

# **How to Deal with Worker Concerns for NORM**

**Health Physics Society  
Annual Meeting**

**Indianapolis, IN**

**An Invited Presentation for a  
Special Session  
on NORM**

**TPM-B.5 Tuesday, July 14, 2015**

**by**

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# **How to Deal with Worker Concerns for NORM**

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**Invited Paper for a Special Session on NORM**

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NORM may be encountered in workplaces where it is unexpected and become a great concern to workers not trained for radiation safety. Without such training most of what workers may believe about radiation is mythology (not technically true). Case studies show that the sound of a clicking Geiger counter in response to a NORM signal can set workers into a panic. The unexpected presence of radiation brings up images of Hiroshima (or Fukushima) and anticipated terrible consequences from radiation exposure. Helpful responses for concerned workers begin with letting them know that it is OK to feel afraid. This can best be done with the communication tool called “active listening” to hear their feelings. The key question to consider with workers is, “How afraid is appropriate for the circumstances?” After establishing rapport by active listening, workers may then be open to hear what is known technically about NORM to help with their questions on radiation safety. Measurements of radiation with a Geiger counter or other radiation instrument have no meaning until evaluated for worker exposures. Unfortunately there are over 20 factors that could cause a NORM measurement to be misleading and result in erroneous decisions for safety. Radiation safety decisions should account for source characteristics, exposure rates, the proximity of workers, and the duration of exposures. Often NORM measurements are made in the wrong place (for example, in contact with a pipe) and do not take into account occupancy factors. The best way to help with worker concerns is to have them do the measurements (with appropriate instructions). With data from actual measurements, workers can then go through the eight steps from cause to effect to answer the question, “Is it safe?” The most common error of workers is to assume that a NORM measurement automatically equates to unacceptable risks from lack of knowledge about radiation. A short class on NORM Safety Awareness could help alleviate much of worker concerns. This paper will review several case studies dealing with worker concerns for NORM.



## **Raymond H. Johnson, MS, PSE, PE, FHPS, CHP**

Director, Radiation Safety Counseling Institute 301-370-8573

- BS - Civil Engineering, University of Vermont (1961)
- MS - Sanitary Engineering, Massachusetts Institute of Technology (MIT) (1963)
- PSE - Professional Sanitary Engineer Degree, MIT and Harvard University (1963)
- PE - Licensed Professional Engineer, Vermont (1965 - present)
- PhD Studies, Radio and Nuclear Chemistry, Rensselaer Polytechnic Institute (1966-1972)
- Greater Washington Institute for Transactional Analysis - Counseling (1977-1980)
- CHP - Certified Health Physicist, American Board of Health Physics (1983-present)
- Johns Hopkins Fellow, Organizational Systems and Communications (1984-1985)
- FHPS - Fellow of the Health Physics Society and Past President (2000)
- Past President, American Academy of Health Physics (2015)
- Commissioned Stephen Minister - Counselor, United Methodist Church (2003-present)

### **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 and x-ray safety. Specialist in helping people understand radiation, what is safe, 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 and consultant to Dade Moeller Radiation Safety Academy, training and consulting in x-ray and radiation safety, safety program audits, radiation instruments, and regulatory requirements.
- 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 inspections of three accelerators and over 100 x-ray machines.
- 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 for radon, radon measurements, radiation risks, radiation instruments, and radon risk communication courses (1990-1998).
- 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 radiation exposures from all sources of radiation in the 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 delegate (1975-1985). Retired as PHS Commissioned Officer (O-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. (2005-2012); Historian (2012-Pres.) Continuing Education Cmte. (2005-2012). Academic Dean for HPS Professional Development School on Radiation Risk Communication (2010) and Radiation Instruments School (2014). PEP, CEL and Journal Reviewer. AAHP Instructor; Treasurer, AAHP (2008 - 2011). AAHP President-elect, President, Past President (2012-2015). 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 HPS, 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 American Industrial Hygiene Association (1997-Pres.) (Secretary, Vice Chair, Chair, Ionizing Radiation Committee, 2009-2012), Conference of Radiation Control Program Directors (1997-Pres.), Studied H.P. communication styles and presented Myers-Briggs seminars to over 3500 H.P.s since 1984. Over 35 professional society awards. Licensed 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, 1994 -2001, and 2012- 2013. Contact at: 301-990-6006, [ray@radiationcounseling.org](mailto:ray@radiationcounseling.org), 301-370-8573, [www.radiationcounseling.org](http://www.radiationcounseling.org)

## How to Deal with Worker Concerns for NORM

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### Introduction

- What happens when you first discover NORM
- What do you tell workers ?
- How will they react ?
- What will go on in their minds about radiation ?
- How do you respond to worker fears ?
- What NOT to do
- Most helpful response – Active Listening
- NORM safety awareness training
- Show steps, cause to effect - Answer questions

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### Main Issues for NORM

- What is the actual hazard of NORM ?
- What do workers believe is the hazard?
- How will management react ?
- How will the worker's Union react ?
- How will worker's families react ?

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### Is it OK to be Afraid ?

- What will workers think when they hear a clicking Geiger counter?



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### Concerns for Radiation

- Fear
  - Common denominator for all radiation issues
- Often enhanced by discovering unanticipated NORM exposures, i. e.
  - NORM in the workplace
  - NORM contaminated materials
  - Radium scale in pipes
- Without special training, people resort to what they have always heard about radiation
  - Namely - "Bad News"

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### Radiation – Bad News

- Can you remember ever hearing anything good about radiation?
  - Occasionally someone will think of cancer treatment
- After studying radiation fears for many years
  - I conclude that most radiation fears are based on myths about radiation that have come to be accepted as facts.
- Helpful communication on NORM issues
  - Will require dispelling many radiation myths


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# How to Deal with Worker Concerns for NORM

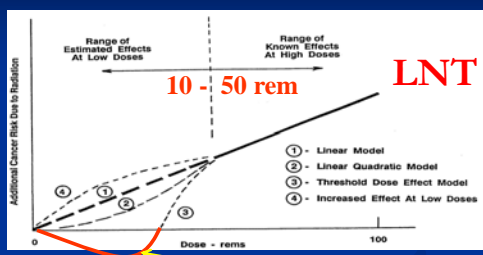
## Myth of “Deadly Radiation”

- Media has used these words for over 60 years
- Now accepted as basis for understanding radiation
- Assumes cause and effect automatically
  - Analogy with “Deadly Aspirin”
- Results
  - Fears of radiation seem out of proportion to risks as we would technically understand them



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## Myth of Models for Estimating Risk



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## “No Safe Level of Radiation” - Myth

- The only safe level is zero radiation
- Predicted by LNT
- Every radioactive atom is harmful
- Every atom must be removed
- Basis of antinuclear sentiments and opposition to nuclear technology
- Ignores radiation all around us

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## Myth of LNT

- Leads to views - “No Safe Level of Radiation”
  - No level without risk
  - The only safe level is zero
- However,
  - There is no zero
    - We are all exposed to radiation all the time
  - The debate on low dose effects will go on
    - because of lack of data
  - Propose a new message:
    - “It is actually very difficult to harm someone with radiation!”



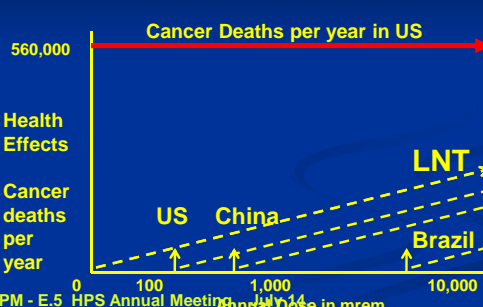
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## What Does Zero Mean ?

- Zero health effects start at 560,000 cancer deaths a year in US
- Zero radiation starts at background
  - 310 mrem / year average across US
  - 600 – 800 mrem / yr in Yangjiang, China
  - 1,500 – 2,500 mrem / yr in Kerala, India
  - 6,000 - 8,000 mrem / yr in Guarapari, Brazil
  - 10,000 – 26,000 mrem / yr in Ramsar, Iran

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## True Model for Estimating Cancer Risk



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## How to Deal with Worker Concerns for NORM

### “Is it Safe?”

- Primary question for workers
  - When beginning to deal with radiation
- This question is what staff want answered
  - Basis for radiation safety awareness class
- Response to concerns hampered by LNT – risks down to zero dose
  - Difficult to conclude any level is inherently safe, without risk

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### Dealing with NORM Issues, What Will be the Greatest Challenge ?

- Technical Issues ?
  - Inadequate instruments or understanding how to interpret the readings
  - Inadequate knowledge or skills
- People Issues ?
  - Dealing with fears of radiation
  - Radiation phobia
  - Dealing with feelings

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### Are You Prepared to Deal with Feelings ?

- Such as :
  - An upset person ?
  - An overly alarmed person ?
  - An overly complacent person ?
  - A person who tells you how you should be responding to radiation ?
  - A person you say he does not believe anything you are saying ?

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### Why Will People Issues Be So Difficult ?

- Fear of radiation is common factor
- Fear is an emotional feeling
- How many of us have had training in dealing with feelings?
- How well do we understand feelings?
- How much of our lives are affected by feelings that we do not understand?

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### There Would Be Less Fear of Radiation, if only ..... !

- *If only* - people understood radiation, the way we do !
  - Is the answer better education of the public?
- *If only* - people were more rational and logical.
  - Do irrational emotions lead to extreme reactions?
- *If only* - people did not have such strange perceptions of radiation risks ?
  - People need to deal with “What is” vs “What if”

### What is true on this slide ?

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### Results of Worry

- I've experienced a great many terrible things in my life, a few of which have actually happened.



Will Rogers

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## How to Deal with Worker Concerns for NORM

### How to Help Workers

- How to answer, “Is it safe ?”
- It’s OK to be afraid
- Active listening
  - Hear and reflect content and feelings
- NORM Safety Awareness Training
  - What is NORM, risks, ALARA
- Answer questions
- Provide steps from cause to effect

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### Active Listening

- Hearing the message and the feelings
- Why bother?
  - To establish rapport as basis for presenting your risk message
  - To get down to the real issue of concerns for radiation risks
- Active listening is not easy for technical experts and managers

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### Natural to Give Answers

- Not a matter of right or wrong responses
- Two precautions when giving answers:
  - Are you answering the right question ?
  - Who owns the problem ?
- The giver of answers assumes the responsibility
- Giving answers sets up opportunities for adversity

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### Why Not Troubleshoot Right Away?

- By giving answers first
  - You miss opportunity to connect with feelings and real reasons for concern
- Hearing feelings establishes basis for rapport and credibility
  - They may then “hear” your answers
- When you go directly to answers you may discover you are answering the wrong question
- Fearful people may not want specific answers, but rather to know that someone hears their feelings

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### Active Listening Approach

- Respond to your perception of speaker’s message and feelings
- There are four feelings:
  - Mad, Sad, Glad, Afraid
- Opens doors to “real issues”
- Does not take away from:
  - Other person’s right, responsibility, and capacity to solve their own problems

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### Hearing and Reflecting Feelings

- Fears are best handled by hearing and reflecting feelings
- Do not say, “I know how you feel.”
  - You can never know another person’s feelings
- Describe the feeling in your own words
  - Let the other person correct you
  - Four feelings - mad, sad, glad, and afraid
- Dialogue process
  - Paraphrase and reflect
  - Do not interpret or rationalize

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## How to Deal with Worker Concerns for NORM

### Hearing Feelings

- “I don’t want to go near radiation”
  - “Radiation makes you nervous”
- “Yes, I might still like to have children”
  - “You are afraid that radiation may affect whether you can have children”
- “Yes, I don’t want children with 3 eyes”
  - “So your real concern is whether radiation will affect future children”
- “Yes” Ok, here is what I have learned”

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### Examples of Active Listening

- “Radiation, I don’t want any of it !”
  - “Radiation is scary isn’t it ?”
- “I don’t believe a word you are saying!”
  - “You are concerned that I may not be telling you the truth ?”
- “I know what happens when you are exposed to radiation ?”
  - “If you are exposed to radiation, you feel that something bad will happen?”

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### How to Answer “Is it Safe”

1. What are properties of radiation
  - $\alpha$ ,  $\beta$ ,  $\gamma$ , x-ray ?
  - Form and quantity ?
2. Where is it located - Inverse square law ?
3. How is it contained - Shielding ?
4. How will it move in the environment ?
5. What are the exposure conditions – mR / hr ?
6. What is the duration of the exposure – hr ?
7. How much energy is deposited in our body - mrem ?
8. How does this compare with limits or guidelines?

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### NORM Awareness Training – 90 min

- Review of ideas and views on radiation
- What is radiation and NORM
- What do we know about NORM risks
- Everyday sources of radiation, show antiques
- Regulatory guidelines
- Comparison with NORM at the facility
  - Many pictures and actual measurements
- Are these sources safe, who decides, and how do we know?
- Answer questions

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### A TENORM Case Study

- Workers at a large paper making plant
- Became alarmed upon hearing of radium scale from Alum in pipes and pumps
- Questions
  - What is NORM?
  - How long will NORM stay in my body?
  - How much do I need to inhale before I get cancer?
  - Does smoking increase my risk?
  - How can I tell if I have been exposed?

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### More Questions on NORM

- What should I do if I have been exposed?
- If I get cancer, can I tell if it is from NORM?
- What happens to NORM in my body?
- What kind of cancer does NORM cause?
- Am I going to die from NORM exposures?
- Will a dust mask protect me?
- What medical procedures will help me?
- Are there regulations for safe work?
- Could I get NORM on my clothes and take it home?
- Will my family be harmed?

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## How to Deal with Worker Concerns for NORM

### Meetings

- Informal – about one hour around a table
- Explained NORM
  - Sources and types of radiation
  - Normal exposures to background
  - Discussed how to measure
  - Answered questions on health effects
- Included show – and - tell
  - Radioactive antiques
  - Samples of uranium ore

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### Measurements with Workers

- Passed out radiation instruments to workers
- Explained how they worked
- Determined normal background readings
- Invited them to check readings on antiques
- Went into plant – spent all day, checked wherever workers wanted. Took samples
- I explained results as we went along
- At the end of the day, I gave conclusion
  - Results not very exciting

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### Summary

- Many workers may have concerns for possible exposures to radiation
- Use active listening to hear their fears and feelings
- Ask lots of questions
- Address mythology
- Provide NORM awareness training
- Help workers find their own answers
  - Hands on measurements are best

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### Questions ?



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