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Radiation Risk Debate

The following two articles are Tami Thatcher's published responses to two Op-ed articles in Idaho Falls Post Register.

In response to Arthur S. Rood's letter[1], I agree "good science should be devoid of all agendas and only interested in deriving the truth from the evidence."

But unbiased science from Antone Brooks? Hardly. Brooks, former Research Director of the DOE's Low Dose Radiation Research Program, should know better. An example: while radiation "bystander effects" may either increase or decrease radiation cancer risk, he mentions only the beneficial effects.[2] Of weapons fallout cancer increases, Brooks appears oblivious to any of epidemiological studies that found increased cancer rates in Utah.[3] Studies by Lyon of the University of Utah and Wiess found excess leukemia in Utah from 1950-1964 fallout.[4] Dismissal of the proven cancer-causing effect of weapons fallout in Utah is just another of many Brooks' falsehoods.

Putting trust in industry hack R. Wakeford? His poorly designed study of leukemia rates in children from above-ground testing did not find an increase in leukemia rates. But post-Chernobyl studies from six countries did find increased leukemia rates of children who were in the womb at the time of the Chernobyl accident, indicating a 1000-fold error in the ICRP model. And the routine operations of nuclear facilities have shown clear increases in childhood leukemia as well.[5]

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[1] March 19, 2014 letter to the editor printed in the Post Register.

[2] http://nuclearstreet.com/nuclear_power_industry_news/b/nuclear_power_news/archive/2010/01/14/an-exclusive-nuclear-street-interview-with-low-dose-radiation-health-effects-expert-dr-antone-l-brooks-01142.aspx#.UzDoj1duqLI

[3] Antone Brooks, "From the Field to the Laboratory and Back: The What ifs, Wows, and Who Cares of Radiation Biology," http://www.falloutradiation.com/files/CaresOfRadiationBiology.pdf

[4] Fradkin, P. L., *Fallout – An American Nuclear Tragedy*, Johnson Books, Boulder, Colorado, 2004. p. 203, 219, 220.

[5] Busby, C., "Aspects of DNA Damage from Internal Radionuclides," *InTech*, 2013. http://www.intechopen.com/download/get/type/pdfs/id/44596

Chris Busby is indeed a controversial figure in his outspoken criticism of the nuclear industry. Nonetheless, acting as expert witness in radiation injury lawsuits in the UK where people are forced to carefully examine the scientific evidence, Busby's take on the science is winning dozens of cases.[6]

Low dose radiation:

Steve Piet's belief that low doses of radiation may have a beneficial effect and that radiation protection standards are too stringent show the effectiveness of the industry echo chamber.[7] Even DOE's researchers understand there are serious problems with extrapolation of large external radiation doses to low internal doses, stating "The non-uniform distribution of internal emitters is a prime concern and makes it difficult to estimate risk."[8] Many experts in radiological protection have voiced concerns over the shortcomings of the ICRP internal dose model over the years.[9] [10] [11]

The conventional committed absorbed dose model of internal radiation accounts for multiple decays but wrongly assumes it is evenly distributed in our bodies. While the ICRP model recognizes that some radionuclides preferentially collect in certain organs, it dilutes the dose and the predicted cancer risk by averaging across the entire organ. The affinity of uranium for our DNA has been known since the 1960s, yet the ICRP model does not account for this.[12]

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[6] Busby, Chris, "Deconstructing Nuclear Experts," March 28, 2011 http://www.counterpunch.org/2011/03/28/deconstructing-nuclear-experts/

[7] N. F. Metting, ScD, Program Manager, U.S. Low Dose Radiation Research Program, Presentation to the EFCOG Radiation Protection Subgroup, 13-15 March 2012. (This presentation which focuses on low external dose by gamma and x-ray radiation is a prime example of discounting the health risks of radiation and hyping up the possible beneficial effects.) http://www.efcog.org/wg/esh_rp/events/RPSG_Spring_12_Meeting/Noelle%20Metting%20-_%20Low%20Dose%20Update-2012%20EFCOG.pdf

[8] U.S. Department of Energy, website: lowdose.energy.gov/ Powerpoint Presentation "Radioactive material within the body - Low Dose Radiation ..." (This DOE website presentation is undated, untitled, and no author is given.)

[9] 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

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

[11] Alice M. Stewart, M.D., *A bomb survivors: factors that may lead to a re-assessment of the radiation hazard*: International Journal of Epidemiology **29** no. 4, August 2000.

[12] Chris Busby, "Aspects of DNA Damage from Internal Radionuclides," *InTech*, 2013. http://www.intechopen.com/download/get/type/pdfs/id/44596, p. 612.

Studies of radiation-exposed nuclear workers have produced varied results, but it requires a real leap to conclude that radiation protection standards should be more lenient.[13] [14] [15] [16]The energy worker compensation act, EEOICPA, has paid out billions of dollars to workers with toxin and radiation-related cancers.[17] This should provide a clue about DOE's effectiveness in protecting human health, especially under more lenient radiation protection standards of the past.

Research exists of the protective effect of radiation due to the "bystander effect," the communication from a cell hit by radiation to nearby cells.[18] But, after many years of study, a prominent committee, the BEIR VII Phase 2, stated: ". . .the assumption that any stimulatory hormetic [beneficial] effects from low doses of ionizing radiation will have a significant health benefit to humans that exceeds potential detrimental effects from radiation exposure at the same dose is unwarranted."[19]

Sweden's study of cancer rates using aerial mapping of Cesium-137 contamination from Chernobyl fallout found a 10% increase in cancer rate for a 100,000 Bq per square meter of Cs-137 contamination,[20] [21]over 400 fold higher than ICRP predicts (and not good news around Fukushima). Other studies indicate childhood leukemia rates from internal radiation are 1000 fold higher than ICRP predicts.[22] [23]

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[13] Gregg S. Wilkinson, Ph.D., "Some Pitfalls in Studies of Low-Dose Ionizing Radiation: The Healthy Dose Effect, Significance Questing, and Exposure Reductionism, Physicians for Social Responsibility, 1992. http://www.ippnw.org/pdf/mgs/psr-2-1-wilkinson.pdf

[14] Alice Stewart, M.D., George W. Kneale, Ph.D., "The Hanford Data: Issues of Age at Exposure and Dose Recording," 1993. http://www.ippnw.org/pdf/mgs/psr-3-3-stewart.pdf

[15] E. Cardis, et al., "Risk of cancer after low doses of ionizing radiation: retrospective cohort study in 15 countries, July 2005, BMJ 2005: 331:77. http://www.bmj.com/content/331/7508/77

[16] R. Julian Preston, Associate Director for Health, U.S. EPA, Presentation on Radiation Protection Standards, NCI May 2007.
http://radepicourse2007.cancer.gov/content/presentations/slides/PRESTONJ_slides.pdf

[17] U.S. Department of Labor, Office of Workers' Compensation Programs, EEIOCPA Program Statistics, http://www.dol.gov/owcp/energy/regs/compliance/weeklystats.htm

[18] N. F. Metting, ScD, Program Manager, U.S. Low Dose Radiation Research Program, Presentation to the EFCOG Radiation Protection Subgroup, 13-15 March 2012.

[19] *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2*. National Academies Press. 2006. ISBN 978-0-309-09156-5. (National Academy of Sciences (NAS) Biological Effects of Ionizing Radiation (BEIR).

[20] Martin Tondel et al, Increase of regional total cancer incidence in north Sweden due to the Chernobyl accident? J. Epidemiol Community Health 2004;58 1011-1016. www.ncbi.nlm.nih.gov/pmc/articles/PMC1732641/pdf/v058p01011.pdf

[21] 1 Bq (Becquerel) is 1 disintegration per second. 1 Curie is 37 GBq or 3.7E10 Bq.

[22] P. Kaatsch et al., Leukemias in Young Children Living in the Vicinity of German Nuclear Power Plants, Int J Cancer 122, pp. 721-726, 2008. (Known at the KiKK study.)

Radiation research remains highly prone to bias because the industry predominantly funding the research has long feared that knowledge of adverse health effects would compromise support for nuclear weapons and energy programs.[24]

The "Father of the Nuclear Navy," Hyman G. Rickover, testified in 1982, "I do not believe that nuclear power is worth it if it creates radiation. . .I think the human race is going to wreck itself, and it is important that we get control of this horrible force and try to eliminate

The WIPP problem, and what it means for defense nuclear waste disposal

By Robert Alvarez

"It's a surprise when there are no surprises," a cleanup worker told me a few years ago at the Hanford site in Washington state, once the world's largest producer of plutonium for nuclear weapons and now home to a massive effort to stop leaking nuclear waste tanks from poisoning the Columbia River. This maxim can hold painfully true for a variety of events assigned an extremely small chance of happening. On February 4, 2014, assumptions of very low probability crumbled at the Energy Department's Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, when a fire in a large salt truck raged for hours, deep underground.

Ten days later, an even more unlikely accident happened: Wastes containing plutonium blew through the WIPP ventilation system, traveling 2,150 feet to the surface, contaminating at least 17 workers, and spreading small amounts of radioactive material into the environment.

"Events like this simply should never occur. One event is far too many," Ryan Flynn, New Mexico's environment secretary, said immediately after the accident. The US Energy Department, which oversees WIPP, views the fire and leak as simply small bumps in the long road of running a long-term waste repository. "Without question, there is absolutely not an iota of doubt …. We will re-open," David Klaus, the Energy Department deputy undersecretary, told the public in Carlsbad on March 8. But less than two weeks later, New Mexico seemed to have the last word on the immediate response to the accident, when it cancelled its permit for additional disposal at WIPP.

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[23] Chris Busby, "Aspects of DNA Damage from Internal Radionuclides," *InTech*, 2013. http://www.intechopen.com/download/get/type/pdfs/id/44596, p. 624.

[24] Steven Wing, "A Critical Review of the Department of Energy Efforts to Investigate the Human Health Effects of Plutonium," 1992. *rmpjc.org/wp-content/uploads/2012/02/Wing-Pu.doc*

More than a month after the fire, WIPP remains closed, and what happened underground remains unclear. It is not known whether the leak and the truck fire are connected; a waste-drum explosion or the collapse of a roof of one of the facility's storage chambers could be to blame for the radiation event. As Energy Department contractors send robots to explore WIPP's caverns, the future of the world's only operating high-hazard radioactive waste repository is uncertain.

What WIPP does, and what it contains. In 1979, Congress authorized the design and construction of WIPP, planned to be a repository for a class of waste known as transuranic (TRU)--that is, radioactive elements heavier than uranium on the periodic chart, including plutonium, americium, curium and neptuniumand generated by the US defense effort after 1970. A bedded salt formation was chosen as the site of the project because of its presumed long-term stability and self-sealing properties. After several long-running legal challenges, Congress authorized the opening of WIPP in 1992 and set a cap of 175,000 cubic meters of waste to be disposed. Seven years later, WIPP began to receive wastes.

The end of the Cold War and the downsizing of the US nuclear weapons complex expanded WIPP's mission to include excess plutonium. Instead of just contaminated rags, clothing and equipment, in 1998 the Energy Department decided to dispose of plutonium, originally part of the US strategic stockpile, from the now-closed Rocky Flats site. Some 3.5 tons, or more than 70 percent of the plutonium stored in WIPP, was originally meant to be used in nuclear weapons.

WIPP now holds more than 171,000 waste containers containing approximately 4.9 metric tons of plutonium. With a total cost that the Energy Department estimates at $7.2 billion, WIPP employs some 800 workers. The site involves an ongoing mining operation in which salt is loaded on trucks and conveyed to the surface, to other trucks that dump it in a disposal area. The floor space of the mine is designed to be substantially larger than the Pentagon's. Waste packages are disposed in a 100-acre area that includes seven "roomseach with a footprint as large as three football fields carved out of the salt formation in the deep mine.

The toxicity of plutonium and other transuranics was known to be very high in the early days of nuclear weapons production. But official recognition of the waste hazards they pose did not come until the early 1970's, when the governor of Idaho threatened to halt waste shipments from the Rocky Flats plutonium-component plant in Colorado to what was then known as the Idaho National Engineering Laboratory for disposaleffectively disrupting weapons production. Citizens and political leaders of the state, fearful that the wastes could reach the state's largest fresh water aquifer, became alarmed when, after a major fire at Rocky Flats in 1969, an unprecedented amount of transuranic waste was sent to Idaho for shallow land burial. By 1973, Atomic Energy Commission chair Dixie Lee Ray promised to dispose of these wastes in a geological repository.

Plutonium 239 is a major safety concern because of its high radiation levels and long half-life- 24,100 years. About 200,000 times more radioactive than the commonest naturally occurring uranium, plutonium 239 emits alpha particles as its principal form of radiation. Plutonium inhalation can cause permanent lung damage and even death. When taken in the body, microscopic amounts can penetrate deep into the lungs and deposit, via the bloodstream, in the liver, bones, and other organs.

WIPP receives TRU wastes generated after 1970 and, therefore, represents only a partial solution to the United States military nuclear waste problem. Before 1970, more than 2,000 kilograms of plutonium were dumped into the ground as "low-level" waste at many locations across the country. Because of the high costs for removal and geological isolation of that waste, the Energy Department considers pre-1970 TRU wastes to have been disposed "in-place." The quantity of pre-1970 plutonium currently in the soil at Energy Department sites is some 1,300 times more than is permitted to leak into the human environment from WIPP, 10,000 years after the repository is closed. With nearly half of these wastes in the soil at Hanford, the Energy Department plans for a significant part of that site to become a de facto " national sacrifice zone."

The preponderance of the waste placed in WIPP is considered "contact handled," meaning that it can be prepared for disposal using conventional excavation and processing practices with a manageably small risk of radiation exposure. Since 1970, tens of thousands of such contact-handled TRU waste containersranging from steel drums to cardboard boxeshave been stored under just a few feet feet of soil at several Energy Department sites.

But there is also a large inventory of "remote-handled" waste that contains highly radioactive transuranics and other isotopes. This type of waste requires heavy shielding and remotely operated equipment to protect workers from severe exposure. Remote-handled packages can emit potentially lethal doses of radiation as large as 1,000 rem per hour.

What happened at WIPP and why? The mishaps at WIPP prompted several ongoing investigations and led to the removal and demotion of a contract manager employed by the UBS Corporation. The fire is believed to have started when diesel fuel or hydraulic fluid leaked inside a truck's engine compartment. The fire consumed the driver's compartment and the truck's large front tires, which produced copious amounts of thick black smoke, prompting 86 workers to be evacuated. Six workers were treated at the Carlsbad hospital for smoke inhalation, and another seven were treated at the site. Workers have not been allowed back in the mine since. The fire occurred a little less than half a mile from an air monitor alarm set off by the radiation leak, which was located near the latest room being filled with wastes from Idaho, Savannah River, and Los Alamos sites.

The Energy Department investigation report of March 14 concluded the fire could have been prevented had the contractor and Energy Department site managers bothered, after being repeatedly warned, to remove a buildup of flammable material in the mine, to regularly maintain trucks and equipment, and to correct emergency response deficiencies. Moreover, the automatic fire suppression system had been turned off before the fire.

In 2011, the Defense Nuclear Facilities Safety Board, an independent organization that advises the executive branch about health and safety issues at Energy Department defense nuclear facilities, reported that WIPP "does not adequately address the fire hazards and risks associated with underground operations. ... Of particular concern is the failure … to recognize the potential impact of a fire on WIPP's ability to process waste, and ultimately on the ability to reduce inventories of transuranic (TRU) waste at other [Energy Department] sites."

Whether the radiation leak and the truck fire inside WIPP are connected remains an unanswered question. Among other possible causes of the leak, a waste drum explosion is now under consideration. Energy Department sites have experienced numerous nuclear-waste container fires and explosions through the years. Waste drums containing transuranics generate hydrogen, methane, and other volatile gases which, if unvented, can build up and, if ignited, explode. The most recent drum fire occurred at Los Alamos in November 2008. To mitigate potential explosion hazards from leaking drums, the Energy Department is required to install 12-foot-thick blast walls at WIPP after a room is closed.

Concerns have also been raised about the possibility of a storage room ceiling or wall collapse. Eventually, when WIPP closes, which is projected to occur sometime after 2030, the salt formation is expected to slowly collapse and seal off the drums of waste. But this was not expected to happen until long after the repository is filled and closed. If a collapse has already occurred, just 15 years after the facility opened, it will raise additional questions about WIPP's ability to ensure engineered barriers and institutional controls will work for a 10,000 year period.

Nowhere else to go? There are more questions than answers as the Energy Department and the Defense Nuclear Facilities Safety Board investigate what happened at WIPP and why. Robotic equipment has been sent into the facility, to be followed in the next several weeks by inspectors wearing protective gear, who will ascertain the extent of contamination before a decision is made on whether to send workers back underground. If there is residual contamination, workers may need protective clothing and respiratory protection. Cleanup of a contaminated underground radioactive waste storage site has never been attempted. It could well prove to be daunting.

At least 66,200 cubic meters of transuranic waste sit at Energy Department sites, awaiting shipment to WIPP. The Energy Department is also considering disposal of 5 tons of excess plutonium now at the Savannah River Site in WIPP. Over the past decade, the department has also been seeking to use WIPP to dispose of the contents of several high-level radioactive waste tanks at Hanford by reclassifying those contents as transuranic waste. WIPP is being eyed as a final resting place for tens of tons of plutonium from dismantled weapons as well, because the Energy Department is backing away from the $30 billion price tag now attached to a plan for mixing the plutonium with uranium and using that mixed-oxide to fuel nuclear power plants.

An extended closure of WIPP would no doubt increase political pressure emanating from Washington state, South Carolina, Tennessee, Texas, Idaho, and New Mexico, none of which wants to be left with large amounts of nuclear waste and nowhere to put it. The stakes are large. The questions are many. Competing forces await answers. Surprises should be expected.

The above article by Robert Alvarez appeared as a column in the Bulletin of Atomic Scientists 03/23/2014.
http://thebulletin.org/wipp-problem-and-what-it-means-defense-nuclear-waste-disposal7002