"Japan Nuclear Fears – Real and Perceived Dangers"

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Ray Johnson, MS, SE, PE, FHPS, CHP
VP Training Programs, Dade Moeller and Associates
Director, Radiation Safety Counseling Institute

The earthquake and tsunami in Japan, with subsequent damage to several nuclear plants, have given the media a new source of alarming news about perceived dangers of radiation. The media and antinuclear advocates now have a great opportunity to speculate about deadly radiation not only in Japan but wherever nuclear plants are located. The evolving drama of the nuclear plants lends itself to daily news events while the earthquake and tsunami become old news. The question is, however, how much of the response by authorities and the public is based on real versus perceived dangers? Based on what we know of radiation effects, it is likely that either none or very few deaths will be traced directly to the Japan nuclear incidents. And yet, fears of radiation are rampant, not only in Japan, but in other countries including the U.S.

On the other hand, psychologists know that fear is a good thing as a natural response of our brains for our protection. We have survived as a species by knowing when to be afraid and when to react for safety. Psychologists define fear as an emotional response to a specific stimulus, such as pain or immediate threat of real danger. Since radiation does not produce any sensation in our bodies, then our fears of radiation have to be based on imagination. Thus, fear of radiation is not a true fear based on something happening right now (real danger), but a manufactured fear based on images of terrible consequences (perceived danger).

Regulators in Japan and the U.S. may be driven by many fears (what if they are not seen as responsive to scared constituents, what if they do not provide for adequate safety measures, what if people are harmed from their negligence, etc.?). Radiation safety professionals may also be driven by fears as well, such as fear of criticism for not doing their jobs well, irresponsibility, carelessness, or neglect.

Raymond H. Johnson, MS, SE, PE, FHPS, CHP

VP Training Programs, Dade Moeller & Associates 301-990-6006
Director, Radiation Safety Counseling Institute 301-370-8573

- BS Civil Engineering (1961) University of Vermont
- MS Sanitary Engineering (1963) Massachusetts Institute of Technology (MIT)
- Prof. Sanitary Engineer Degree (1963) MIT and Harvard University
- PhD Studies, Radio and Nuclear Chemistry (1966–1972), Rensselaer Polytechnic Inst.
- Greater Washington Institute for Transactional Analysis - Counseling (1977–1980)
- American Board of Health Physics Certification (1983–present)
- Johns Hopkins Fellow, Organizational Systems (1984–1985)
- Past President and Fellow of the Health Physics Society (2000)
- President-elect Designate, American Academy of Health Physics (2011)
- Commissioned Stephen Minister – Counselor, United Methodist Church (2003–pres)

Experience

2010 – pres.	Director , Radiation Safety Counseling Institute. Workshops, training, and counseling for individuals, companies, universities, or government agencies with concerns or questions about radiation safety. Specialist in helping people understand radiation, risk communication, worker counseling, psychology of radiation safety, and dealing with fears of radiation and nuclear terrorism for homeland security.
2007 – pres.	VP, Training Programs, Dade Moeller & Associates, training and consulting in radiation safety.
1984 - 2007	Director, Radiation Safety Academy. Providing x-ray and radiation safety training, audits, and consulting to industry (nuclear gauges and x-ray), universities, research facilities, and professional organizations
1988 - 2006	Manager and Contractor to National Institutes of Health (NIH) for radiation safety audits of 3,500 research laboratories and 2,500 instrument calibrations a year, along with environmental monitoring, hot lab and analytic lab operations, and accelerators and x-ray inspections.
1990 - 2005	President of Key Technology, Inc. a manufacturer and primary laboratory for radon analysis with over 1,500,000 measurements since 1985. Primary instructor at Rutgers University 1990-1998 for radon, radon measurements, radiation risks, radiation instruments, and radon risk communication courses.
1986 - 1988	Laboratory Director, RSO, Inc. Directed analytical programs and Quality Assurance for samples from NIH, Aberdeen Proving Ground, radiopharmaceutical companies, and the nuclear industry.
1970 - 1985	Chief, Radiation Surveillance Branch, EPA, Office of Radiation Programs. Directed studies of radiological quality of US, coordinated 7 Federal agencies for nuclear fallout events, QA officer 8 years. Head of US delegations to I.A.E.A and N.E.A. on radioactive waste disposal. ANSI N-13, (1975-1985). Retired PHS Commissioned Officer (0-6) in 1985 with 29 years of service.
1963 - 1970	U.S.P.H.S. Directed development of radiation monitoring techniques at DOE National Labs, nuclear plants, and shipyards in the US and Chalk River Nuclear Laboratory in Canada.

Health Physics and Professional Activities

Health Physics Society (HPS) plenary member 1966; President-elect, President, Past President (1998-2001), Fellow (2000), Treasurer (1995-1998); Secretary (1992-1995); Executive Cmte. (1992-2001), Chair, Finance Cmte. (1996-1998); Head of U.S. delegation to IRPA X (2000). RSO Section Founder and Secretary/Treasurer (1997-2000); Co-founder and President, Radon Section (1995-1996). Co-Chair Local Arrangements Cmte. Annual Meeting in DC (1991); Public Info. Cmte. (1985-1988); Summer School Co-Chair (2004); Chair, President's Emeritus, Cmte (2006); Chair, Awards Cmte. (2002); Chair, History Cmte. (2005-Pres.); Continuing Education Cmte. (2005-Pres,). Academic Dean for HPS Professional Development School on Radiation Risk Communication (2010). PEP, CEL and AAHP Instructor; Journal Reviewer; Treasurer, AAHP (2008 – Pres.). AAHP President-Elect Designate (2011). Baltimore-Washington Chapter: President (1990-1991) and Honorary Life Member; Newsletter Editor (1983-2005); Public Info. Chair (1983-1991), Science Teacher Workshop Leader (1995 – Pres.). New England Chapter: Newsletter Editor, Board of Directors, Education Chair (1968-1972). President, American Association of Radon Scientists and Technologists (1995-1998) and Honorary Life Member, Charter Member; Board of Directors; Newsletter Editor (1990-1993). Founder and first President, National Radon Safety Board (NRSB) (1997-1999). Member of Sigma Xi (1966-Pres.); ANS (1983-Pres.), Society for Risk Analysis (1984-Pres.); AIHA, CRPA, CRCPD (1997-Pres.), Studied H.P. communication styles and presented Myers-Briggs seminars to over 3500 H.P.s since 1984. Over 30 professional society awards. Registered Professional Engineer since 1965. Certified Health Physicist since 1983.

Publications

Authored over 500 book chapters, articles, professional papers, training manuals, technical reports, and presentations on radiation safety. Author of monthly column, "Insights in Communication" HPS Newsletter 1984 - 1989 and 1994 -2001.

Contact at: 301-990-6006, ray.johnson@moellerinc.com; or 301-370-8573, ray@.radiationcounseling.org

Japan Nuclear Fears: Real and Perceived Dangers

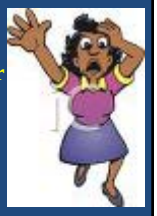
Ray Johnson, MS, SE, PE, FHPS, CHP
VP Training Programs,
Dade Moeller Radiation Safety Academy
Director, Radiation Safety Counseling Institute
301-990-6006

Japan Nuclear Incident

- March 11, 2011
- Earthquake
- Tsunami
- Nuclear plants
- Loss of coolant
- Exposed fuel rods
- Hydrogen explosion
- Efforts to control events
- Release of radioactive materials
- Evacuation
- Media reports and public fears

What the World Heard

- Nuclear plants out of control, explosions
- Meltdown, high levels of radiation found
- Another Chernobyl, IAEA Level 7
- Radiation spewing forth, millisieverts
- Radiation found in air, ground, seawater
- Tainted water, vegetables, milk, fish
- Radiation levels above legal limits
- TEPCO is withholding information
- Evacuation due to unsafe conditions
- Workers injured
- Everyone could be a victim of radiation



What They Saw

What They Saw

Damaged Reactor Buildings

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Fires

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What They Saw

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Evacuees Follow the News

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Evacuees

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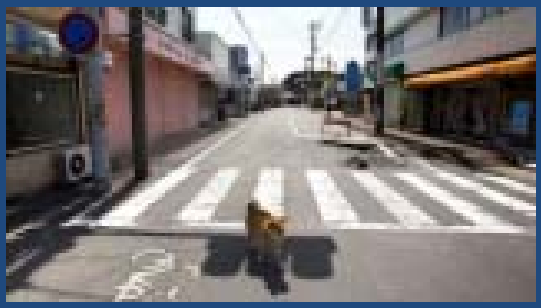
Nuclear Ghost Towns



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Rescue and Recovery

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Restoring Power to the Reactors

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Restoring Power

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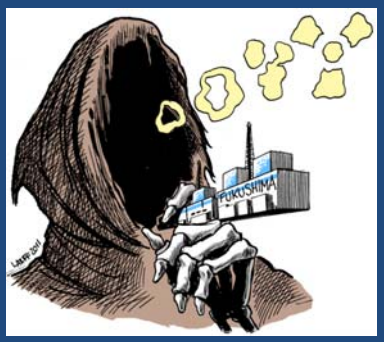
What They Thought About



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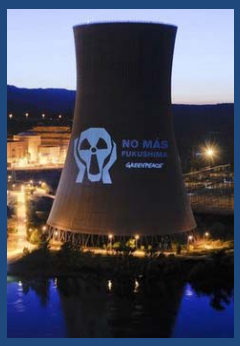
What They Thought About



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Protestors

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Even the US is at Risk

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Real vs Perceived Dangers

- Maximum reported doses to workers
  - 250 mSv = 25 rem = 25,000 mrem
  - No observable physical effects
- BEIR VII risk - 1 death for 10 rem to 100 people
  - 1 death per 1,000 person – rem
  - 3 workers at 25 rem = 75 person - rem
  - 28 workers at 10 rem = 280 person - rem
- Some increased risk, but not likely enough to ever determine radiation effects
- Unlikely that radiation effects will ever be seen in members of the public

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Results of Japan Nuclear Fears

- People from Fukushima - discrimination
  - Need certificates to show no contamination
  - Children turned away from schools
  - Produce thrown out
  - Trucks with Fukushima licenses – denied gas
  - Sale of fish, milk, and vegetables denied
  - Hotels refuse them as guests
- Travel banned
- People leaving Japan – tourism down
- Fear of all products from Japan
  - Stigma on Japan brands
  - Import restrictions

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Workers Prepared to Die

- The So-called Fukushima 50, the group of around 300 technicians, soldiers and firemen who work in shifts of 50, have been exposed repeatedly to dangerously high radioactive levels as they attempt to avert a nuclear disaster.
- The mother of one of the men has admitted that the group have discussed their situation and have accepted that death is a possibility.

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How Safe is Safe ?

- The International Atomic Energy Agency said radioactivity safety limits had been exceeded as far as 25 miles away and urged the government to re-examine its exclusion zone in which residents are banned.
- Spot tests 25 miles northwest of Fukushima, showed readings twice as high as levels at which the agency recommends evacuation

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Shockwave of Fears

- Japan asked trading partners at the World Trade Organization not to "overact" by unnecessarily restricting the import of food produce.
- However, a growing number of international food companies are shunning Japanese products amid fears of contamination, despite government assurances of safety.
- In physical terms, the shockwave of Fukushima may have only reached a few kilometers. But in psychological terms, it has traversed the entire world.

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Sources of Radiation Fears

- Perceptions of radiation risks
  - Related to images of unacceptable consequences
- Lack of information
  - Forces people to rely on
    - What they already know or believe about radiation
    - Use of imagination
    - Worst case images of disaster

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Fear of Radiation

- Psychological effects may be equally, if not more, damaging than physical health effects
- Fear is created by the unconscious mind as a protective mechanism
- Result of linking radiation with emotional trauma
  - Real life injuries – not likely
- Powerful negative association, unconscious mind says this is very dangerous and to avoid radiation, I will attach terrible feelings to radiation, to assure that I will be safe
- A radiophobia is born

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Source of Fear ?

- Psychologists define fear as a response to a specific stimulus
  - Such as pain or imminent danger
- Since radiation produces no sensation
  - Radiation fears are based on imagination
  - Not a true fear based on imminent danger
- Many radiation fears are based on mythology
  - Something believed which is not technically true
  - Based on false premises and misunderstanding

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Fears and Imagination

- All fears are based on imagination
- Fears summon powerful predictive forces
- Fear is about what might happen next
  - Not what is happening now
- Example – fear of heights
- If we tell that person, "You do not need to be afraid," will that help them?
- Radiation fears are based on imagination of unacceptable consequences
  - Cancer and death

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Radiation and Cancer

- Reports on radiation raise fears, public concern rises, and reporters respond with more fear stories, and the loop expands.
- Everyone knows radiation causes cancer
- Cancer is a word which is black and frightening, it stirs bleak feelings, reporters experience those feeling sand their perceptions are shaped by them.

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We Want to Avoid Cancer

- It's easy to conclude – Precautionary Principle "better to be safe than sorry."
- Cancer is a crab-like scavenger reaching its tentacles into the life of the soul as well as the body. It destroys the will as it gnaws away at the flesh.
- We worry about cancer when more than half of all cancers might be prevented by lifestyle changes, such as exercise, weight control, and not smoking.

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Nuclear Fear Motivates Regulators

- Few will blame a regulator for saying a risk is high when it does not come to pass, but if they downplay a risk that later hits the news, they can expect a trial by inquisition.
- Therefore, Japan regulators called for evacuation out to 12 miles
- US regulators said to evacuate to 50 miles

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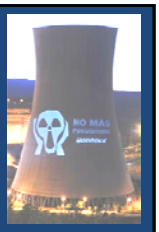
Future of Nuclear Energy – Public Sentiments



- Cannot rely on nuclear power
- Cannot guarantee safety
- Need to revise plans for more nuclear
- Worried about children and grandchildren
- Nuclear accidents could take great toll of lives
- Other energy sources are safer - wind, solar

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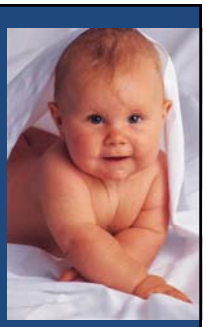
Conclusions



- Hopefully this review of nuclear fears has provided a useful perspective.
- Most likely nuclear fears will be active long after the technical issues are resolved.
- Dealing with nuclear fears will be a long and difficult process

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