Rulemaking1CEm Resource

From: RulemakingComments Resource
Sent: Wednesday, November 25, 2015 11:41 AM
To: Rulemaking1CEm Resource
Subject: Comment on PRM-20-28, PRM-20-29, and PRM-20-30
Attachments: Final NRC Hormesis Comments.doc

DOCKETED BY USNRC—OFFICE OF THE SECRETARY

SECY-067
PR#: PRM-20-28, PRM-20-29, and PRM-20-30
FRN#: 80FR35870
NRC DOCKET#: NRC-2015-0057
SECY DOCKET DATE: 11/20/15
TITLE: Linear No-Threshold Model and Standards for Protection Against Radiation
COMMENT#: 562

Hearing Identifier: Secy_RuleMaking_comments_Public
Email Number: 1440

Mail Envelope Properties (19617664440b4a2fb3dc8fed2106713c)

Subject: Comment on PRM-20-28, PRM-20-29, and PRM-20-30
Sent Date: 11/25/2015 11:40:56 AM
Received Date: 11/25/2015 11:41:01 AM
From: RulemakingComments Resource

Created By: RulemakingComments.Resource@nrc.gov

Recipients:
"Rulemaking1CEm Resource" <Rulemaking1CEm.Resource@nrc.gov>
Tracking Status: None

Post Office: HQPWMSMRS02.nrc.gov

Files	**Size**	**Date & Time**
MESSAGE	298	11/25/2015 11:41:01 AM
Final NRC Hormesis Comments.doc	153854	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

NRC Docket ID NRC-2015-0057
By Susan Michetti

Table of Contents

1. Radioactive Catastrophes cause adverse human health effects:

The book, ***Chernobyl: Consequences of the Catastrophe for People and the Environment*** by **Alexey Yablokov, Vassily Nesterenko, and Alexey Nesterenko** was originally published by **New York Academy of Sciences, 2009**. This book identifies scientific research and clinical records of adverse public health and environmental impacts from ionizing radiation exposures after Chernobyl's catastrophe. References document morbidity, mortality, and genetic malformations observed in contaminated territories.

At workshop at the University of Wisconsin a few years ago, **Dr. Helen Caldecott, M.D.**, held this book up as containing sufficient medical evidence of serious adverse harm from ionizing radionuclides. Caldecott said this book contained the evidence that was inappropriately and irrationally dismissed by pro-nuclear engineers. Caldecott said this book contained overwhelming evidence of harmful effects of ionizing radiation exposure that could not be dismissed. I already had this book.

Large-scale irreversible genetic damage occurred with Chernobyl exposures both to animals and to humans. Thousands of children were born with serious birth defects.

The genetic damage was concealed at the time that it occurred. It was not visible. It was not observable at the time of occurrence, as there was no invasive exploration or biopsy. In the past, scientists knew how to measure the damage caused by specific ingestion of a specific radionuclide. Where is the historical memory parked?

Methods exist to detect the genetic damage at the time that it occurs. **The U.S. Army Environmental Policy Institute** knows how to determine cancer and hereditary risk estimates. See the **U.S. Army June 1995 Report to Congress**.

The damaged genes occur inside the concealed structures of living organisms where nuclear DNA is located inside of the center of cells. The impacted people and wildlife from Chernobyl's Exclusion Zone often looked normal in appearance---at least superficially for most visual observances. This seemed to be the case until **Dr. Timothy Mousseau, Biologist, University of South Carolina**, looked at barn swallows, other birds, insects, and spiders, where genetic damage became evident. The genetic damage also reared in the fetuses of exposed pregnant women, worsened by their inappropriately delayed evacuation. Gross deformities occurred. Children were delivered and born who can never breathe on their own and who will have to be taken care of for the rest of their lives. Ionizing radiation is extremely harmful to all stages of the reproductive process. It is extremely harmful to fetuses, infants, and growing children as well as women with potential for pregnancy.

1a: Fetuses, infants, children and women require adequate vulnerability safety guidelines to protected the majority of the population

It is unacceptable that fetuses, infants, children, and women are often disregarded and insufficiently protected in too many inaccurate, unrealistic mathematical formulas that calculate physical injuries and adverse health effects in guidelines.

These more vulnerable populations are different from the adult male model for whom the most accurate calculations have been historically made and focused. Yet, it is precisely these subgroups that compose the majority of USA's population; they have increased vulnerabilities to serious harm from toxins and ionizing radiation which requires sufficient protection and calculation corrections made to all risk assessments, rules, regulations, and guidelines, beyond that of standard adult males.

Limits set in 1970s, restricted the dose to the fetus of a pregnant female to 500 millirem in the workplace for the duration of the pregnancy, based on limits set in 1970s. The same limit was determined for general public exposure in the 1970s. In the late 1980s, this was reduced to 100 millirem annually for general public exposure. Inconsistently, the fetal exposure limit in the workplace remains inappropriately out-dated in consideration of

new determinations, according to the **Institute for Energy and Environmental Research (IEER), Volume 16, No. 1 of *Science for Democratic Action*, August 2009**. I am uninformed if it has been subsequently lowered downward, but the public safety requires that this be checked and fine-tuned into accuracy.

In early stages of pregnancy, the adverse medical effects of ionizing radiation and accumulated doses are insufficiently researched for non-cancer effects, but this does not change the fact that the science sufficiently confirms that damage occurs. Studies are needed regarding accumulated internal emitters that irradiate the fetus and may possibly cross the placenta and become part of fetal tissues; This studies are required before any safety assessments can be reliably determined, but I suspect that this information is missing from the science.

Risks of later term pregnancy from ionizing radiation are comparable to those of infants. Differences in characteristics of some radionuclides and differences in external and internal emitters make a general exposure dose guideline inadequate for enhanced risks to fetuses, to infants, to growing children, and to potentially pregnant women that will require increased protection. Precautionary Principle should be used to protect, if the data hasn't been found. **IEER** uses the example of accumulated inhaled iodine-131 in the first 5 years of life in terms of damage to thyroid as 5 times greater than its accumulated exposure between age 18 to age 70, the determined adult lifetime period "calculated from FGR 13 dose conversion factors in the 2002 CD Supplement, with linear interpolation between the ages of 1 and 5, 6 and 10, 11 and 15, and 15 and 18 years;" this occurs with discussion of the perverse effects of relying on **Reference Man**.

Average human is not interchangeable with average man. Exposure dosages to any human must be protective and safe from ionizing damage to health. These sloppy games with definitions must stop. It should be obvious to all that numerically much more than half the population requires stricter protection restrictions than the average adult man.

I request the NRC to review all of its rules, regulations, requirements, and guidelines to identify any possible inaccuracies for correction that may have been calculated erroneously by inappropriately excluding the majority of human beings from sufficient protection calculations, particularly pertaining to restrictions of workers and to limitations for public exposures to protect all humans, not just average males, from any exposure harm.

Projects with emissions should not be acceptable at levels of "as low as reasonably achievable" (ALARA), but at levels that protect all humans from adverse harm, particularly fetuses, infants, growing children, and from women who have the potential to be pregnant. Male sperm also requires protection, if not already in the adult male model. ALARA that does not sufficiently protect these more vulnerable groups means that the technology that results in harmful levels at ALARA requires rejection and/or shutting it down. It is not acceptable to allow private commercial nuclear enterprises to continue to operate if humans are becoming sick or genetically damaged from ALARA emissions or leakages or potential leakages due to sloppy EIS approvals, particularly if approvals may have ignored or dismissed warnings without adequate study and analysis.

Science has proven that women and children are at much greater risk than men of developing cancer from the same exposure.

I ask for NRC to report on the status of their radiation protection standards for women and children in all rules, guidelines, regulations, and applications (or any other language used for standard calculation and criteria), particularly in terms of updating and including women and children or in terms of the date by which these inaccuracies will be corrected.

Let me suggest that the following areas are pertinent to inclusion in such a review that reports human safety standards as opposed to mature male safety standards:

Based on the **May 30, 2008, Obama-Waxman-EPA correspondence, obtained by IEER**, **Senator Barack Obama and Congressman Henry Waxman, Chair of House Oversight and Government Reform Committee**, **wrote to the EPA** to clarify use of Reference Man in EPA guidelines and stands and to inquire about plans to phase out the Reference Man model. **EPA's Administration** responded that EPA generally stopped using Reference Man in 1990, that "EPA continues to update and improve its age- and gender- specific models in light of continuing research. EPA's radionuclide-specific cancer risk coefficients are used for calculating the excess cancer risk to the general population from chronic low level exposure to radionuclides in the environment. Our risk coefficients and regulatory actions are 'conservative' in that they sum the risks from an entire lifetime exposure, taking into account age-dependent differences in intake, biokinetics, and sensitivity to radiation. Thus, our regulations are fully protective of the entire population, including infants and children."

IEER identifies that while this "explicit statement" is "long overdue" and "a sign of great progress," that EPA's admission in the same letter of relying on **FGR 11 and FGR 12** for "some regulatory applications" **specifies the location of safety calculations inaccuracies** that remain unacceptable failures to sufficiently protect all humans. These guidance documents are widely applied **based on Reference Man**, not the actual human population, in unscientific approvals and determinations **by the EPA, DOE, and NRC**.

These guidance documents and their use by the EPA, DOE, and NRC require immediate conversion away from Reference Man in order to sufficiently protect the human population, particularly that part actively engaged in potential reproduction cycle and growth prior to full maturity. The science studies are available to determine when children may get higher doses.

This information including **12 recommendations by IEER** to end the use of Reference Man and to study, calculate, develop, revise, correct, and publish protective standards on risk-based radiation protection can be obtained from IEER or from **IEER's website www.ieer.org** . See citations and info at **www.ieer.org/reports/referenceman.pdf**. See **http://www.ieer.org/sdafiles/16-1/referenceman-letters.html**.

1b: Government spokespersons must immediately stop misrepresentations of ionizing damage:

I was annoyed by incompetent misrepresentations of safety pertaining to Fukushima's out-of-control ionizing radiation that continued and continued and continued. These inaccurate lies were echoed through the mass media without thought. It is unacceptable for regulators to lie and to declare every release to be not of any public harm, but they have done this in the USA with Three Mile Island, Chernobyl, and Fukushima as well as with virtually every low dose "unintended releases" and routine releases at commercial nuclear plants. If the spokespersons can't face the public with the truth, then they belong in another profession where they won't harm the public with their misrepresentations and lies.

The New Age game of deceit by denial is over. The game of calling harmful substances safe is over. The George Orwell scenario does not serve American values and democracy. Instead, it serves the very small interests of a few billionaires who have heavily invested in think tanks that interfere with our abilities to think clearly without confusion. They have distracted us by creating a society that has taken away the tools from us to sufficiently control the direction of our lives while training us to create our own wealth and happiness by positive thinking. It is an illusion. Extremeness without balance is never real. We can only have a healthy society with dependable wealth and happiness opportunities if

we honesty and freely discuss the advantages and disadvantages, the fairness and unfairness, and do our best to create consensus decision-making. If we want a healthy society that serves the best interests of the overwhelming majority, we can't deny the needs of some people. We need to reward integrity with its honesty, dependability, reliability, and trustworthiness towards the larger community. We need to stop rewarding those who can't meet these values that are required for all to have a piece of the American pie, rather than just a small few of them. It's about up and down, not left or right.

Too many innocent believers have been hurt unnecessarily. Reliable, dependable, trustworthy decision-making does not emerge from only hearing and analyzing the pleasant advantages, while denying and ignoring the unpleasant disadvantages, while not collecting, itemizing, and analyzing the disadvantages. Evil and catastrophe emerges from decisions made by those who do not to deal with anything except pleasantness. When such "only pleasant and positive-focused" New Age-type folks realize that the placebo effect didn't influence the outcome of most of their one-sided decisions made without input from the negative side, then, they often find themselves in a crisis, requiring emergency counseling and healthy guidance.

Only cruel, selfish, and/or uncaring incompetent individuals would conduct their jobs by leading the public deliberately into harm's way, and these people should be identified as incompetent for their job description by their superiors.

The misrepresentation to the public with false assurances of public safety from nuclear radiation must stop immediately.

Inaccurately informed people cannot protect themselves by avoiding inhaling and ingesting radiation and other exposures, but those who are accurately informed will have increased chances of survival.

1c: Professionalism is a job requirement that too few spokespersons have competently retained:

Professionalism is not about NOT conveying unpleasant information. It's about communicating clearly and accurately about unpleasant information within the big picture.

The think tanks of New Age magical thinking serve as thought-police to push people into denial of the truth when it contains unpleasantness, but professionals manipulated around like that become worse than useless in their jobs to protect the public that they theoretically should be serving.

It is the job of professionals to accurately understand the health and safety risks.

It is expected that professionals have competent communication skills in which to accurately inform the vulnerable public of reasonable ways that they can help to protect themselves.

Professionalism is about integrity, honesty, reliability, dependability, and trustworthiness. That should be the content of any business deal with the public; and the extent that this integrity is lacking toward those s/he serves defines the extent of incompetence and corruptness present. This includes not only government and regulatory spokespersons, but it also applies to academics and think-tanks teaching unbalanced crap to students and regulators for some undisclosed selfish personal agenda.

The scientific truth must be told publicly---that the background contamination of the entire Northern Hemisphere increased, first from Chernobyl, and then from Fukushima. The earth is no longer as healthy for human survival as it was prior to these catastrophes. As the "natural" background radiation increases, it brings harm in all cases. In zero cases it brings improvements.

We are required to face the horrid truth before we can stop it from getting worse. The entire global change crisis is being caused by greed, and by liars pretending to be in denial, when it's really about extreme greed to melt the ice caps in order to drill in the Arctic.

1d: Medical studies show Low dose ionizing radiation not only causes adverse health effects but that they are worse than Intermediate and High dose ionizing radiation:

The medical databases are full of data pertaining to adverse health effects caused by the medical profession from diagnostic imaging by low dose ionizing X-rays and low dose ionizing X-ray mammography of the breasts as well as from medical diagnostic procedures, such as swallow studies, treadmill heart scans, and other cardiovascular testing.

For example, the use of diagnostic medical X-rays is associated with small increases in cancer risk, estimated up to 3%, as reported in **Chapter 30** of **Life Extension Foundation's *"Disease Prevention and Treatment,"* 5th edition, 2013.**

In another example, the risks of cancer increase for women under age 30 from the use of mammography with low-dose X-rays of the breasts, as reported in **Chapter 30** of **Life Extension Foundation's *"Disease Prevention and Treatment,"* 5th edition, 2013.**

Another study, ***"Dental x-rays and risk of meningiomas"*** in the journal, ***Cancer*, Sept 15, 2012, 118 (18): 4530-7,** report 4.9 times higher risk of brain tumors from low dose dental X-rays.

"Brain and salivary gland tumors are related to prior dental radiography: Implications for current practice," Journal of American Dental Association, 1990, Feb.: 120 (2): 152-8 indicates that low dose ionizing radiation has adverse health effects.

Dr. Mercola on his website quotes **John Gofman, M.D., Ph.D**. as indicating that there is strong evidence that half of all cancer deaths and 60% of the death rate from ischemic heart disease being induced by ionizing radiation treatment. This presents compelling evidence that radiation from medical procedures from treadmill heart scans is linked to the pathogenesis of cancer and ischemic heart disease.

John Gofman, M.D., PhD, *"Radiation-Induced Cancer from Low-Dose Exposure: Independent Analysis"* 1990, Committee for Nuclear Responsibility, Incorporated, San Francisco, CA, in Chapter 2 with references to Chapter 13 reports that 1.5 million Americans receive occupational ionizing radiation across many professions. He said, "The carcinogenicity of X-rays is greater than that of A-bomb radiation….New A-bomb evidence shows when all ages are considered together that the cancer hazard per dose unit is more severe at Low doses than at Intermediate and High doses; The dose response curve is supra-linear….The new A-bomb evidences confirms that the cancer risk is much higher for younger people than for older people, when they receive the same dose."

Gofman's findings show that low dose ionizing radiation has greater serious adverse side effects than high dose ionizing radiation as well as Intermediate dose ionizing radiation. He also indicates that the same dose causes more damage in an age-related way, that decreases with age. I interpret this to be another indicator warning that fetuses, infants, developing children, and women with potential to be pregnant have increased vulnerability that must be calculated and applied in the NRC's rules, regulations, and guidelines as well as applying the strongest guidelines for low level ionizing radiation.

Doses from UN SCEAR

9 mSv dose of full body CT scan
9 mSv average annual dose of airline crews on polar route between NY and Tokyo
2 mSv average annual dose of background radiation worldwide
1.5 mSv dose of spinal X-ray
.01 mSv dose of dental X-ray

1e: Let's talk about the horrible truth of ionizing internal emitters:

Birth defects exist in thousands of the offspring of former Chernobyl Exclusion Zone residents and farther territorial area residents. Much of this occurred early from acute exposures. It is continuing to occur among birds, insects, and spiders at Chernobyl's Exclusion Zone from what is being characterized by some as chronic low level ionizing radiation with higher level hot spots that will exist for tens of thousands of years, if not more.

Thousands of Japanese children already have thyroid dysfunctions/cancers from Fukushima, showing that they experienced damaged cells and mutations.

We have overwhelming evidence of the adverse medical effects of ionizing radiation from Chernobyl and evidence starting to accumulate from Fukushima. We will not know the full extent of the damage from both acute high level survivors and from those chronically exposed to low level ionizing radiation including ingestion. It may be difficult to measure many of these components that caused harmful adverse effects, but that does not alter the fact that harmful adverse effects occurred.

Throughout this ongoing Fukushima disaster, ionizing radiation is inaccurately characterized as the same as an internal emitter with internal ionizing radiation emitting constantly next to living tissues. They are treated interchangeably, which is extremely scientifically inaccurate and unprofessional. One you can walk away from and escape more radiation. However, inhalation, ingestion, or absorption through skin or eyes of a radionuclide constantly emitting harmful rays is constantly damaging your cells, preventing repair processes from working. Such inaccurate reporting is an indicator of the failure of integrity of spokespersons who are expected to be sufficiently knowledgeable about safety.

I did not enjoy lies told to the American public by **USDA, FDA, EPA,** and perhaps **NRC spokespersons** making seriously inaccurate statements that claimed complete safety of American food, drinking water, and the air we breathed into our lungs. I do not find pleasant untrustworthiness attractive. This ignored and denied the much more serious threat from internal emitters. These statements came from incompetent, untrustworthy, and unprofessional "Professionals." I believe it was former Secretary of State Hillary Clinton who shut down most of our mobile **EPA air monitors** and stopped recording the data at key sites needed to keep Americans, like myself, who wanted to be informed about rising and falling levels of potential internal emitters falling daily from our skies.

In the past, sometimes we heard the truth.

For example, reliable spokespeople have presented accurate accounts of radioactive risk in the past: The U.S. military acknowledged that ingested Depleted Uranium-238 is radioactive and harms the body more than external emitters. "The radiation dose to critical organs depends upon the amount of time that depleted uranium resides in the organs," informed the **US Army Environmental Policy Institute**, in a **June 1995 Report to US Congress**, "When this value is known or estimated, cancer and hereditary risk estimates can be determined." This military information clearly identifies the potential to generate significantly greater medical consequences if an emitter enters the body than if it remains an external emitter.

In another example, **Colonel Robert G. Claypool, US Army Surgeon General's Office** on **August 16, 1993**, stated: "When soldiers inhale or ingest DU dust, they incur a potential increase in cancer risk. The magnitude of that increase can be quantified (in terms of projected days of life lost) if the DU intake is known (or can be estimated)…Expected physiological effects from exposure to DU dust include possible increased risk of cancer (lung or bone) and kidney damage."

The point I'm making with these spokesperson quotes is that they indicate that appropriately educated professionals in our nation already know that inhalation or ingestion of nucleotides internalizes them. We already know that internal emitters increase the risks

by constantly emitting damaging waves which is very different from the adverse health effects of a simple external emitter exposure. So why the denial of historical memory?

In **1984, the Federal Aviation Administration** told its investigators in an advisory bulletin: "If particles are inhaled or ingested, they can be chemically toxic and cause a significant and long-lasting irradiation of internal tissue."

What occurred that silenced this information by government spokespersons during an actual crisis?

Why are the nuclear scientists who provided insight and conversations into Fukushima's catastrophe recognizing that a significant difference exists between ingested and external radionuclides, while the official media story misled the American public?

How can we have a professional Nuclear Regulatory Commission that bases safety plans on science when large components of the science have disappeared from the official government conversations directly to the American public, specifically such misrepresentation that no harm to the public occurs with low dose routine or "unanticipated releases" as well as misrepresentation that internal ionizing radiation causes a lot more injuries compared to the damage of an external emitter?

How did this important part of the adverse health effects get lost so that regulatory spokespersons misspeak with inaccurate scientific facts pertaining to the public safety? How did this occur and nobody noticed?

When did the NRC and the nuclear engineers lose their historical institutional memory that they must have in the past, prior to placing something as far-fetched on the NRC docket as hormesis that opposes solid scientific facts about ionizing science in general as well as vastly increased dangers of internal emitters?

At least, the military knew once upon a time. Am I missing something major?

Ingested effects, involving the primary radionuclides that escape into the environment in a nuclear catastrophe, must be seriously recognized, compiled, translated, and analyzed, for the actual danger that they present to all life forms.

Ingested ionizing effects require top priority over any feigned serious consideration of the hormesis theory wrapped in pleasant dreams.

The Nation magazine, **May 26, 1997, page 20**, quoted the **Radiological Task Group from US Army Armaments, Munitions, and Chemical Command (AMMCCOM)** from **July 1990** identifying Depleted Uranium as a "low level alpha radiation emitter, which is linked to cancer when exposures are internal and chemical toxicity causing kidney damage." AMMCCOM further clarified: "Long term effects of low doses have been implicated in cancer….There is no dose so low that the probability of effects is zero."

The hormesis advocates can't reconcile their position with this low dose harmful truth, and so they pretend the truth does not exist.

2. Pandora's Promise is an opinion:

The film, ***Pandora's Promise,*** dismisses scientific evidence by ignoring it or insufficiently addressing it. Instead, emotionally giddy New Age magical thinking nuclear engineering students who are strongly pro-module nuclear reactors are seen falsely claiming that ionizing radiation has no adverse impacts. This film shows youthful nuclear science students walking about the Fukushima Exclusion Zone without any protective gear or masks, promoting exposure to the radiation there as not harmful and even as beneficial. These insufficiently-educated engineering students do not understand the difference between independently replicable and proven scientific facts and carefully designed studies that carefully record and measure radiation and exposure changes from baseline. These students are taking leaps away from the accumulated scientific facts to their beliefs. They

are following a dream. They are following magical thinking. Magical thinking does not make it so beyond a possible placebo effect.

The adverse health effects of Chernobyl don't disappear because sponsors of ***Pandora's Promise*** and UW nuclear engineers claim otherwise. The increased risk of adverse health effects from low level X-rays for medical imaging doesn't disappear because hormesis hypothesis proponents claim that harm doesn't happen.

At least one scientist from a non-nuclear science discipline at the University of Wisconsin remarked in public, at a recent film showing in Madison, that the hormesis hypothesis advocated specifically by **"Pandora's Promise"** constitutes an opinion, which is not the same thing as science. The hormesis hypothesis is extremely controversial. The hormesis hypothesis is supported by a small number of academics with protégées, but it is not supported by mainstream science. The reaction to the showing of **"Pandora's Promise"** at the University of Wisconsin many months ago brought out audience accusations of corporate agenda for profits coupled with emotional true believers.

Indeed, the hormesis theory claims to be a theory. I do not believe it has sufficient supporting sets of replicable facts in order to be much more than a hypothesis.

It is not a law of science. As such, the hormesis theory is not reliable and dependable and has not been fully vetted for its accuracies and inaccuracies, and as such, does not deserve to be specially recognized under this docket number.

It is a distraction away from critical problems that need to be solved.

3. Hormesis theory depends upon unproven safety claims:

The hormesis theory depends upon its claim of safety.

Its claim of safety depends upon the presence of evidence that external ionizing radiation is safe and that also internal ingested ionizing radiation is safe, but this has not been proven.

A claim of safety requires replicable proof that these exposures are safe for infants, for growing children developing during their timeline to adult maturity, for all components of the reproductive system including male sperm, and for pregnant women and their fetuses as well as for the general human population and the general wildlife populations.

A claim of safety must be proven safe for both mitochondrial genetic material in the cytoplasm as well as nuclear DNA in the center of the cell. The wellness and life-span of the host must not be compromised or shortened. A claim of safety must prove no harmful genetic damage will result to the host's descendants into the future, for at least 4 generations. Native Americans want proof for at least 7 generations.

3a: Mitochondrial Genetic Damage found with healthy appearances in rodents exposed to chronic low level ionizing radioactivity around Chernobyl.

The Chernobyl vole study by Texas Technical University biologists reported observing mitochondrial genetic damage, despite healthy appearances of bank voles (rodent family), after presuming with verification of 40 generations of chronic low level exposure, but they did not examine the nuclear DNA. The generational question here brings into sharp question if testing only 4 generations is sufficient to study permanent irreversible genetic damage. How many generations does it take DNA mutation to express?

The Texas Technical University study by Dr. Robert J. Baker, biologist, is very useful in that it documents mitochondrial genetic damage occurring with chronic low level ionizing radiation exposure. Unfortunately, he did not examine the nuclear DNA for damage.

I ask: Are the bank voles in the Chernobyl Exclusion Zone as energetic as bank voles not in the Exclusion Zone? Do they continue to make the same number of

movements during equal time periods at the same relative time of the day, or are they becoming "lazy"?

It would be interesting, if possible, to adapt a new break-through scientific method to identify and measure exertion fatigue, which would be one of the expectations of mitochondrial furnace dysfunctions or mitochondrial genetic damage. It would be interesting if this break-through measuring technique might be adapted to animal studies exposed to precisely measured and recorded ionizing radiation with different isotope variables from commercial nuclear plants. Is sufficient animal brain imaging possible? Applicable?

3b. Chernobyl rodents with observed mitochondrial mutations who appeared healthy with known chronic low dose ionizing exposure might be very much like millions of patients in the USA with mitochondrial dysfunctions (known to be related to syndrome diagnoses with unknown causes) who appear healthy while exerting energy.

I am curious: Might each vole month of life be equivalent to about 12 human years?

How long does a vole take to mature fully? Can voles hold up to normal energy expenditures if observed for their entire life spans with low dose ionizing exposures? When does the mitochondrial genetic damage begin? Nuclear DNA damage?

Humans with mitochondrial furnace dysfunctions (given various medical diagnoses) are able often to expend energy and appear normal in social situations and in public, but afterwards Systemic Exertion Intolerance occurs with their ability to produce energy debilitated. One-quarter are bed-bound or house-bound at some point. Up to three-quarters are unable to work full-time in the workplace at some point.

Using electrodes and video brain imaging on patients diagnosed with Chronic Fatigue Syndrome in the USA has resulted in a scientific-methods break-through that enables reliable and replicable measurements of brain waves responding to actual energy levels; this new 2015 evidence has confirmed subjective reporting of patient fatigue in a population that has long suffered cruelty from far too many skeptics who did not believe them and labeled them "lazy." This information can be found at the Institute of Medicine of the National Academies in ***"Report Guide for Clinicians: Beyond Myalgic Encephalomyelitis/Chronic Fatigue Syndrome: Redefining an illness."***

ME/CFS (Systemic Exertion Intolerance Disease = SEID) diagnosis requires 3 symptoms:

1. "substantial reduction or impairment in the ability to engage in pre-illness levels of occupational, educational, social, or personal activities, that persists for more than 6 months and is accompanied by fatigue, which is often profound, is of new or definite onset (not lifelong), is not the result of ongoing excessive exertion, and is not substantially alleviated by rest" and
2. "Post-exertional malaise" (for "at least half of the time with moderate, substantial, or severe intensity").
3. "Unrefreshing sleep" (for "at least half of the time with moderate, substantial, or severe intensity").

The ME/CFS diagnosis requires at least one of two manifestations:

4. "Cognitive impairment" (for "at least half of the time with moderate, substantial, or severe intensity") AND/OR
5. "Orthostatic intolerance."

The cause remains unknown.

ME is the British diagnostic term. The US diagnostic term has been Fibromyalgia (diagnoses were heavily epidemic-concentrated in the upper Midwest and around the Great Lakes but found across the USA with least diagnoses in the Deep South). Fibromyalgia is a name which patient support groups have rejected. The Institute of Medicine of the National Academies has proposed that a more appropriate name "Systemic Exertion Intolerance Disease" (SEID) which more accurately captures "the essential characteristics of the illness." The first early news reports of Fibromyalgia referred to it as "Yuppie Flu;" and it occurred as large isolated clusters that sprung up simultaneously in USA's western desert, where releases from military ionizing radiation were suspected by some. Chronic Fatigue Syndrome (CFS) is strongly associated with Fibromyalgia with overlapping large check-off lists of 50-60 diagnoses and/or symptoms and overlapping patient support groups. Fibromyalgia has more excessive bilateral joint and muscle involvement providing those patients a much quicker Rheumatology or Physical Medicine diagnosis, despite well-accepted scientific research identifying it as Central Nervous System disorder with endocrine dysfunctions. CFS has more fatigue and almost no joint pain and/or joint swelling; CFS is only diagnosed after rule-out of over 100 other diagnoses, making a diagnosis unaffordable without good health insurance. The Institute of Medicine estimates about 85% of ME/CFS have not been diagnosed. Interestingly, Gulf War Syndrome has all the identical syndrome diagnoses and/or symptoms of Fibromyalgia but the statistics identifying the percentages of patients diagnosed with each syndrome contain variations in the percentages of each population sample with actual diagnoses for each syndrome component. Many Gulf War Syndrome patients were primarily treated by physicians in the military or in Veteran's hospitals, but who did not recognize or diagnose Gulf War Syndrome itself, despite diagnosing and treating individual components of the syndrome.

The mystifying factor that would have to be explained to push the hypothesis of ionizing radiation more towards a causal position requires identification of missing proof that non-deployed Gulf War Syndrome patients were exposed on the US-side of the ocean to unknown Depleted Uranium (DU) or to unknown ionizing radiation from some identifiable source with sufficient evidence. Imagine if an airplane from the Gulf War with uranium dust returned to an air base where the non-deployed were stationed, perhaps to unload the plane, clean the plane, or do mechanical or electrical repairs on it. Imagine that the non-deployed picked up uranium dust on their clothing and hands and perhaps inhaled or ingested some of it. Imagine that they then had a meal with their buddies involving typical body contact and exchanges and that uranium dust became airborne. Depleted uranium is an alpha emitter with a radioactive half-life of 4.5 billion years.

A surge in Midwestern and Great Lakes' fibromyalgia diagnoses appears to begin during and after Chernobyl's atmospheric fallout was above the USA in 1986-1995. There were pre-existing cases.

There were also the most commercial nuclear plants in that region that chronically exposed the public with chronic low-level ionizing radiation, particularly tritium. Several decades ago when public data was compiled with more details, several adverse health effect studies were conducted near numerous commercial nuclear power plants; 25-mile bell-curve findings included increased still born deaths and increased childhood leukemia. These ionizing exposures came from daily allowable low-level releases (24-hour allowable leak rate, at least in Westinghouse reactors). These exposures come from routine low level tritium releases into atmosphere and to water bodies at virtually every reactor site (which often becomes radioactive rain, per Ken Sejkora). As radioactive water, tritium can cross the placenta, posing some risk of birth defects and early pregnancy failures, reported **Annie and Arjun Makhijani, Ph.D**. in ***"Radioactive Rivers and Rain: Routine Releases of Tritiated Water from Nuclear Power Plants,"*** in **Science for Democratic Action, August**

2009. These exposures come from hit-and-miss "unintended releases" declared by the NRC to be low level, with scientifically inaccurate and unacceptable down-play of the potential public health and environmental consequences. This often results in irrational double talk, where reporters quote spokespersons accurately who speak simultaneously in both directions of increased harm and no danger from the same event. See **Philip Hilts, *"Higher Cancer Risk Found in Low-Level Radiation," New York Times*, December 20, 1989**.

This regional background establishes a relatively constant background of chronic low level radiation across a region with concentrated American residents: a field test experiment without the informed consent of those being exposed. We are actually already in a field test that confounds the purity of the baseline physical data to the point where a small significant finding may actually be much larger than recorded or much more widespread than recorded. It's complicated.

3c. The hormesis hypothesis on the NRC docket justifies putting on the docket my counterpart equivalent hypothesis involving similar mitochondrial dysfunction in humans that appear healthy but actually have Systemic Exertion Intolerance Disease (SEID).

If the NRC can justify putting on this docket the hypothesis of hormesis which contains similarly rated weak circumstantial evidence to my SEID hypothesis pertaining to low level ionizing radiation exposure effects as well as similar leaps that haven't been connected to sufficient proven facts and evidence, then the NRC should put my SEID hypothesis on the docket and call for comments. Both are hypotheses and beliefs.

I would have never have considered this SEID hypothesis to be developed sufficiently enough to ask it to be put on the docket for comments to put the feelers out to see what information might emerge, until I realized that the hormesis hypothesis was roughly equivalent in credibility status. If NRC lowers their standards for three people, they should do it for me if I can find 2 other people. I do believe that I can get 2 other people in the USA to agree that this group of medical diagnoses caused by mitochondrial energy production dysfunction and other problems clearly has weak links to evidence that show it might be caused by ionizing radiation, but too much of the information is submerged, hidden, and not readily available. If it gets put on the NRC docket in its weak state, it will be interesting if information emerges that has been hitherto complicated to find or obtain.

Much of the military side of my SEID hypothesis which includes Gulf War Syndrome has been classified after the Gulf War---much of it after the fact that it had previously been in the public domain. It appears that the military didn't want the public to know facts associated with Gulf War Syndrome.

However, I will be upfront regarding my SEID hypothesis. Some of the confounding evidence, beyond ionizing radiation exposure, that create other common plausible hypotheses, for this incapacitating fatigue among patients with healthy appearances, involves viruses, bacteria, Epstein-Barr, Mononucleosis, Babesiosis (a parasite traveling with Lyme Disease), proven contaminated polio vaccines in the 1950s with matching childhood locations and dates, fluoride enzyme dysfunctions involving ion cascades documented by German researchers, heavy metals, other toxins, and pesticides/insecticides.

The hormesis theory likely has a similar litany of confounding evidence. I do not have a lot of respect for bias introduced for the sake of being right, no matter if one is right or wrong. The symptom of this is found in selective data where confounding evidence is ignored or hidden. This symptom destroys rigor of science and renders it untrustworthy until honestly fully admitted.

4. Linear ionizing radiation exposure shows cause with the linear effect of adverse biological impact:

Ionizing radiation has a scientifically-proven cause-and-effect adverse biological impact. These plot on the graph, showing a linear relationship. Linear relationships are indicators of direct cause-and-effect. Ionizing radiation exposure measurements showing linear measurements of adverse biological impact are a strong indicator of a cause-and-effect relationship.

It is a well-known fact among scientists, in general, that significant reliable studies exist that identify initial injuries to humans from the lowest ionizing exposures. It is a well-known fact among scientists, in general, that significant replicated well-designed reliable studies show no safe low-level threshold exists for any exposure of ionizing radiation to humans. It is a well-know fact that replicated studies of these facts have verified linear relationships, which are generally considered one of the best indicators of a causal relationship.

US EPA has a Maximum Contaminant Level Goal for all radionuclides, including tritium, of zero. EPA and all radiation protection regulations followed the **National Academies *BEIR VII Report***'s facts: Every exposure to radiation produces a corresponding cancer risk---low exposures produce low risk, and risk increases with exposure. No threshold exists below which there is zero risk.

Linear cause-and-effect relationships are strong enough evidence to be seriously considered and weighed in legal court cases involving adverse health effects to the public. For example, the huge class action law suit against Monsanto in Anniston, Alabama was won with this type of evidence of harm. The closer the people lived to locations in which the PCBs were directly exposed to the environment, the higher the severity of sickness and deaths as well as the higher percentage of the total population containing harmful PCB levels in their serum. Linear cause-and-effect relationships were established with sufficient individual cases of injuries clinically documented. Almost everyone in the immediate neighborhood was part of the class action due to the presence of elevated PCBs found in blood samples. Monsanto boldly mocked the plaintiffs' attorneys, expecting that they would fold under the financial burden of proving the damage, but Monsanto was exposed as negligent and reckless.

Overwhelming numbers of medical research studies have been conducted showing many factors interfere with the various repair processes in animals and humans. Repair processes is a broad term that includes myriads of specialized functions. These factors are discussed in various medical databases, scientific journals, as well as databases and magazines from Life Extension Foundation, Weston A. Price Foundation, and other nutritionally-focused organizations who are very interested in enhancing the repair processes in humans. Med-Pub and other medical research databases provide summaries of studies. The depth and diversity of medical data known is astonishing.

5. Hormesis theory contains 2 fatal flaws from ignoring well-accepted scientifically proven facts with rigor and independently replicated linear cause-and-effect damage of ionizing radiation as well as low dose ionizing radiation with no threshold below which it is safe:

5a. Fatal Flaw to deny linear cause-and-effect damage of ionizing radiation:

For the hormesis theory to disregard the proven linear cause-and-effect damage of ionizing radiation indicates it contains a major flaw that may not be able to be remedied.

Proponents of the hormesis theory are making opinionated claims based on weak studies that help accumulate interesting data, but even that data must be viewed from the

perspective that it is tainted with sloppy presumptions and selective bias with omissions of possible confounding causes. With such weaknesses in the data, certainly any conclusions arise from assumptions. These introduce unreliability and undependability.

This is not proven science. At best, it is an half-baked hypothesis.

Hormesis requires more study without blatant major assumptions. This bias must be remedied, prior to being presented as an hypothesis. The potential flaws must be admitted to the public.

5b. Fatal flaw of hormesis hypothesis ignores well-accepted scientific and medical proof that any ionizing radiation exposure is unsafe and doesn't explain the countless studies proving harm:

Proven lack of safety for low dose ionizing radiation: Ionizing radiation is not safe below any threshold. It is not safe at low levels. It is not safe at chronic low levels. It is not safe at chronic high levels. It is not safe for a single or a few low level short term exposures, such as an X-ray or a mammogram. It is not safe for a single high level short exposure. It is not safe at any level.

When people built bomb shelters in their backyards in the 1950s, it was widely recognized that there was no safe level of exposure to radiation. People understood in the 1950s that inhaled or breathed radiation was harmful; some communities distributed one heavily-filtered breathing mask to each household along with "How-to-build bomb shelter" pamphlets with recommendations to store food, drinks, blankets, and a first aid kit.

US Environmental Protection Agency (EPA) stated in its ***"Ionizing Radiation Series,"* No. 2, Air and Radiation, 6601J, EPA 402-F-98-010, May 1998**, that any exposure to radiation can be harmful based on scientific evidence.

EPA's *"Radiation: Risks & Realities,"* Air and Radiation, 6602J, EPA 402-K-92-004, Aug 1993, clarified that "There is no level below which we can say an exposure poses no risk…Radiation is a carcinogen. It may also cause other adverse health effects, including genetic defects in the children of exposed parents or mental retardation in the children of mothers exposed during pregnancy."

US Department of Energy (DOE) said that "regulations assume that the effects of all of all radiation exposures are cumulative and should be limited as much as reasonably possible."

US NRC, *"How Does Radiation Affect the Public?"* stated: "The radiation protection community conservatively assumes that any amount of radiation may pose some risk for causing cancer and hereditary effect, and that the risk is higher for higher radiation exposures. A linear no-threshold dose-response relationship is used to describe the relationship between radiation dose and the occurrence of cancer…any increase in dose, no matter how small, results in an incremental increase in risk."

Proven cellular membrane injuries: The smallest, briefest, single-dose of ionizing radiation from an external exposure location causes injury to several cellular components that are important and essential to maintain and sustain the constantly changing health of the entire organism: shape, flexibility, and round biconcavity of the cell membrane; membrane permeability functions and gate-keeping; membrane electro-chemical internal bonding structure inside the cell; and alterations in the serum CBC levels.

In larger longer doses, excessive ionizing inside the living organism creates excessive Reactive Oxygen Species (ROS), or free radicals, which create domino-like chain reactions that oxidize, damage, and destroy cells and tissues in a rapid aging-like process in the contacted tissues. Fatigue is among the first subjective symptoms reported.

US Department of Health and Human Services in ***"Cancer and the Environment: Ionizing radiation"*** stated: "Ionizing radiation is invisible, high-frequency radiation that can

damage the DNA or genes inside the body….Children whose mothers received diagnostic X-rays during pregnancy…were found to have increased risks of childhood leukemia and other types of cancer, which led to the current ban on diagnostic X-rays in pregnant women." Diagnostic X-rays are classified as low level external radiation; this low level radiation causes adverse health impacts, which is the opposite of what hormesis proponents are claiming.

Thyroid damage can occur, which, in turn, impacts the cellular functions of every cell in the entire body. Thyroid cancer medical textbooks identify ionizing radiation exposure from radioactive Iodine as a known cause of thyroid cancer. No other causes for thyroid cancer were identified in the thirty-some thyroid specialty medical textbooks, written by thyroid surgeons, often the chiefs of surgery departments, that I have read. For the last decade, prior to Fukushima, thyroid cancer has been inexplicably near the top of the list which identifies the rising medical epidemics in the USA.

The epidemic of thyroid cancer in the USA has caused suspicion by many medical professionals that this thyroid cancer epidemic might be driven by the increase in CTs, mammograms, and X-rays as well as other ionizing procedures in the last few decades. This has caused physicians to think twice about the necessity of ordering CTs and mammograms, in general.

The legal liability of medical malpractice drives many imaging orders.

CTs usually provide the maximum amount of information in order to be more certain of a diagnosis. Information from mammograms has come under increasing attack as very often unnecessary, specifically due to poor comparable outcome statistics, which become much harder to defend on a scientific basis.

Best case ionizing radiation exposure scenario: In the best case scenario of the least possible ionizing radiation from an external source for a one-time briefest exposure, such as perhaps a single dental x-ray, then, the best repair job for which we can hope, to return to pre-existing wellness, requires that the body has sufficient well-being and full health, in order to repair the damage quickly.

Proven complications in widespread medical repair processes, in general, can occur for any injury: In the presence of sleep disturbances; insufficient nutrition; immune system dysfunction; other environmental toxins; endocrine dysfunction/imbalance; inflammation; chronic disease (including Diabetes, Fibromyalgia, Gulf War Syndrome, AIDs, Muscular Sclerosis, Addison's Disease); or other aging problems; the repair processes, in general, often work slower than normal, perhaps very slowly, and may not be able to repair these injuries before one of these other processes knocks the health down further. It happens all the time.

Repair processes work for the healthy. They do not work well for the chronically ill. A healthy person heals from major surgery and returns to work in 2 weeks. Most take 2 or 3 months to recover. Another takes 6 months to heal from major surgery. Some take a year to recover, because they are already ill or elderly with activated aging processes. The cause in medicine does not have to be identified.

In such a scenario, the already ill person hit with any exposure from an external ionizing source is likely to have significantly decreased quality-of-life from which that person may or may not recover. This can be projected based on the general facts known about medical injury from the least ionizing radiation and based upon general facts known about medical variables that interfere with myriads of repair functions, in general.

We have a society with significant populations diagnosed with chronic illnesses and syndromes, including major CNS (cognitive) and endocrine (hormonal) disorders. Many are taking pharmaceuticals that cause nutrient imbalances and adverse side effects. None of

these people are likely to recover as quickly, or as fully, as an Olympic-class athlete who sufficiently sleeps, exercises, hydrates, and attends to nutritional needs.

5c. No threshold exists below which ionizing radiation is safe.

All ionizing radiation, including extremely low level, shows linear damage.

Initially, ionizing radiation damages the membranes on Red Blood Cells (RBCs) and alters Complete Blood Counts (CBC) levels. Biological damage increases with linear graphing of the duration or intensity of ionizing radiation. Linear graphing indicates strong cause-and-effect where ionizing radiation causes adverse biological effects. Science proving adverse biological effects of ionizing radiation has existed for at least 65 years.

Medical imaging exposures of ionizing radiation involve safety protocols directing professionals to weigh advantages and disadvantages.

Ionizing exposures are not to be made for curiosity, but rather to identify a possible medical issue with more serious threats that occur sooner in time than any potential long-term risk to the patient from the radiation exposure.

The potential benefits of imaging by radioactive exposure should always outweigh the risks in order to meet the professional medical code, "Do No Harm."

US National Academy of Sciences (NAS) 7th Report on the effects of ionizing radiation exposure stated: "There is a linear dose-response relationship between exposure to ionizing radiation and the development of radiation-induced solid cancers in humans. The committee further judges it unlikely that a threshold exists for the induction of cancers."

Herbert L. Abrams, Harvard, **NAS committee member**, concurred, per the ***Stanford Report,* Stanford University, October 25,2005**: "There appears to be no threshold below which exposure can be viewed as harmless."

6. NRC docket gate keeping in question:

6a. Questions:

I question the gate-keeping at the NRC that allowed this opinion with extremely weak data surrounded by assumptions in the absence of scientific rigor to get put on this docket.

What is the training of the gate-keepers?

Why would they put a weakly supported opinion up against proven linear cause-and-effect relationship that ionizing radiation does cause adverse health effects from the lowest level to the highest level?

Why would they waste staff time and resources on this distraction from serious problems needing to be solved?

Who is doing oversight of the gate keeping staff at the NRC?

Do these gate keepers into the docket have sufficient scientific methods and analysis training and understanding?

Why would this type of lack of weighted rationality be placed on the docket, I presume, by trained professionals?

6b. Definition of an hypothesis/part of a theory:

An hypothesis is a tentative explanation that accounts for a set of facts and can be tested further by further investigation. An hypothesis is also something taken to be true for the purpose of argument or investigation; an assumption. An hypothesis is also the antecedent of a conditional statement. These 3 definitions come from the ***American Heritage Dictionary of the English Language, 3rd Edition***.

Asking the NRC to specially recognize this minimally-supported hypothesis is the equivalent of asking the FDA to recognize for approval a new pharmaceutical for the public about which a few are excited because they have big dreams about its success in healing,

but they haven't produced sufficient evidence that it is safe or has efficacy in healing. It would be incompetent for the FDA to approve such a drug. They wouldn't be fulfilling their mission as regulator to protect the public safety.

7. Ionizing rays and particles have different characteristics and must not be inaccurately treated the same.

Food from the Pacific Ocean is probably unsafe due to the Fukushima catastrophe. Aquatic organisms have likely ingested internal emitting particles.

The largest spills of radioactivity into a major ocean in the history of the planet occurred after Fukushima nuclear power plant went out-of-control, due insufficient environmental impact analysis and planning after ignoring the whistleblowers; insufficient backup generation options; dangerous storage locations of spent power fuel rods---all examples of human incompetence. These are not human errors in the presence of active recklessness and neglect of known and previously clearly identified concerns of these specific vulnerabilities. This is criminal conduct by the management and regulators of Fukushima as well as the manufacturer.

Since aquatic species on the bottom of the food chain in the Pacific Ocean absorbed radionuclides from Fukushima's uncontrolled leakage of radioactive water, this raises the concern about the inexplicably missing criteria about internal emitters from the criteria and guidelines used for safety and for planning by the NRC. Where is it, if I am missing it?

It is irrational and unprofessional that ingestion internally and external exposure are being publicly treated inaccurately as if they are the same. This is peculiarly happening unscientifically across much of the nuclear engineering field. In particular, some of the upcoming wave of nuclear engineering students are demonstrating their failure to grasp the rudimentary basics of nuclear science when they aggressively push unprofessional safety claims.

It is unscientific and unprofessional for regulators and professionals to not recognize and articulate similarities and differences between exposures from internal versus external emitters. While more studies need to be done for fine-tuning quantification differences, the scientific facts are already known to distinguish general severity of impacts in general.

For example, it is known external radiation has the form and characteristics of a ray (or wave) in terms of its impact from the outside upon a living organism.

On the other hand, internal radiation has the form and characteristics of a particle that emits a ray (or wave) from inside the living organism and constantly continues to emit.

Particles and rays have different physical characteristics and different impacts. They require full acknowledgement and examination from both biological and physics viewpoints.

8. The difference between ingested ionizing radiation (particles) and ionizing rays requires more safety studies.

The differences between radioactive rays (as external exposure) and particles (as internal exposure) require more in-depth study and focused analysis in terms of extent, severity, impact, and other characteristics from different types of radionuclides. The difference in impact from external ray and from ingested particle emitting a constant ray must be explored and studied.

The failure to incorporate these particle-ray, or external-internal emitter, distinctions into all plans has been a major historical oversight that requires immediate remedy. The data compiled and subsequent safety advice provided to the workers and to the public must include food and water contamination as well as breathing protection during unanticipated disasters and leakages in the USA, but this did not happen when the jet stream carried

damaging radionuclides over the USA and fell into surface drinking water and onto agricultural fields, pastures, forests, and other lands.

Why? How did the major difference between the effects of a ray vs a particle get missed by NRC for all these years? How did the major difference between the effects of external exposure vs. internal exposure get missed by NRC for all these years? Why didn't the NRC notify the public about steps to take to avoid or decrease ionizing exposure?

8a. Basic studies needed to identify when specific injuries occur:

Internalization: Ionizing radioactive particles can be ingested. Studies need to determine if ionizing particles can be absorbed through the skin or the eyes or by breathing.

Type and Ionizing reach: The difference in distance reaches of different radionuclides requires quantification for the reach of alpha, beta, and gamma particles for every radionuclide in the inventory of a specific nuclear reactor. Perhaps research conducted for container storage can become the foundation for a database of living cell ionization.

Cell exposure: After ionizing particles enter the body, they are ionizing constantly and reaching at least extremely close adjacent and nearby cells, according to known facts about their nature. I strongly suspect that cell exposures and damage vary depending on the distance, intensity, radionuclide, and depending upon the presence of alpha, beta, or gamma waves (rays). These characteristics require detailed study and quantification in terms of cell exposure, other observations, and impacts, particularly to define the precise timing involved with for all known or possible injuries after exposure.

Disintegration of body structures: Previously unknown but remarkable disintegration of body structures and death occurred to at least one aquatic species, following the contamination of the Pacific Ocean with radionuclide particles from Fukushima. This was completely unexpected. Some suspect that ionizing radiation bombarded and weakened the electric bonds that held bonding molecules together, resulting in this disintegration and death of a life form; confounding hypotheses exist regarding viruses, bacteria, fungi, and toxins and perhaps other possibilities.

Aquatic, airborne, and land-and-terrain life forms: The NRC should ask today's equivalent of the NAS to compile, translate, and analyze studies and to report back at what levels of ionizing radiation as well as accumulated internal particles, over time periods, might disintegrate body structures of living organisms among aquatic, airborne, and land-and-terrain life-forms. At what levels do various effects begin?

I suspect ionization caused the disintegration due to its ability to break and destroy electro-chemical bonds that otherwise would hold molecules tightly together. I am unaware of how the other suspects might break these bonds or exert this magnitude of an electrical impact. I am also unaware of any previous precedents of bonding destruction involving the other suspects. In my opinion, the new factor without precedent was excessive contamination of the Pacific Ocean with ionizing particles that speculatively could cause this type of disintegration. I remain uninformed of any funded studies to try to isolate the causal agent.

Adverse health effects, other impacts: Such constant ionizing of cells requires detailed study to quantify the differences in timing, severity, and extent of impacts between exposures of ingested internal ionizing emitters and external ionizing radiation with the subsequent timing differences of each type of adverse health effect.

The accumulated results from rigorous safety studies pertaining to ingested internal ionizing radiation are extremely important for application to safety guidelines.

8b. Request for NRC to order studies pertaining to all human health effects of ionizing radiation (internal and external emitters) and ask NAS to review existing worldwide studies:

Several outstanding nuclear scientists evaluating the ongoing catastrophe at Fukushima have identified that the entire subject of internal ingestion of ionizing particles are completely missing from the NRC rules and regulations and requirements. This is unacceptable. NRC must place remedy as a top priority.

Dr. Timothy Mousseau, University of South Carolina, and **Dr. Anders Pape Moller, Universite Paris-Sud, Orsay France** did a **Meta-Analysis in 2012** of natural radiation variations across the planet, covering low-dose exposures with 375 data points in 42 papers where changes were reported. The changes were never beneficial. Major problems were found. The impacts were never positive in 375 cases. Zero was the quantification of beneficial radiation found in the organism studies involving many species. This data must be applied to safety guidelines.

I ask the NRC to ask world-wide nuclear regulatory agencies to send them all studies that they might have pertaining to the differences between external and internal (ingested) ionizing radiation, between ionizing rays (waves) and particles. I ask the NRC to particularly be sure to ask Canada, France, Sweden, Great Britain, Germany, Japan, China, and Australia, and other nations conducting scientific research. I ask that the NRC have these studies translated into English and compile them to provide them to all interested parties.

We need an independent review, such as the former NAS, to conduct this work and then to analysis and review it in order to identify unreliable and missing information from what information is known in order to recommend public safety guidelines.

Since worker and public safety should be the highest priority, it is unacceptable to have on-going safety risk exposures that remain unstudied and/or missing from rules, regulations, and guidelines and/or insufficiently considered in Environmental Impact Statement requirements, Environmental Analyses, and other attempts to quantify and guide safety requirements.

Meanwhile, I look forward to the NRC ordering studies pertaining to the human health effects of ionizing radiation, particularly of adverse effects. We already know that injury occurs. I ask the NRC to order a world-class review that translates all studies involving radioactivity, particularly ingested radiation, in terms of adverse human health effects.

Why did the NRC recently stop human health effects' studies after initiating them?

I request the NRC to make a special call for comments from the academics in both the physics and biologic fields about the differences between radioactive rays and particles as well as differences in impact based upon their location externally or internally in terms of living organisms. Gathering comments regarding the nature and behavior of this subject should include the elicitation of suggestions of areas to study with the major reasons such study should be conducted. Gathering such comments pertaining to the big scientific hole of comparing and contrasting radioactive rays and particles as well as external or internal locations has immediate practical and useful applications for guidelines.

This type of scientific advancement for actual missing data and missing studies about known distinctions in physical reality should have a much higher priority than making this current special docket call for comments about an admitted theoretical idea—hormesis. The missing internal emitter data should have been given a much higher ranking on the docket priority list, but it wasn't. Hormesis has the status of a hypothesis, which in my opinion, does not hold sufficient priority to justify this current special docket call for comments on hormesis.

8c. Missing human health information pertaining to ingestion means the safety plans and evacuation plans now have known flaws to the extent that these physical facts were omitted from consideration; and this requires remedy as soon as possible:

The missing information needs to be appropriately addressed in safety plans and evacuation plans pertaining to the release or leakage of ionizing radiation and particles into the environment. We need to quantify this information and identify its impacts because these processes are already occurring in ongoing man-made pathways that the regulators failed to appropriately anticipate in the past.

The very fact that this information is missing renders existing safety plans and existing evacuation plans out-of-date. We now must professionally acknowledge that this information is missing, rendering existing plans flawed.

We now must acknowledge that this is another reason, besides the failure to solve the waste problem, to not go forward with any new commercial nuclear reactors or other technologies that potentially may interfere with the survival of the human race.

8d. Before the hormesis hypothesis can be assigned any status of credibility, based on its claims of healthful repair processes in living organisms, its advocates must present rigorous, reliable and independently replicable proof of the mechanisms by which it produces this hormesis healing effect, but this has not been done:

I suspect that hormesis was hypothesized in the absence of full understanding of the medical research into animal and human repair processes.

Where are the studies proving safety of ingested internal ionizing radiation or of external ionizing radiation? Proof is not anecdotal observation. Proof is not observations of a well-populated rodent community that looks healthy and appears normal living in a low level ionizing exposure in Chernobyl's Exclusion Zone, particularly when the generational assumption cannot be substantiated. Proof is not isolated epidemiological findings. Proof is not a biased study which fails to reconcile its contradiction to mainstream established science facts that have been treated as laws of science for decades.

I do not belief that any proof exists to support hormesis. The supporting documentation is superficial, raising more questions than it answers. The supporting documentation does not reconcile itself with established known and scientifically proven harm from the same effects that the hormesis hypothesis claims heals. The rational credibility for hormesis is lacking from the big picture.

Where are the studies showing the replicable mechanisms of how ionizing radiation heals people? Someone with this information could become a billionaire almost overnight if ionizing radiation could be used to start to heal the physical body. They wouldn't bring it to NRC for affirmation, but rather it would have been quickly patented for FDA pharmacological treatment.

Nothing about this entire call for comments on this docket seems rational. Let me explain this better.

I've described the well-known scientifically and medically accepted general mechanisms, in my comments here, that identify the harm of ionizing radiation to human cellular membranes. I've described the general scientific consensus that those injuries interfere with efficacy in maintaining well-being and full health, until an assortment of varied repair processes are sufficiently activated. I've described general medical research where varied repair mechanisms are fairly well-known, but their activation is not always completely understood. There is general medical research consensus that slowness or delays in activation of repair processes as well as failures exist with often unfortunate ramifications.

Controversy exists pertaining to methods of repair activation in which the medical researchers break into different camps.

I've described the ideal conditions in which repair processes generally work quickly: those of ideal health, ideal sleep, ideal nutrition, ideal hydration, and ideal exercise in the absence of toxins and other problems.

It is common knowledge among educated people that scientific proof has existed for 70 years after World War II pertaining to any low dose exposure to external ionizing radioactivity as predictably causing specific medical harm to the membranes of the Red Blood Cells (RBCs). The injury involves shape distortion, permeability alterations, lack of flexibility in veins and veinules, alterations in electro-chemical docking of substances/nutrients on receptors on both sides of the membrane, and other altered membrane characteristics. This is the first level of damage, and usually shows some alteration in serum CBC level measurements. The second level of damage shows further damage further into the cell's liquid cytoplasm which includes the mitochondrial energy furnaces with their constant requirement for fuel supply. The worst level of damage involves the entire cell, including the nuclear DNA in the center where the worst genetic mutations occur. This proven general sequence of ionizing events causing damage in biological cells is well-accepted throughout the scientific community as well as the medical community.

I am aware that some people want to deny anything negative or anything unhealthy or anything unpleasant because they use only positive thinking so that the placebo effect will give them a boost. While this may have the desired placebo effect in significant cases, New Age magical thinking also contains tragic flaws.

I continue to have difficulty understanding the rationality behind placing hormesis on the docket. It appears to distract NRC staff time and resources away from much more important matters that need to be addressed, problems that are being referred to as an unsolved crisis of great importance---specifically, the great need to develop the safest designs and safest technologies for on-site storage containers as soon as possible as well as to include impacts of internal emitters into all rules, regulations, and guidelines. The injuries to fetuses, infants, children, women with pregnancy potential, and sperm must be included in all safety rules, regulations and guidelines.

9. The hormesis hypothesis should absolutely not be granted any affirmative status until private insurance companies are willing to fully insure the possibility of any catastrophic financial loss or deaths that might occur from building upon such a weak premise of safety:

Private insurance companies would not refuse to insure nuclear plants, if they were safe and if their ionizing radiation could not create catastrophic financial loss. The taxpayers will pay the costs of all risk-taking with ionizing radiation because the liability has been unfairly externalized away from the corporate profiteers through the **Price Anderson Act** insurance and huge government subsidies. It is unacceptable that private commercial nuclear plants and other nuclear enterprises are subsidized. All nuclear reactors are inherently unsafe. Too many human errors, to be polite, occur. If no externalization of costs of doing business occurred in the commercial nuclear reactor industry, then the marketplace would have already driven them out. As long as the insurance companies refuse to insure the nuclear industry, I am sure that they have sufficient evidence that it is too risky. The most reliable information about safety risks is found in the behavior of the insurance industry. When the insurance industry rejects coverage for catastrophic "accidents," the hidden risk behind private promotions with hidden personal agendas is exposed in the most dependable, reliable, and trustworthy way.

10. Survivability of the human gene pool depends upon enacting the Precautionary Principle in terms of damage from any ionizing radiation:

Will the human gene pool survive? Will the wildlife gene pool survive?

The future existence and sustainability of the human race and wildlife depends upon the precautionary principle. We must not take risks based on leaps. We must not take risks based on conclusions arrived at by failing to analyze solid conflicting scientific evidence. We must not take risks created by seemingly independent think tanks that are paying academics to create safety studies that look scientific and independent but are actually being produced to mislead and lie to regulators, such as has been recently exposed in the film, ***"Merchants of Doubt."*** When we have confusion deliberately generated to muck up the science from the misrepresentations, it is time to fully adopt the **Precautionary Principle** to get past this type of deception and fraud.

11. Next: Please ask for citations or references, if you need any clarification:

The information in this submission to the docket tends to come from historically known scientific facts that are well-accepted among the scientific and/or medical communities. As an unpaid volunteer citizen interested in the best outcome for our entire society, I had limited time to construct these comments. **If you have any questions or need any references to support anything that I've reported, please do not hesitate to ask me**.