte/ Location	Date	Min	Max	Average (aCi/m^3)	MDC (aCi/m^3)	40 CFR 61 (aCi/m^3)	DOE DCG (fCi/m^3)
Buren							
Pu-238	(2013)			ND	?	210	37 fCi/m^3
Pu-238, Idaho Falls	2014	-	-	3.2 ± 2.0	2.7	210	37 fCi/m^3
Pu-238, Howe	2015	-	-	7.5 ± 4.9	6.6	210	37 fCi/m^3
Pu-238, Sand Dunes Tower	2015	-	-	5.7 ± 4.0	5.5	210	37 fCi/m^3
Pu-238, Howe	2018	-	-	7.2 ± 3.8	4.8	210	37 fCi/m^3
Pu-238, Monteview	2018	-	-	5.8 ± 3.9	5.7	210	37 fCi/m^3
Pu-238, Craters of the Moon	2018	-	-	7.9 ± 4.6	6.3	210	37 fCi/m^3
Pu-238, Atomic City	2018	-	-	7.3 ± 3.8	4.9	210	37 fCi/m^3
Pu-238, Rest Area	2018	-	-	9.9 ± 4.2	4.7	210	37 fCi/m^3
Pu-238, Idaho Falls	2018	-	-	9.6 ± 4.7	6.1	210	37 fCi/m^3
Pu-239/240, EFS	2014	-	-	1.7 ± 1.2	1.5	200	34 fCi/m^3
Pu-239/240, Idaho Falls	2014	-	-	2.5 ± 1.3	1.1	200	34 fCi/m^3
Pu-239/240, Atomic City	2015	-	-	1.4 ± 1.6	1.0	200	34 fCi/m^3
Pu-239/240, Howe	2015	-	-	2.4 ± 2.0	1.1	200	34 fCi/m^3
Pu-239/240, Rest Area	2015	-	-	3.2 ± 2.0	0.9	200	34 fCi/m^3
Pu-239/240, Sand Dunes Tower	2015	-	-	1.4 ± 1.6	1.0	200	34 fCi/m^3
Pu-239/240, Atomic City	2017	-	-	0.9 ± 1.3	0.8	200	34 fCi/m^3
Pu-239/240, Monteview	2017	-	-	2.0 ± 1.6	1.9	200	34 fCi/m^3
Pu-239/240, Howe	2018	-	-	4.9 ± 2.6	2.5	200	34 fCi/m^3
Pu-239/240, Mud Lake	2018	-	-	2.1 ± 1.6	0.8	200	34 fCi/m^3
Pu-239/240, Craters of the Moon	2018	-	-	2.9 ± 2.1	2.7	200	34 fCi/m^3

Table notes: MDC is minimum detectable concentration. Units: fCi/m^3 is femtocuries per cubic meter or 1.0E-15 Ci/m^3; aCi/m^3 is attocuries per cubic meter or 1.0E-18 Ci/m^3. The action levels from the Idaho DEQ monitoring reports are said to be 10 percent of Appendix E, Table 2 of 40 CFR 61. The Department of Energy "Derived Concentration Guidelines" (DCG) were taken from a 2013 Idahoeser.com Idaho National Laboratory Environmental Monitoring report, which was based on DOE-STD-1196-2011 and supposedly for 100 mrem/yr.

Troubling Increases in U.S. Thyroid Cancer Incidence Rates; And Counties Around the Idaho National Laboratory Roughly Double State and National Thyroid Cancer Rates

In 1975, the rate of thyroid cancer incidence for men and women combined was 4.8 per 100,000 in the US. In 2015, thyroid cancer incidence reached 15.7 per 100,000 according to the Surveillance, Epidemiology, and End Results Program (SEER) website. Thyroid cancer incidence and mortality in the US may have finally leveled off after years of increases, according to the National Cancer Institute, Surveillance, Epidemiology, and End Results Program (SEER). [6] However, several counties surrounding the Idaho National Laboratory have roughly double (or more) the thyroid cancer incidence than the Idaho state average and US average.

The SEER 9 region is roughly 10 percent of the US population and includes parts of California [San Francisco and Oakland], Connecticut, Georgia [Atlanta only], Hawaii, Iowa, Michigan [Detroit only], New Mexico, Utah, and Washington [Seattle and Puget Sound region]. [7]

Thyroid cancer incidence in the US increased, on average, 3.6 percent per year during 1974-2013, from 4.56 cases per 100,000 person-years in 1974-1977 to 14.42 cases per 100,000 person-years in 2010-2013. These thyroid cases were not trivial: the mortality also increased. Mortality increased 1.1 percent per year from 0.40 per 100,000 person-years in 1994-1997 to 0.46 per 100,000 person-years in 2010-1013 overall and increased 2.9 percent per year for SEER distant stage papillary thyroid cancer. [8] From 1974 to 2013, the SEER 9 region cancer data included 77,276 thyroid cancer patients and 2371 thyroid cancer deaths.

Bonneville County, where Idaho Falls is located, has double the thyroid cancer rate of the US and double the rate compared to the rest of Idaho, based on the Cancer Data Registry of Idaho (CDRI) for the year 2017. [9] See Table 5.

---

[6] National Cancer Institute, Surveillance, Epidemiology, and End Results Program, Cancer Stat Facts: Thyroid Cancer. https://seer.cancer.gov/statfacts/html/thyro.html

[7] National Cancer Institute, Surveillance, Epidemiology, and End Results Program, Cancer Query System. https://seer.cancer.gov/canques/incidence.html

[8] Hyeyeun Lim et al., JAMA, "Trends in Thyroid Cancer Incidence and Mortality in the United States, 1974-2013," April 4, 2017. https://pubmed.ncbi.nlm.nih.gov/28362912/ or https://jamanetwork.com/journals/jama/fullarticle/2613728

[9] C. J. Johnson, B. M. Morawski, R. K., Rycroft, Cancer Data Registry of Idaho (CDRI), Boise Idaho, Annual Report of the Cancer Data Registry of Idaho, *Cancer in Idaho – 2017*, December 2019. https://www.idcancer.org/ContentFiles/AnnualReports/Cancer%20in%20Idaho%202017.pdf

Table 5. Bonneville County thyroid cancer incidence rate compared to the rest of Idaho, 2017.

Cancer type	Sex	Rate in Bonneville County	Adjusted Rate in Bonneville County	Rate for remainder of Idaho
Thyroid	Total	28.2	30.7	14.2
	Male	16.0	17.8	7.4
	Female	40.3	43.5	21.0

Table notes: Rates are expressed as the number of cases per 100,000 persons per year (person-years). Rates are expressed as the number of cases per 100,000 persons per year (person-years). Adjusted rates are age and sex-adjusted incidence rates for the county using the remainder of the state as standard. Data from Factsheet for the Cancer Data Registry of Idaho, Idaho Hospital Association. Bonneville County Cancer Profile. Cancer Incidence 2013-2017. https://www.idcancer.org/ContentFiles/special/CountyProfiles/BONNEVILLE.pdf

Some people have wondered if the thyroid incidence rate is due to overdiagnosis of elderly patients — no, it is not. A study of pediatric thyroid cancer rates in the US found that in pediatric patients with thyroid cancer diagnosed from 1973 to 2013, the annual percent change in pediatric cancer incidence increased from 1.1 percent per year from 1973 to 2006 and markedly increased to 9.5 percent per year from 2006 to 2013. [10]

Some people have wondered if the increased rate of incidence is due to overdiagnosis of trivial nodules — no, it is not. The figures for the incidence rates for large tumors and advanced-stage disease suggest a true increase in the incident rates of thyroid cancer in the United States. I've seen this just from a handful of acquaintances in Idaho Falls.

For pediatric patients, the thyroid incidence rate was 0.48 cases per 100,000 person-years in 1973 to 1.14 cases per 100,000 person-years in 2013. The incidence rate for large tumors were not significantly different from incidence rates of small (1-20 mm) tumors.

Both thyroid cancer US trend studies (by Lim and by Qian) used the SEER cancer incidence file maintained by the National Cancer Institute and includes 9 high-quality, population-based registries.

As the SEER 9 region thyroid incidence peaked at 15.7 per 100,000, and the State of Idaho thyroid incidence average was 14.2 per 100,000, Bonneville County reached thyroid cancer rates of 30.9 per 100,000. [11] But other counties near the Idaho National Laboratory also have elevated thyroid cancer incidence rates: Madison (29.3 per 100,000), Fremont (27.9 per 100,000), Jefferson (28.9 per 100,000), and Bingham (28.6 per 100,000). But let's not forget Butte county.

[10] Z. Jason Qian et al., *JAMA*, "Pediatric Thyroid Cancer Incidence and Mortality Trends in the United States, 1973-2013," May 23, 2019. https://pubmed.ncbi.nlm.nih.gov/31120475/ or https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6547136/

[11] Environmental Defense Institute February/March 2020 newsletter article "Rate of cancer in Idaho continues to increase, according to Cancer Data Registry of Idaho."

Butte county's thyroid cancer rate of 45.9 per 100,000 puts it in a class by itself. Much of Butte county is within 20 miles of the INL and nothing says radiation exposure like Butte's leukemia rate at 3 times the state rate and myeloma at 5 times the state average rate.

Some people used to worry about sensational media coverage and I am worrying about the opposite. The news headline for the Idaho cancer register report issued in 2018 read that "cancer trends for Idaho are stable." [12] That is what citizens were supposed to take away from the 2017 cancer rate study in Idaho. Why were citizens not told about any of the cancers in the counties in Idaho that significantly exceeded state average cancer rates and exceeded the rest of the US? [13]

The wide-spread thyroid cancer incidence increases in the US do not appear to be due to radiation exposure. I suspect other governmentally permitted and highly profitable environmental toxins related to our food and perhaps also cell phone use. But the rates that are double the rest of Idaho and the US in only counties near the Idaho National Laboratory are, I believe, due to the radiological releases from INL and are perhaps aggravated by airborne chemical releases from the INL.

The INL has continued to release radionuclides to the air within 50 miles of the lab with radionuclides including iodine-131, iodine-129, americium-241, strontium-90, cobalt-60, plutonium-238, plutonium-239, ruthenium-103, cesium-134 and cesium-137 and many others. And while doing so, has continued to insinuate that all the radionuclides are from former nuclear weapons testing or some other mysterious source. A study published in 1988 found the mallard ducks near the ATR Complex percolation ponds at the Idaho National Laboratory to be full of transuranic radionuclides including plutonium-238, plutonium-239, plutonium-240, americium-241, curium-242 and curium-244. [14] An employee who I knew had the habit of jogging around the radioactive waste ponds at lunchtime. He died of liver cancer in his 50s. This health-conscious non-smoker was told, like the rest of us, that the radioactivity in the ponds was mainly tritium and was of no health concern what-so-ever.

The stated radionuclide releases from the Idaho National Laboratory to air have often been incomplete or underestimated the releases. The stated "effective dose equivalent" whole body dose has been a *fictional* fraction of a millirem.

---

[12] Brennen Kauffman, *The Idaho Falls Post Register*, "New cancer report on 2017 shows stable cancer trends for Idaho," December 13, 2018.

[13] https://statecancerprofiles.cancer.gov/

[14] O. D. Markham et al., Health Physics, "Plutonium, Am, Cm and Sr in Ducks Maintained on Radioactive Leaching Ponds in Southeaster Idaho," September 1988. https://pubmed.ncbi.nlm.nih.gov/3170205/ (This study evaluated the concentrations of strontium-90, plutonium-238, plutonium-239, plutonium-240, americium-241, curium-242 and curium-244 in the tissues of mallard ducks near the ATR Complex reactive leaching ponds at the Idaho National Laboratory. It found the highest concentrations of transuranics occurred in the gastrointestinal tract, followed closely by feathers. Approximately 75%, 18%, 6% and 1% of the total transuranic activity in tissues analyzed were associated with the bone, feathers, GI tract and liver, respectively. Concentrations in the GI tracts were similar to concentrations in vegetation and insects near the ponds. The estimated total dose rate to the ducks from the Sr-90 and the transuranic nuclides was 69 millrad per day, of which 99 percent was to the bone. The estimated dose to a person eating one duck was 0.045 mrem. The ducks were estimated to contain 305 nanoCuries of transuranic activity and 68.7 microCuries of strontium-90.)

The INL releases tons of volatile organic compounds with chlorine compounds to the air, such as the vapor extraction of carbon tetrachloride from buried Rocky Flats waste at the INL's Radioactive Waste Management Complex. A few years ago, EPA monitoring found high levels of carbon tetrachloride in Idaho Falls air. This emission is said to be within federal guidelines, but because chlorine compounds are so unhealthy for the thyroid, the prevalent chemical toxins that are released by the INL that are not even discussed in its environmental monitoring reports may need to be considered in light of elevated thyroid cancer incidence rates near the INL.

The radiation dose reconstruction analysts for the Center for Disease Control, who determine eligibility for the Energy Employee Occupational Illness Compensation Program (EEOICP) continue to ignore what went on and what is still going on at INL facilities, particularly the ATR Complex formerly known as the Test Reactor Area. The radiation dose reconstruction has continued to pretend that the fuel composition of the operating reactors and lack of fuel melt in these reactors means that workers were not exposed to airborne contamination. The CDC need only look at the radionuclides in the ducks. The levels of transuranics including americium-241 and curium in the air at the ATR Complex and other facilities at the INL are sometimes extensive. [15] [16]

The extensive airborne concentrations of americium-241 at the INL may be important to the underestimation of thyroid doses and risks of thyroid cancer incidence. A 1993 study estimated that the dose to the thyroid from americium-241 to be about 1.42 times that delivered to bone. They concluded that the thyroid dose is much higher from americium-241 than has been reported in people. [17]

On the potential health harm of americium-241, the Agency for Toxic Substances and Disease Registry has stated that: "The radiation from americium is the primary cause of adverse health effects from absorbed americium. Upon entering the body by any route of exposure, americium moves relatively rapidly through the body and is deposited on the surfaces of the bones where it remains for a long time. As americium undergoes radioactive decay in the bone, alpha particles collide with nearby cell matter and give all of their energy to this cell matter. The gamma rays released by decaying americium can travel much farther before hitting cellular material, and many of these gamma rays leave the body without hitting or damaging any cell matter. The dose from this alpha and gamma radiation can cause changes in the genetic material of these cells that could result in health effects such as bone cancers. Exposure to extremely high

---

[15] F. Menetrier at al., *Applied Radiation Isot*., "The Biokinetics and Radiotoxicology of Curium: A Comparison With Americium," December 2007. https://pubmed.ncbi.nlm.nih.gov/18222696/ (This study found that the biokinetics of curium are very similar to those of americium-241. Lung and bone tumor induction appear to be the major hazards. Retention in the liver appears to be species dependent.)

[16] R. L. Kathren, Occupational Medicine, "Tissue Studies of Persons With Intakes of the Actinide Elements: The U.S. Transuranium and Uranium Registries," April-June 2001. https://pubmed.ncbi.nlm.nih.gov/11319054/ (This study finds that the dose coefficients for alpha radiation induction of bone sarcoma may be too high while those for leukemia are a factor six too low.

[17] G. N. Taylor et al., Health Physics, "241Am-induced Thyroid Lesions in the Beagle," June 1993. https://pubmed.ncbi.nlm.nih.gov/8491622/

levels of americium, as has been reported in some animal studies, has resulted in damage to organs

Understanding the Thyroid Doses in Idaho from Past Nuclear Weapons Testing

The National Cancer Institute, Division of Cancer Epidemiology and Genetics provides a risk calculator for the thyroid dose and risk for nuclear weapons fallout from nuclear weapons testing between 1945 and 1980. [18] The original thyroid dose calculator was only for radiological fallout from Nevada Test Site nuclear weapons testing, but the updated risk calculator and studies have been extended to include global fallout from the U.S., the U.S.S.R., the U.K., France and China from more than 500 atmospheric tests of nuclear weapons. A summary of the thyroid and overall cancer risk from Nevada Test Site and global weapons testing fallout is provided by Steven L. Simon and others. [19]

The contributions to thyroid internal and external dose for an adult anywhere in the continental US are given for various radionuclides from Nevada Test Site and global fallout in the summary by Simon and others. The largest internal thyroid dose came from iodine-131 resulting from Nevada Test Site nuclear weapons testing. The internal thyroid dose from I-131 to children is 6 times that of an adult. Other radionuclides released by weapons testing also contribute to internal thyroid dose, including cesium-137, carbon-14, tritium and others. Radionuclides contributing to external thyroid dose that were released by weapons testing include cesium-137, antimony-125, ruthenium-103 ruthenium-106, manganese-54, cerium-144, zirconium/niobium-95, barium/lanthanum-140, tellurium/iodine-132, neptunium-239, iodine-133 and zirconium/niobium-97. Many of these radionuclides are released by the Idaho National Laboratory every year and are found in animal tissues as far away as Pocatello, Idaho. While the cesium-137 in Idaho cannot be distinguished from Nevada Test Site fallout or from global fallout or from INL radiological effluents, various *short-lived* radionuclides from the INL can be identified as coming from the INL when detected years after 1980.

The various radionuclides including manganese-54, cobalt-60, niobium-95 and others found in yellow-bellied marmots in the 2002 INL environmental monitoring quarterly report were sanitized in the final annual report to list only strontium-90 and cesium-137. The marmot tissues harvested in 2002 from Pocatello included these tell-tale short-lived radionuclides that could have only come from the INL. Read about the radionuclides in yellow-bellied marmots in the

[18] National Cancer Institute, Division of Cancer Epidemiology and Genetics, Thyroid Dose and Risk Calculator for Nuclear Weapons Fallout for the US Population, accessed July 6, 2020, https://radiationcalculators.cancer.gov/fallout/about/

[19] Steven L. Simon, Andre Bouville and Charles E. Land, The American Scientist reprint, "Fallout from Nuclear Weapons Tests and Cancer Risks – Exposures 50 years ago still have health implications today that will continue into the future," 2006. https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/fallout-pdf

June 2020 Environmental Defense Institute newsletter. [20] It was recognized many years ago at places like Oak Ridge, that sampling the radionuclide concentrations in tissues of farm animals would give useful information about how the human residents were absorbing the radionuclides in air, water and soil. Only at the Idaho National Laboratory has it been pretended for so long that finding radionuclides in animals did not tell us something about the radionuclides accumulating in Idaho citizens. Just don't eat Test Reactor Area pond ducks," they would say. Now they need to add, "don't eat Pocatello marmots."

Estimates of the thyroid doses from iodine-131 resulting from Nevada Test Site and global weapons testing fallout are provided for every county in the continental US for the fallout between 1945 and 1980 on the NCI website. [21] I have provided the iodine-131 dose estimates for nuclear weapons testing fallout from 1945 to 1980 in Table 6, along with my estimates of thyroid organ dose from the INEL Historical Dose Assessment, and recent thyroid cancer incidence rates for selected counties in Idaho.

Table 6. Average thyroid doses from iodine-131 from NTS and global nuclear weapons testing fallout, total thyroid doses from the Idaho National Laboratory until 1989, and the thyroid cancer incidence reported in 2017 for selected Idaho counties.

County	**Iodine-131 dose from NTS and global weapons fallout, dose to adult, (rad), (1945 to 1980)[a]**	**Estimated thyroid dose from INL iodine-131 and other nuclides, adult (rem), (1952 to 1989)[b]**	**Thyroid cancer rate, per 100,000 person-years, 2017[c]**
Gem	15.4 (std dev 3.9)	0	23.3
Fremont	7.0 (std dev 2.0)	1	27.9
Jefferson	6.3 (std dev 3.1)	1	28.9
Butte	6.1 (std dev 2.8)	1	42.8
Madison	5.3 (std dev 2.6)	1	29.3
Bannock	3.1 (std dev 1.7)	<1	11.1
Bonneville	2.7 (std dev 1.7)	1	30.9
Bingham	1.7 (std dev 1.7)	1	28.6

Sources:

a. National Cancer Institute, Division of Cancer Epidemiology and Genetics, Thyroid Dose and Risk Calculator for Nuclear Weapons Fallout for the US Population, accessed July 6, 2020. (Adult average dose in rad.) https://radiationcalculators.cancer.gov/fallout/about/

[20] Environmental Defense Institute June 2020 newsletter article "What yellow-bellied marmots have to tell us about radiological releases from the Idaho National Laboratory."

[21] National Cancer Institute, Division of Cancer Epidemiology and Genetics, Thyroid Dose and Risk Calculator for Nuclear Weapons Fallout for the US Population, accessed July 6, 2020, https://radiationcalculators.cancer.gov/fallout/about/

b. US Department of Energy Idaho Operations Office, "Idaho National Engineering Laboratory Historical Dose Evaluation," DOE-ID-12119, August 1991. Volumes 1 and 2 can be found at https://www.iaea.org/inis/inis-collection/index.html For this table, the cumulative thyroid dose is estimated at about 1 rem. The adult maximum thyroid doses were summed for 1952 to 1989, totaling 858 mrem and when skin was the limiting organ dose rather than thyroid, the summed skin doses of 248 mrem were estimated as the upper bound of the thyroid dose for that year. The sum of the thyroid dose and the skin dose (when no thyroid dose was presented) are 1106 mrem or 1.1 rem, which has been rounded to 1 rem. The location of the dose in the INEL HDE was to be the maximum dose to the nearest resident and so this cumulative dose of 1 rem to the thyroid would be considered to bound the average dose to a resident living farther from the INL, as representative of the INEL HDE estimated doses.
c. C. J. Johnson, B. M. Morawski, R. K., Rycroft, Cancer Data Registry of Idaho (CDRI), Boise Idaho, Annual Report of the Cancer Data Registry of Idaho, *Cancer in Idaho – 2017*, December 2019. [Cancer incidence is from 2013 to 2017.] https://www.idcancer.org/ContentFiles/AnnualReports/Cancer%20in%20Idaho%202017.pdf

The thyroid dose data from past nuclear weapons testing tell us that the average dose from iodine-131 from weapons fallout were larger than the estimated thyroid dose from the INL for the years evaluated in the INEL Historical Dose Evaluation from 1952 to 1989. The environmental reports subsequent to 1989 give a total body effective dose equivalent but not a thyroid organ dose. But the annual dose based on the Department of Energy environmental reports at Idahoeser.com and the INLdigitallibrary.inl.gov would be expected to be in the realm of only a few millirem per year for the thyroid dose. It is important to understand that while the nuclear weapons testing largely stopped by 1980, the radionuclide releases from the INL have continued to release substantial curie amounts of various radionuclides every year since 1952.

From Table 6, we can see that the thyroid cancer rates in these Idaho counties do not correlate to the counties with the highest Nevada weapons testing and global fallout. The highest amount of iodine-131 came from the Nevada Test Site rather than global fallout. Gem County, Idaho had Idaho's highest iodine-131 doses from Nevada weapons testing and global fallout. But Gem County has a low thyroid cancer incidence rate in 2017, in line with the Idaho state average. The other counties I've listed are near the INL, with Bannock county being perhaps that farthest away from the INL. Bannock county is often considered as being too far away from the INL to be influenced by INL airborne releases, but that depends entirely on how the wind blows. Some wind patterns can bring INL airborne releases to Pocatello in Bannock county.

Counties near the INL have double the thyroid cancer incidence while other counties in Idaho did not approach these high thyroid cancer incidence rates. The counties near the INL listed in the table are Butte, Bonneville, Madison, Jefferson, Bingham and Fremont counties, which ranged from 42.8 per 100,000 for Butte to 27.9 per 100,000 for Fremont. These cancer incidence rates are double, or more, the US and the Idaho state average for incidence of thyroid cancer which are 15.7 per 100,000 and 14.2 per 100,000.

The stated radionuclide releases from the INL, even when cumulative doses are considered, would seem to many people to be an extremely low dose. But I have seen so many people with thyroid problems as well as cancerous thyroids that required surgery that I believe something is definitely going on with the environmental releases from the INL.

The average increases in the rate of thyroid cancer in the US and in Idaho are wide spread and began by 2006, before the 2011 Fukushima nuclear disaster, so I do not attribute to radiation exposure to the wide-spread rising thyroid cancer incidence rates. Also, Boise was known to have received rather high fallout from Fukushima and yet does not show an elevated thyroid cancer incidence rate. I do, however, attribute, the many years of doubled thyroid cancer incidence rate in counties near the INL including Butte, Bonneville, Madison, Jefferson, Bingham and Fremont counties to the INL's releases.

For the radionuclide releases and subsequent whole body and thyroid doses from 1952 to 1989 in the INEL HDE, there are missing radionuclides such as americium-241. There are also underestimated or omitted releases of uranium-235 and other uranium and thorium isotopes. And there are underestimated releases, particularly for the 1950s open-air aircraft engine tests which the Center of Disease Control review of the INEL HDE discovered and which have never been corrected. There are, I believe, thousands of curies of underestimated airborne releases from the 1961 Stationary Low-Power (SL-1) reactor accident as well as from the entire collection of 1965 to 1966 SNAPTRAN destructive nuclear reactor tests. [22]

Then there are the unscientific ways that annual wind patterns are emphasized even for releases that are not evenly spread throughout the year. And the problem that the wind pattern concentrations simply do not represent where the radionuclides tend to fallout. The Department of Energy has performed various aerial surveys in the past and they know that the radionuclide fallout from the INL does not necessarily match the annual wind isopleth maps. Not only that, it has been a common practice to unscientifically alter the isopleth maps by deleting the lines that show all the regions where the concentrated effluents are expected. It is a charade to avoid mapping just how far north and south that the INL's effluent blows. Chopping off the wind isopleth concentrations lines south of Dubois and north of Pocatello did not stop the winds from blowing INL radionuclides to those locations. There are unexplained gaps in air monitoring and there appear to be aggressive manipulations to lower the annual average contamination values.

It is true that people are less likely to die of thyroid cancer than many other cancers and for this reason, cancer mortality rates are seldom useful for assessing thyroid cancer incidence. But because the thyroid and breast tissue are extremely radiosensitive, anyone who cares about health should be concerned about years of doubled thyroid cancer rates in counties surrounding the INL (as well as the increases in breast cancer, particularly in men). Mothers and their unborn are greatly affected by poor thyroid function. Thyroid cancer incidence is not the whole story of health issues pertaining to radiation-induced thyroid problems.

A 1 rem of dose to a child can create far higher cancer incidence increases than the same 1 rem of dose to an adult. John Gofman wrote about this in 1981. [23] Later on, the BEIR VII report would conclude that female children were far more likely to have elevated cancer rates for the

---

[22] Environmental Defense Institute May 2020 newsletter article "Destructive SNAPTRAN tests at the INL from 1964 to 1966." This article describes the Stationary Low Power 1 (SL-1) reactor radioactivity inventory and discusses how the three SNAPTRAN cores were roughly one-third the size of the SL-1.

[23] John W. Gofman, M.D., Ph.D., *Radiation and Human Health*, Sierra Club Books, San Francisco, 1981. ISBN 0-87156-275-8.

same dose to an adult male. The BEIR VII report [24] which acknowledges higher levels of vulnerability of women and children to radioactivity has not evaluated the growing evidence concerning elevated childhood leukemia from Chernobyl fallout and from other nuclear facilities. [25] Health Physics professionals and professors I have asked have no explanation for why more recent epidemiology isn't used except to say that "somebody high up must have decided the cost was not worth the benefit."

The whole-body effective dose equivalents are skewed by the industry to reflect less risk of death by thyroid cancer. It isn't easy to obtain accurate thyroid doses nor should it be assumed that the thyroid disease risks from radionuclide intakes are accurate. The doses and the risks are far more uncertain and speculative than people are led to believe.

In the U.S., the officialdom radiation protection models are wrong — and deliberately biased to underestimate the health harm of ionizing radiation. Differing vintages of International Commission on Radiological Protection (ICRP) methods are used by the Environmental Protection Agency, Nuclear Regulatory Commission, and Department of Energy to estimate the radiation doses to workers and the public. Internal radiation dose harm is underestimated more than external radiation dose harm. And the health harm from ionizing radiation is not limited to cancer incidence and mortality.

The foundation of U.S. radiation protection standards come from the ICRP. In ICRP 60, it is stated that "The primary aim of radiological protection is to provide an appropriate standard of protection of man without unduly limiting the beneficial practices giving rise to radiation exposure." **Their aim is not the protection of human health; their aim has been and continues to be the protection of the nuclear industry. This cannot be emphasized too strongly.** The ICRP is populated by nuclear industry and radiologists [26] which may explain why evidence that strongly indicates that people are not adequately protected by existing radiation standards is often ignored.

---

[24] "Health Risks from Exposure to Low Levels of Ionizing Radiation BEIR VII – Phase 2, The National Academies Press, 2006, http://www.nap.edu/catalog.php?record_id=11340 The BEIR VII report reaffirmed the conclusion of the prior report that every exposure to radiation produces a corresponding increase in cancer risk. The BEIR VII report found increased sensitivity to radiation in children and women. Cancer risk incidence figures for solid tumors for women are about double those for men. And the same radiation in the first year of life for boys produces three to four times the cancer risk as exposure between the ages of 20 and 50. Female infants have almost double the risk as male infants.

[25] C. C. Busby and A. V. Yablokov, European Committee on Radiation Risk (ECRR), "Chernobyl: 20 Years On. Health Effects of the Chernobyl Accident," 2006. p. 3 http://www.ratical.org/radiation/Chernobyl/chernobylebook.pdf

[26] Thomas Dersee and Sebastian Pflugbeil, *A Foodwatch Report*, German Society for Radiation Protection in cooperation with the German Section of the International Physicians for the Prevention of Nuclear War (IPPNW), "Calculated Fatalities from Radiation: Officially Permissible Limits for Radioactively Contaminated Food in the European Union and Japan," September 2011. https://www.foodwatch.org/uploads/tx_abdownloads/files/fw_report_CalculatedFatalitiesfromRadiation11_2011.pdf p. 6.

The EPA's Federal Guidance Series reports, FGR 11, 12, and 13 are based on ICRP 26/30, 38 and ICRP 60. [27] [28] OSHA regulations use ICRP Publication 2 and the EPA and NRC still have regulations that require the use of ICRP 2. Along with differing methods, there is tremendous latitude in the selection of assumptions that dramatically alter the estimated radiation dose received, particularly by a worker. The Department of Energy has adopted an ICRP 60 approach for calculating the doses to workers, yet the methods allow tremendous latitude in the selection of assumptions. The U.S. DOE and NRC have never adopted the ICRP radiation dose limit for workers, of 2 rem/yr, preferring the 5 rem/yr limit. This is despite epidemiology that shows an elevated cancer risk from an average 0.4 rem/yr (400 millirem/yr) to radiation workers. [29]

Internal dose methods range from critical organ dose, as determined using ICRP Publication 2 published in 1959 to the most recent method for determining effective dose, based on ICRP Publication 103, published in 2008. [30] ICRP models are always evolving but not necessarily getting more accurate. Tissue weighting factors and the selection of tissues to include have gyrated up and down. The ICRP is always working on a revision that will come out in a few years. [31]

Once the radiation dose has been estimated, cancer risk is only focus for U.S. agencies and this is based on the 1990 ICRP Publication 60. Here, the risk coefficients, average the genders — which leave women less protected than men both leaves both genders inadequately protected. When cancer incidence or mortality dictate the radiation protection standard, the elevated illness and death statistics from the premature aging and the genetic and reproductive effects caused by ionizing radiation are not downplayed or ignored.

The exclusive focus on cancer incidence and mortality from ionizing radiation fails to protect adults and does not adequately protect the unborn or children.

"After the Chernobyl reactor catastrophe, not only were many people afflicted with cancer, but there was also a sharp increase in other somatic illnesses such as a weakening of the immune system, premature aging, cardiovascular disease even in younger patients, chronic diseases of the stomach, the thyroid gland and the pancreas (diabetes mellitus), as well as in neurological-

---

[27] EPA powerpoint presentation by Michael Boyd, "The Role of Federal Guidance in Radiation Protection," November 20, 2017. See llwforum.org

[28] This link describes the EPA's radiation modeling https://www.epa.gov/radiation/tools-calculating-radiation-dose-and-risk

[29] Richardson, David B., et al., "Risk of cancer from occupational exposure to ionizing radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS), BMJ, v. 351 (October 15, 2015), at http://www.bmj.com/content/351/bmj.h5359 Richardson et al 2015 . This epidemiology study that included a cohort of over 300,000 nuclear industry workers has found clear evidence of solid cancer risk increases despite the average exposure to workers being about 2 rem and the median exposure was just 410 millirem. Also see December 2015 EDI newsletter.

[30] Michael A. Boyd, U.S. EPA, "The Confusing World of Radiation Dosimetry," WM2009 Conference, March 1-5, Phoenix, AZ. http://www.wmsym.org/archives/2009/pdfs/9444.pdf

[31] Sora Kim et al., *Journal of Radiation Protection and Research*, "The System of Radiation Dose Assessment and Dose Conversion Coefficients in the ICRP and FGR**,"** 2016; 41(4): 424-435. Published online: December 31, 2016. DOI: https://doi.org/10.14407/jrpr.2016.41.4.424

psychiatric disorders and genetic or teratogenic disorders as a result of low-level doses of radiation.” [32]

The 1986 Chernobyl fallout affected the US far less than countries closer to the Ukraine. But despite the denial by an INL expert at the INL’s Chernobyl talks last year, Chernobyl’s fallout was detected in Idaho. The peak concentration of iodine-131 in milk levels due to the Chernobyl nuclear disaster in 1986 was found in Jefferson county at 740 picocurie/liter when normally the concentrations would be below 1 pCi/L. Gross beta concentrations in air were 10 to 100 times higher than normal, peaking at 1500 E-15 microcuries/milliliter, or 1500 femtocuries/cubic-meter. See the 1986 Environmental Monitoring Report for the Idaho National Engineering Laboratory Site, DOE/ID-12082(86), 1987.

The Hanford Thyroid Disease Study (HTDS) acknowledges a study about the 1986 Chernobyl accident that found the incidence of thyroid cancer in 9-year-old children increased 50-fold in the high exposure areas compared to an increase of 6-fold among 17-year-old children. But the Hanford study misidentifies the reference document for the study and the actual source of the study is, I suppose, one of the several Chernobyl studies identified in the HTDS. [33]

The ICRP models and hence U.S. regulations are based largely on the cancer and leukemia risk obtained from the Life Span Study of World War II Japan’s bombing survivors. The problem is that this study has been manipulated by adjusting the estimated radiation dose of external gamma and neutron radiation to the survivors in order to reduce the estimated harm of ionizing radiation. [34] [35] [36] And the effects of internal radiation from inhalation and ingestion of radionuclides are canceled out of the study. [37] Japan’s bomb survivors in the city during the bombing and the control group — people outside the city during the bombing but who returned soon after the bombing — were both exposed to the radioactive fallout and internal radioactivity from inhalation and ingestion of radionuclides. So, the Life Span Studies reflect only the gamma and neutron external dose and **not the effects of radioactive fallout on internal dose**. The dose

[32] Thomas Dersee and Sebastian Pflugbeil, *A Foodwatch Report*, German Society for Radiation Protection in cooperation with the German Section of the International Physicians for the Prevention of Nuclear War (IPPNW), “Calculated Fatalities from Radiation: Officially Permissible Limits for Radioactively Contaminated Food in the European Union and Japan,” September 2011. https://www.foodwatch.org/uploads/tx_abdownloads/files/fw_report_CalculatedFatalitiesfromRadiation11_2011.pdf p. 9.

[33] Center for Disease Control, Hanford Thyroid Disease Study webpage, accessed July 6, 2020. https://www.cdc.gov/nceh/radiation/hanford/htdsweb/library.htm The full report identifies reference 69 as the source but Ref. 69 is about the Marshall Islanders not Chernobyl. References 71 to 77 identified in the HTDS may be the source of the information.

[34] John W. Gofman, M.D., Ph.D., Committee for Nuclear Responsibility, Inc., “Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis,” 1990.

[35] Other books by John W. Gofman, M.D., Ph.D.: *Radiation and Human Health*, Sierra Club Books, 1981; and *Preventing Breast Cancer: The Story of a Major, Proven, Preventable Cause of this Disease*, Committee for Nuclear Responsibility, Inc., 1996.

[36] Gayle Greene, “The Woman Who Knew Too Much – Alice Stewart and the Secrets of Radiation,” The University of Michigan Press, 2003.

[37] Chris Busby, *The Ecologist*, “The ICRP’s radiation risk model is bogus science,” October 2014. https://theecologist.org/2014/oct/22/icrps-radiation-risk-model-bogus-science

estimates from the ICRP for external radiation may underestimate the dose by a factor of 2 to 5 or more. But the dose estimates from the ICRP for internal radiation dose from inhalation or ingestion by underestimate the dose by a factor of 100 or more because the simplistic emphasis on the imparted energy from the radionuclide decay does not consider the highly concentrated damage to cellular tissue where the radionuclide is concentrated.

The estimates of radiation dose for the Life Span Studies were made years following the bombing and manipulated after cancer results were available. An important aspect of the inadequacy of the current radiation model, ICRP 60, [38] is that it underestimates the human health harm, especially to the developing embryo or young child.

The European Committee on Radiation Risk (ECRR) 2010 report [39] discusses how in 2009, the Scientific Secretary of ICRP, resigned. He stated that the ICRP risk model could not be employed to predict or explain the health effects of exposures to human populations, largely because the underestimation of internal exposures, by a factor of 100. The inhalation or ingestion of iodine-131 or iodine-129 is an internal exposure.

I can hardly do justice to the topic of the multitude of ways that the U.S. radiation protection standards with their foundation from the ICRP fail to protect workers and the public, not to mention medical diagnostic treatments. I recommend the 2010 ECRR report for further reading on the shortcomings of the ICRP radiation risk model.

The Hanford Thyroid Disease Study – What Went Wrong?

With my recent focus on trying to understand the elevated thyroid cancer incidence rates in the counties surrounding the INL, I reviewed the Hanford Thyroid Disease Study (HTDS). [40] The Hanford Thyroid Disease Study was mandated by Congress in 1988 and was conducted to determine whether thyroid diseases were increased in people exposed as children to radiological releases of radioactive iodine-131 from the Hanford Nuclear Site in Washington State from 1944 through 1957. Dissolving nuclear fuel at Hanford between 1944 and 1972 released 740,000 curies of iodine-131, with most of it released by 1957.

It was believed that because there were certainly people with thyroid and other cancers living near Hanford and because the Hanford releases of radioactivity were extremely high, that the

[38] International Commission on Radiological Protection, "Compendium of Dose Coefficients Based on ICRP Publication 60," ICRP Publication 119, Volume 41 Supplement 1 2012. http://www.icrp.org/docs/P%20119%20JAICRP%2041%28s%29%20Compendium%20of%20Dose%20Coefficients%20based%20on%20ICRP%20Publication%2060.pdf

[39] European Committee on Radiation Risk, Edited by Chris Busby with Rosalie Bertell, Inge Schmitz-Feuerhake, Molly Scott Cato and Alexey Yablokov, *2010 Recommendations of the ECRR – Health Effects of Exposure to Low Dose of Ionizing Radiation*, Green Audit Press, 2010. p. 5. http://euradcom.eu/ordering-3/ Free available download of report.

[40] Center for Disease Control, Hanford Thyroid Disease Study webpage, accessed July 6, 2020. https://www.cdc.gov/nceh/radiation/hanford/htdsweb/library.htm

doses to residents could be estimated and that a pattern of high rates of cancers would correlate with predicted high dose rates. While the iodine-131 releases were large, the wide range of other radionuclides simultaneously released appears to have largely been ignored.

A study was conducted that involved only 3,440 residents living near Hanford.

While cancer rates do differ from place to place and with time, it is useful to know that thyroid cancer rates in the U.S. in 1975 were 4.8 per 100,000. This would suggest that that chance of finding a thyroid cancer in just 3,440 people should be less than 1 incidence of thyroid cancer, odds being 0.165 for 3440 people in a given year. When that annual rate spans, say, 45 years, however, there could be roughly 7 people expected to have been diagnosed with thyroid cancer.

The study took great pains to avoid comparing the thyroid cancer incidence rate near Hanford to any US or state statistics from any time frame. Right there, I knew we were dealing with the worst type of certified health physics professionals. The kind of professionals that Karl Z. Morgan wrote about in his book *The Angry Genie*, that put the nuclear industry ahead of human health. [41] The kind of certified health physics professionals that comply with adhering to any nonsense their profession demanded in order to protect the health of the nuclear industry rather than the health of human beings.

The Hanford Thyroid Disease study took many years and millions of dollars, and concluded that the rates of thyroid diseases in the HTDS population were generally consistent with the rates of disease detected in other populations. And all without ever comparing the thyroid cancer incidence rate to any US statistic. If the goal was to avoid acknowledging the extent of the damage to human health caused by the Department of Energy to the people living in the region, then the HTDS was a success.

There are 19 people out of the 3440 that developed thyroid cancer. For the 45 years since the exposure began, there would have been expected to be 7. The HTDS study never brings itself to discuss anything of the sort. It would have meant acknowledging harm from the Hanford facility operated by the Department of Energy.

The National Academy of Science review simply faulted the HTDS researchers for their tone and means of delivery and implied certainty of the unpopular result which was stated as, no, Hanford didn't cause any problems, no way, no how. [42]

Yes, it is disappointing that the estimated exposures did not correlate with the incidence rate of thyroid cancer. Were the estimated doses, estimated 45 years after the releases, possibly inadequate? Yes. Did that lack of correlation justify the conclusion that Hanford's releases did

[41] Karl Z. Morgan and Ken M. Peterson, "The Angry Genie – One Man's Walk Through the Nuclear Age," University of Oklahoma Press, Norman, 1999.

[42] National Academy of Sciences (US) Committee on an Assessment of Centers for Disease Control and Prevention Radiation Studies from DOE Contractor Sites: Subcommittee to Review the Hanford Thyroid Disease Study Final Results and Report, Washington (DC), *Review of the Hanford Thyroid Disease Study Draft Final Report*, National Academies Press (US), 2000. https://www.ncbi.nlm.nih.gov/books/NBK225225/

not cause harm? No. It appears to me that discussing the thyroid cancer incidence rate with basic US statistics would have been appropriate and it wasn't simply because it would have shown that the thyroid cancer incidence rates were in fact elevated.

The Guide for the study [43] mentions that overall mortality rates in the study population were about the same as those in the state of Washington for the same period. "However, mortality rates for non-hereditary causes due to conditions that occurred before or shortly after birth were somewhat higher than those in the state of Washington for the same period." It is well known that infant mortality was increased near the Hanford plant and the name "Hanford babies" meant babies born with serious birth defects.

Buried in the study is the finding that 8 percent of the participants had cancer other than thyroid cancer. No information on age of the person when cancer was diagnosed seems to be provided.

This Guide for the HTDS should have been written to convey information from the study that was highly technical but instead it is a complete white-wash to cover up the harm caused by the Department of Energy's Hanford releases.

I thought I'd seen it all — the CDC refusing to conduct epidemiology to the Mud Lake, Terreton, Atomic City and other populations near the Idaho National Laboratory based on the Department of Energy's low-balled radiological release estimates in the INEL HDE. And the CDC refusing to conduct epidemiology on the people living downgradient of the aquifer, laden with radionuclide wastes that are now spread from INL to the Snake River and beyond due to the deepwell injection of enormous amounts of radioactive liquid wastes largely from reactor operations and fuel reprocessing at the INL, all based on the US Geological Survey's record destruction, emphasis on not monitoring the radionuclides that would implicate the INL waste water injection and percolation into the Snake River Plain Aquifer and various deliberately inadequate monitoring and reporting practices to actively hide the contamination levels in the aquifer caused by the Department of Energy.

But this CDC study of the Hanford Thyroid Disease Study is an insult to the good people living near Hanford and an insult to anyone anywhere who cares about the truth and who cares about human health.

Gotta hand it to the CDC. If it wasn't clear already, this Hanford Thyroid Disease Study provides that they can lie like no one can — and get away with covering up the misdeeds of the Department of Energy. There is slime growing in fish tanks with far more integrity that the authors and the technical steering panel of the Hanford Thyroid Disease Study.

Articles by Tami Thatcher for July 2020.

---

[43] A Guide To The Hanford Thyroid Disease Study, Final Report, at https://www.cdc.gov/nceh/radiation/hanford/htdsweb/pdf/cdchanford_guide.pdf (I find this guide to be a travesty and a total white-wash of the very contrived study of thyroid illnesses near Hanford.)