July 25, 2016

The Honorable Gina McCarthy, Administrator
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FR 81:112 page 37589-37592, 10 June 2016

Dear Administrator McCarthy:

We write in strong opposition to the drinking water protective action guide (PAG). This guide will not protect the public in case of a radiological release. **The EPA should abandon the PAGs and use the current standard already in place for drinking water--or better yet, be informed by levels that have been set for other man-made pollutants, such as lead, that have a goal of zero exposure.**

- In reality, EPA is treating radiation very differently from other contamination, allowing as much as 1 in 18 cancers (see calculations in section 2) in the PAG regime while EPA's goal is 1 in 1 million to 1 in 10,000. This inconsistency means the Office of Radiation and Indoor Air (ORIA) drinking water (and other) PAGs violate some basic risk goals for the entire Agency, creating a regime whereby the public deserves less protection from radioactivity than any other pollutant EPA regulates, and making a mockery of EPA's basic mission, which apparently ORIA doesn't think applies to it.
- The EPA is proposing drinking water contamination levels of 100 mrem for pregnant and nursing women, and children. But 100 mrem isn't safe enough and drinking water will not be the only exposure pathway. EPA needs to protect health by considering the *totality* of the PAG exposures. If EPA fails to do this, it is ignoring biological reality and abdicating its role to protect human and environmental health. Further, there are indications that the EPA's "conservative" exposure limit of 100 mrem could allow enough internal contamination to cause birth defects in the form of congenital anomalies (see section 5).
- In order to assess early life impacts of the PAGs, EPA has relied on NCRP, a coalition of industry and radiation medicine groups, funded in part by the nuclear power lobbying group Nuclear Energy Institute (NEI) and other nuclear industries. Thus, NCRP conclusions benefit their industry constituents, not public health, and are not reflective of the latest unadulterated science. Until NCRP is subject to the Federal

Advisory Committee Act (FACA), makes their reports accessible to the public, and opens committee participation to a broad range of public health and medical disciplines, EPA should not rely on any issuances from NCRP.

- EPA ORIA would do well to avail itself of more current and stronger research data (some of these studies are featured in section 4) rather than allowing NCRP to filter the available research. EPA ORIA needs to take a cautious approach to exposure where the indicator of protection is not *definitive causation*, but rather *association* with an exposure to a health impact.

1) A tale of two contaminants: How Flint's lead woes can be instructive regarding the proposed radiation PAGs

Despite expert recognition that there is no safe dose of either lead or radioactivity, EPA is treating these contaminants very differently. This inconsistency means the PAG violates some basic EPA risk goals, creating a regime whereby the public is less protected from radioactivity than any other pollutant EPA regulates, and making a mockery of EPA's basic mission to "protect human health and the environment -- air, water, and land. . ." Flint lead contamination in drinking water (DW) went on for 2 years or more[1] and violated EPA standards, as lead levels in additional areas of the country still do. With approval of the PAGs, large radiation exposures could go on for years--like Flint-- except in this case, EPA would have officially abdicated its responsibility to the detriment of public health, instead setting in stone the higher, very dangerous limits without any repercussion or remedy for members of the public. The public will be discouraged or unable to either protect their own health, or hold industry accountable for the health impacts, because EPA ORIA has given a nod of acceptance to industry violation of drinking water standards.

EPA's website[2] states that it "has set the maximum contaminant level goal for lead in drinking water at zero because lead is a toxic metal that can be harmful to human health even at low exposure levels." And "EPA and the Centers for Disease Control and Prevention (CDC) agree that there is no known safe level of lead in a child's blood. Lead is harmful to health, especially for children." These statements mirror statements made about radioactivity by the National Academy of Sciences and other experts.[3]

Further, there appears to be no PAG for lead and therefore no allowance for a greater dose from man-made sources under *any* circumstances. So why is EPA supporting a special allowance for man-made radioactive isotopes? Again, EPA, through ORIA, is demonstrating that exposure to radiation is somehow "special", "privileged" and it, above all other contaminants is allowed to endanger the public to a much greater degree than is allowed by EPA agency-wide risk standards.

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[1] http://www.msnbc.com/rachel-maddow/watch/flint-water-crisis-unresolved-after-two-years-715673155777
[2] https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water
[3] http://static1.1.sqspcdn.com/static/f/356082/23159715/1374531979130/NO_Safe_Dose1.pdf?token=iRp8JKfLinzGGhve5xbH%2F6nGSRg%3D

What other pollutant is allowed to pose a 1 in 18 cancer risk to female children for just three years of exposure at levels proposed by EPA? What other pollutant is allowed to override SDW standards for a release "incident" of convenience? EPA says "A PAG is the projected dose to an individual from the release of radioactive material at which a specific protective action should be taken to reduce or avoid that dose." And the EPA has set the DW dose at 100 mrem per year for pregnant and nursing women and children under 15. For everyone else, the "specific protective action" limit is 500 mrem--the implication being that "no specific protective action" needs to be taken below these doses, no matter what the undefined "incident" is; even if the incident is intentional and unnecessary, such as the holding, diluting, and then releasing of contaminated water: "Actions to protect water sources may be implemented at other levels and at any time following a radiological incident, *and even before an anticipated release occurs*." (emphasis added)

And, just like Flint, the poorer populations will be the victims of rationing clean water, making this an environmental and economic justice issue: "If bottled water must be rationed, for example, authorities may make the bottled water available to children, pregnant women and nursing women, and instruct the rest of the population to use a public drinking water supply that will not trigger the 500 mrem PAG."

2) *100 mrem for sensitive life stages is not protective and violates EPAs own agency-wide risk goals.*
The EPA is proposing drinking water contamination levels of 100 mrem for pregnant and nursing women, and children. But 100 mrem isn't safe enough and there is no assurance *this* limit will be used in case of a radiological "incident". Further, drinking water will not be the only exposure pathway since food, groundshine, air and initial exposures due to the precipitating incident all have their own, non-protective, allowable limits. EPA ORIA needs to protect health by considering the *totality* of the PAG exposures. If EPA fails to do this, it is ignoring biological reality and abdicating its role to protect human and environmental health.

While it is good to see EPA ORIA finally recognizing early life stage vulnerabilities to radiation exposure, (something other EPA offices have known for decades) the lip service provided for actually accommodating these vulnerabilities is inexcusable. The fact is, nothing in the DW guides or other PAGs is legally binding so the 100 mrem annual limit is only a suggestion. The fact that a 500 mrem level is included for the general public at all means EPA has tacitly approved its use – and both limits are entirely non-protective of early life stages, particularly in light of additional exposures EPA PAGs will allow including:

- *Immediate exposures: 1-5 rem in first four days (inhaled, cloudshine and groundshine from radiation)*
- *Relocation: 2 rem for first year, 0.5 for subsequent years (combination of inhaled, cloudshine and groundshine for first year and groundshine for subsequent years)*
- *Food: 0.5 rem per year*

While EPA ORIA claims that the intermediate phase may last from weeks to months, in fact, relocation takes place during this phase, and can last for years at a heightened level of exposure. If we use the example of Fukushima, a real-life scenario in which it appears USEPA has given exposure advice, we note that even 5 years after the catastrophe began –and subsequent to decontamination attempts-- environmental cycling processes continue to change the artificial radiological profile in the areas of contamination. Therefore, assessing what areas are and will remain below the level of any allowable exposure for 5, 10, 100 years, is a Sisyphean task.

Let's calculate exactly what cancer risk will be posed by exposure scenarios allowed in the PAGs:

To assume 3 years of exposure post "incident" is not unreasonable given what continues to unfold at Fukushima. **Lifetime risk from a 3-year exposure at 100 mrem per year including pregnancy, zero and first years for female infants is approximately 1.5 in 1000[4].** This exposure is through DW only and it is already outside of EPA's purported risk goal of 10^6 to 10^4 cancer incidence.

If we calculate a low and high end risk for 3 years worth of exposures additional to DW, including immediate, relocation and food, we get:

Low end scenario exposure risk of 1 in 34 risk of cancer from exposure to radiation from the incident at an exposure that totals 5.8 rem.[5]

High end scenario exposure risk of 1 in 18 risk of cancer from exposure to radiation from the incident that totals 11 rem.[6,7]

These risk calculations are likely underestimates for a number of reasons:

- The base risk number of 5020 cancers per 10,000 person Gy reflects a DDREF of 1.5 for most cancers, meaning that while EPA gives lip service to adhering to the Linear-no-Threshold model for risk, at low doses the risk is reduced by 1.5, which discounts the risks low doses pose per unit compared to higher doses. This discounting of risk is not supported by a good number of health studies that instead show risk per unit dose of radiation is nearly equivalent down to zero.
- Since this risk number is for age 0, it doesn't account for unique risks posed during pregnancy (fetal or embryonal stages).

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[4] EPA Radiogenic Cancer Risk Models and Projections for the U.S. Population. "Blue Book". April 2011, p 54, table 3-12b.
[5] **The lower allowable exposure scenario includes 0.3 rem from DW (100 mrem per year), immediate exposure of 1 rem, total of 3 rem for relocation, 1.5 rem for food**
[6] The higher allowable exposure scenario **includes 1.5 rem from DW (500 mrem per year), immediate exposure of 5 rem, total of 3 rem for relocation, 1.5 rem for food**
[7] both high and low scenarios are **for a female infant, including pregnancy, year zero (post natal but under 1 year) and year 1-2.**

- It doesn't account for non-cancer impacts like neurological impairment.
- Calculations used to derive this cancer risk number come almost exclusively from the atomic bomb survivor cohort (LSS), which represents primarily external, higher doses delivered over hours or days, not over months or years as would be applicable to PAG scenarios.
- Neither high nor low scenarios presented here include already existing background radiation exposure or any medical exposure.
- Exposure may last longer than three years under the PAGs.

3) EPA ORIA relies on reports from NCRP, an industry-funded group whose publications are obtained by members of the public only at great expense.

In order to assess early life impacts of the PAGs, EPA has relied on NCRP, a coalition of industry and radiation medicine groups funded in part by the nuclear power lobbying group Nuclear Energy Institute (NEI) and other nuclear industries. In fact, NCRP seems unwelcoming and dismissive of public health expertise outside of radiological disciplines. NCRP's narrow acceptance of disciplines limits the research on which it makes its conclusions and keeps EPA unaware of the full harm radioactivity poses.

This unwillingness to accommodate a wide range of public health experts is reflected in the NCRP conclusions -- conclusions that benefit their industry constituents, not public health, and that are not reflective of the latest, unadulterated science. Until NCRP is subject to FACA, makes their reports accessible to the public, and opens their committees to a broad range of public health and medical disciplines, EPA should not rely on any issuances from NCRP.

NCRP structure and function

NCRP is funded by industries that make or save considerable amounts of money exposing people to radiation, including medical radiation and nuclear power and weapons industries.

NCRP reports are reviewable by these entities before the NCRP publishes final copies, which are then not open for public comment. Full and final reports are only available to the general public at considerable cost or to those members of the public with access to specialized libraries.

NCRP report 174 committee experts on ionizing radiation represent a very narrow range of disciplines needed to assess radiation's impact on health, largely consisting of people representing fields that expose people to radiation such as radiology and nuclear medicine, while the report minimizes, even degrades, the necessary input by those in early life stage health disciplines such as obstetricians. For instance, NCRP 174 states: "However, frequently the obstetrician does not have the experience or knowledge to provide appropriate counseling for all exposure circumstances and additional professional help is recommended." Contrary to this NCRP statement, disciplines outside the radiological realm have often provided ground-breaking methodologies and research information that

helped alter our understanding of radioactivity's impact on animal and environmental health, and have lead to protection that would otherwise have been denied.[8]

Despite NCRP's function as an advisory committee issuing reports used by all manner of U.S. government agencies, and it's congressional charter, NCRP does not seem subject to Federal Advisory Committee Act (FACA) stipulations, as are other advisory committees. Additionally, NCRP places government employees on their committees and EPA ORIA employees help draft these reports, but these reports are still not easily or cheaply obtained by the public, nor does this process seem subject to FOIA or FACA, despite agency participation and use.[9] Because NCRP functions as committees that advise government agencies on exposure regulation and guidance through reports and statements, it should NOT be able to operate in the hidden capacity it now enjoys.

Fallacious conclusions of NCRP report 174

The NCRP report concludes that "There is a general misconception by members of the public and many health practitioners that ionizing radiation at any level is much more detrimental to the embryo or fetus than is actually the case" and for cancer, "(e)xcess absolute rates (EAR) per 10,000 person years per gray in the study revealed a substantially lower increase with attained age among those exposed *in utero* than the marked increase with attained age among those exposed in early childhood", conclusions which EPA seems to parrot.

In fact, these conclusions are only true if the LSS data are used or more recent data are cherry-picked. Research highlighted in section 5 below was dismissed or not even considered in NCRP report 174, yet it offers some of the most substantial and clearest science yet on cancer and non-cancer impacts of radioactivity on early life stages. Additionally, leukemia data for the LSS is minimal or unavailable for the years 1945-1957—a fact recognized by NCRP-- meaning that any impact from in utero radiation exposure that occurred within the first 12 years of life may not have been recorded, particularly if the child was unrecognized as "hibakusha" or passed away from "unknown causes". Therefore, more recent studies with better measurements and methodologies should replace the LSS data and assumptions on which the NCRP relies quite heavily, particularly for low, acute or chronic dose assessments.

4) Current studies indicate radiation doses within background range are associated with childhood cancers and neurological impairment during development in utero.

EPA would do well to avail itself of more current and stronger research data rather than allowing NCRP to filter available research. EPA needs to take a cautious approach to exposure where the indicator of protection is not definitive causation, but rather association with an exposure to a health impact.

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[8] Dr. Alice Stewart's research first introduced the idea that pregnancy has to be protected from medical xrays. Dr. Timothy Mousseau's research on Chernobyl's environmental impact lead other researchers to compare laboratory results with real-world radiation impacts. As a result, we now know that lab studies can underreport radiation damage by about 8 times. There are additional examples not mentioned here.

[9] http://www.nti.org/gsn/article/epa-documents-raise-doubts-over-intent-new-nuclear-response-guide/

Natural and artificial background gamma radiation and childhood cancers

Two recent studies on natural and artificial background gamma radiation and childhood cancers possess individual data and higher statistical power than other previous studies that have yielded mixed results. Kendall yielded a statistical significance for leukemia while Spycher showed statistical significance for all cancers, particularly leukemia and central nervous system cancers (CNS).

For the Spycher study[10], children "< 16 years of age in the Swiss National Censuses in 1990 and 2000 were included. The follow-up period lasted until 2008, and incident cancer cases were identified from the Swiss Childhood Cancer Registry. Among 2,093,660 children included at census, 1,782 incident cases of cancer were identified including 530 with leukemia, 328 with lymphoma, and 423 with a tumor of the central nervous system (CNS)…This nationwide census-based cohort study… found evidence of an increased risk of cancer among children exposed to external dose rates of background ionizing radiation of ≥ 200 nSv/hr [175 mrem per year] compared with those exposed to < 100 nSv/hr for any cancer hazard." (88 millirem per year)

For the Kendall study[11], there were cases (27,447) born and diagnosed in Great Britain during 1980-2006 and matched cancer-free controls (36,793) from the National Registry of Childhood Tumors. Researchers report a "statistically significant leukemia risk" and conclude: "[s]ubstantial bias is unlikely, and we cannot identify mechanisms by which confounding might plausibly account for the association, *which we regard as likely to be causal*." (emphasis added)

Chernobyl cesium radiation and neurological detriment

Almond, et al examined 560,000 Swedish children born between 1983 and 1988.[12] "They found that academic performance was generally weaker in all children still in utero at the time of maternal exposure to Chernobyl fallout, and this effect was most pronounced for those foetuses at 8 to 25 weeks post conception. . . This is the peak period of brain development when cells may be particularly vulnerable to being killed by relatively low doses of radiation. . . Moreover, children born in regions of Sweden that received most fallout seemed to fare worst - for the eight municipalities receiving the highest doses, children born between August and December 1986 were four per cent less likely to qualify for high school and had five per cent lower grades. Indeed, the radiation exposure of Swedish mothers reached a maximum dose of about 4 milliSieverts, perhaps twice the normal background level and within the 'safe' control range of the Japanese study. . . their model does not prove cause and effect, only an association

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[10] Spycher, BD. Background ionizing radiation and the risk of childhood cancer: a census-based nationwide cohort study. Environ Health Perspect. 2015 Jun;123(6):622-8.

[11] Kendall, GM. A record-based case-control study of natural background radiation and the incidence of childhood leukaemia and other cancers in Great Britain during 1980-2006. Leukemia. 2013 Jan;27(1):3-9.

[12] Almond, et al. Chernobyl's Subclinical Legacy: Prenatal Exposure to Radioactive Fallout and School Outcomes in Sweden. The Quarterly Journal of Economics (2009) 124 (4): 1729-1772. see also: Heiervang, KS. The Chernobyl accident and cognitive functioning: a study of Norwegian adolescents exposed in utero. Dev Neuropsychol. 2010;35(6):643-55.

[between academic performance and radiation exposure]. . . this study appears better than most at controlling for [unknown or confounding] factors."[13]

Researchers Fairlie and Korblein pooled health data from 4 European country studies conducted around reactors, (CANUPIS, GEOCAP, KiKK, COMARE) they found a 37% increase of childhood leukemia that wasn't attributable to factors other than radioactivity.[14],[15] Dr. Fairlie presented this pooled data to EPA ORIA in April 2015 and the extracted table below is from that presentation. This increase around reactors is not surprising taken in context of the Spycher and Kendall studies on background radiation. Therefore, it is illogical to ignore, as some radiation experts have, that radioactivity from nuclear power reactors can impact human health, when we have evidence of negative impact from readily measurable natural and manmade background radioactivity.

4 European studies - post KiKK

Körblein A and Fairlie I. French Geocap study confirms increased leukemia risks in young children near nuclear power plants. Int J Cancer. Article published online: 1 Sept 2012. DOI: 10.1002/ijc.27585

Acute leukaemias in under 5s within 5 km of NPPs

Country	Observed	Expected	SIR=O/E	90%CI	p-value
Germany	34	24.1	1.41	1.04-1.88	0.0328
GB	20	15.4	1.30	0.86-1.89	0.1464
Suisse	11	7.9	1.40	0.78-2.31	0.1711
France	14	10.2	1.37	0.83-2.15	0.1506
pooled data	**79**	**57.5**	**1.37**	**1.13-1.66**	**0.0042**

[13] http://www.rsc.org/chemistryworld/News/2007/August/16080701.asp.
[14] Koerblein A. French Geocap study confirms increased leukemia risks in young children near nuclear power plants. Int J Cancer. 2012 Dec 15;131(12):2970-1
[15] Fairlie I. A hypothesis to explain childhood cancers near nuclear power plants. J Environ Radioact. 2014 Jul;133:10-7.

Radiation acts along the estrogen pathway? If true, this may result in cancer and non-cancer disease endpoints

In 2011, a medical hypothesis[16] was published highlighting this interaction, which was found in a number of different research papers. Radioactivity seems to act along the estrogen pathway and this action could, at least partially, explain both early and developing life stage increased sensitivity, and adult female sensitivity, to ionizing radiation. But more than providing a mechanism for early life and female impacts, this research review also indicates that radioactivity may play a role in causing a number of diseases.

Low radiation doses early in life could lead to radiosensitivity later in life by acting on the estrogen pathway: "low radiation doses led to increased estradiol levels and an early onset of puberty. These hormonal disturbances may have impact on pathological changes of maturation of tissue estrogen receptor levels and lead to higher radiosensitivity later in life.

Radiation could lead to tissues becoming sensitive to estrogen that wouldn't have been otherwise: "of great interest, however, [is] to investigate whether estrogen could have the same biological effects in ionizing radiation-exposed tissues that had not been considered as hormonally sensitive."

The study review concludes that "The impact of estrogen and estrogen receptors on the response of living organisms, including humans, after exposure to ionizing radiation should be included in future in radiation safety regulations..."

Laboratory studies underestimate the damage radioactivity does in real life scenarios outside of the lab.

Use of non- human laboratory studies, such as those used by NCRP to assess impact to human early life-stage health, is fraught with complications. A study by Garnier-Laplace, et. al[17] found "…that the best estimate of the median value (HDR50) of the distribution established for field conditions at Chernobyl (about 100 μGy/h) was eight times lower than the one from controlled experiments (about 850 μGy/h), suggesting that organisms in their natural environmental were more sensitive to radiation." This implies that using laboratory studies of animals under controlled conditions is not representative of what is happening in a natural setting and any exposure recommendations relying on lab results, such as those EPA now proposes which are based on NCRP, need to be replaced with research on real life systems.

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[16]Fucic A. Interaction between ionizing radiation and estrogen: what we are missing? Med Hypotheses. 2011 Dec;77(6):966-9.

[17] Garnier-Laplace J. Are radiosensitivity data derived from natural field conditions consistent with data from controlled exposures? A case study of Chernobyl wildlife chronically exposed to low dose rates. J Environ Radioact. 2013 Jul;121:12-21.

In a Chernobyl- contaminated region of Ukraine, pregnant women with higher radiocesium body burden have higher rates of birth defects (BD)

In Polissa, a Chernobyl- contaminated region in Ukraine, pregnant women collect more cesium than women who are not pregnant. Birth defects, including neural tube defects, and microcephaly/microthalmia, conjoined twins and teratomas (all forms of congenital anomalies) are higher among this population than in populations from other, less contaminated environments, and are among the highest in Europe. The researchers conclude that these data are enough to indicate an association, but not a causal relationship between incorporated cesium and BD. [18]

A word on "cause" versus "association" and implications for protecting public health.

Before protecting health, many federal agencies expect a link between radiation exposure and health detriment to be "absolutely established", "conclusively linked", or "proven". But "absolute proof" will be difficult to attain[19] and is not necessary. When regulators rely on such a draconian standard, they are serving the interest of industry, not the public. In reality, health researchers recognize that meeting the high standard of "conclusively linked" is not only challenging, but could be causing unrealized and preventable damage to humans. Instead, these researchers use the term "association" in their studies, rather than "causation". Establishing causation is not always necessary[20] before acting to protect the public from environmental exposures, especially during vulnerable pregnancy and childhood.

5) EPA DW PAG limits could cause birth defects: Comparison of Ukraininan data to EPA PAG assumptions for impact of incorporated radiocesium.

Mean whole body count was 2767 Bq of radioactive cesium in the pregnant women of Polissa, Ukraine, where an association between congenital anomalies (CA) and incorporated radiocesium was indicated.

In its lowest exposure scenario, used for pregnant women, EPA is allowing 6140 pico curies (227 Bq) per liter. By EPA's assessment, ingestion of almost a liter of water a day for an adult is reasonable, which means 227 Bq cesium ingested per day, although the recommended amount of water is twice that.

According to ICRP report 111[21] you reach 1400 Bq total body burden of cesium in 1.5 years with a chronic ingestion of 10 Bq per day. (See figure below) For a 227 Bq per day consumption, a pregnant, nursing or woman of

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[18] Wertelecki, W. Elevated Congenital Anomaly Rates and Incorporated Cesium-137 in the Polissia Region of Ukraine. Birth Defects Research (Part A) 106:194–200, 2016.
[19] http://scienceblogs.com/thepumphandle/2012/11/19/what-causes-disease-association-vs-causation-and-the-hill-criteria/
[20] Kundi, M. Commentaries & Reviews. Environ Health Perspect. 2006 Jul; 114(7): 969–974.
[21] CLEMENT C. Ed. ICRP PUBLICATION 111. Application of the Commission's Recommendations to the Protection of People Living in Long-term Contaminated Areas after a Nuclear Accident or a Radiation Emergency. Approved by the Commission in October 2008

childbearing age could reach over 28,000 Bq total in her body in 1.5 years.[22] This would be ten times greater than the whole body count at which the Polissa pregnancies had increased CA's.

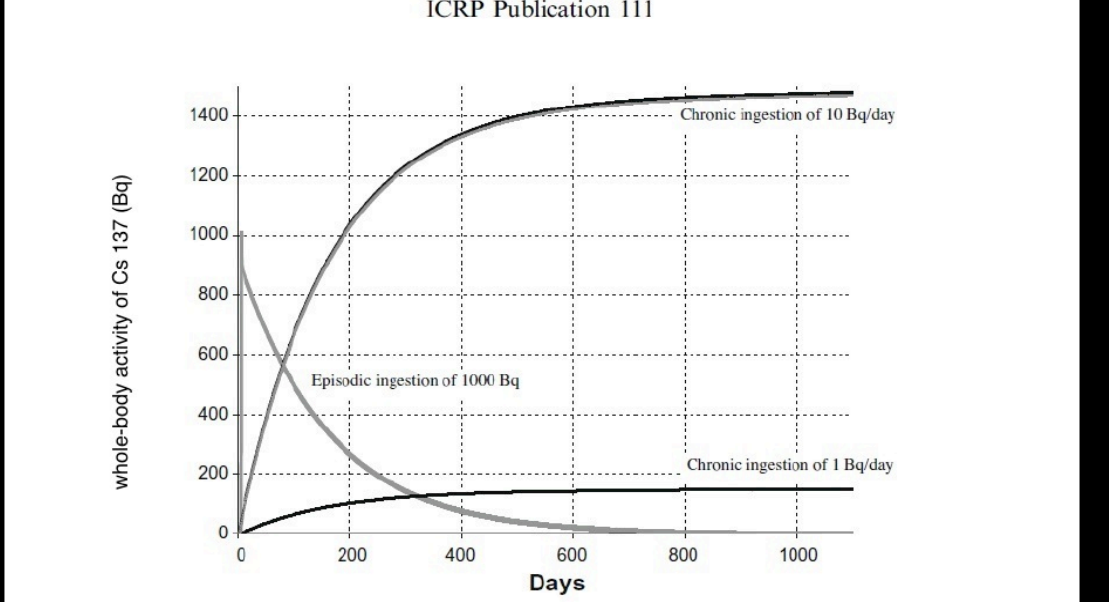

Fig. 2.2. Evolution over a pluri-annual period (1000 days) of whole-body activity (Bq) associated with an episodic intake of 1000 Bq and daily intake of 1 and 10 Bq of ^{137}Cs.

Calculations using the EPA's higher contamination limit would actually be more appropriate for women who are not yet, but may become, pregnant. This indicates that they will have higher cesium body burdens going into a pregnancy. Even if these assumptions are off and result in half or a quarter of this body burden, this would still be two or three times higher than the cesium incorporation at Polissa which is associated with CAs.

ICRP 111 makes a very interesting statement regarding the calculated dose of incorporated radiocesium: "Twenty years after the Chernobyl accident, typical average daily intake due to 137Cs for an adult in the contaminated areas around Chernobyl is in the range of 10–20 Bq, and additional higher episodic intakes in the range of a few hundred Bq are common due to, for example, the ingestion of wild mushrooms or berries. This results in annual effective doses in the range of 0.1 mSv. However, some poorly informed individuals or those with very particular dietary habits may present daily intakes in the range of 100 to a few hundred Bq. This corresponds to an annual effective dose in the range of 1 to a few mSv." **This ICRP statement is instructive because both ICRP and EPA seem to be under the impression that these levels of incorporated radiocesium would result in (at most) a few mSv-- a level considered "safe" by most radiation experts. Yet Polissa CA data, collected and assessed by medical**

[22] For ingestion of 1 Bq per day of cesium-137, total body burden reaches about 140 Bq in about 1.5 years. For ingestion of 10 Bq per day, total body burden reaches 1400 Bq in 1.5 years. For 100 Bq per day, we can infer another jump in order of magnitude, resulting in 14,000 Bq total body burden. Since EPA ORIA's limit is 227 Bq per liter, this would result in a little more than 28,000 Bq total body burden of cesium-137 in 1.5 years.

doctors with expertise in birth defects, appear to say that incorporated radiocesium at the levels allowed by the EPA DW PAGs *alone*, could be many times more than the amount associated with CAs, never mind what the millirem calculation says.

EPA PAGs practically guarantee that EPA ORIA will violate the agency-accepted risk range for cancer and that people will be forced to endure radiation exposure many times what is safe, often to their health detriment.

The animal and environmental research from Chernobyl and Fukushima raises a more fundamental question regarding our current inability to assess long term and multigenerational radiation exposures both to animals and the environment. Indeed because the EPA ORIA has decided to issue guidance rather than retain the regulatory limits of other EPA offices like Superfund and the Office of Water, EPA will not be able to enforce its own stated protection goals. In other words, there is no guarantee that the limits in the PAGs will ever be reduced to pre-incident levels.[23] Under the long-term goals in the full PAGs, ORIA has stated that EPA's risk ranges may not be "practically achievable for major incidents…" yet EPA also does not indicate that it will reject resettlement to these areas of higher radioactivity—quite the contrary. In fact, in the wake of Fukushima, resettlement to higher areas of radiological contamination is not only encouraged, it is practically forced.[24] This is the regime established by the PAGs. Further, the unwillingness of radiation regulators and experts to consult with or in some cases even recognize data from studies outside their very narrow disciplines will continue to inhibit a truer assessment of radiation's impact, particularly on early life. **EPA must not ignore indications of increased health risks—childhood cancer and neurological impairement in utero—at doses starting at 175 mrem per year. It must replace the PAGs with standards that meet EPA's more protective risk levels.**

[23] According to the NTI piece by Doug Guarino, "[EPA ORIA employee] Boyd's presentation… says long-term cleanup conducted under the guide could only 'potentially' strive to meet EPA's traditional rules."
[24] http://www.dw.com/en/tokyo-under-fire-for-plans-to-speed-return-of-fukushima-evacuees/a-18597707