2014 AAHP Special Session
New Frontiers in Radiation Risk Communication

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The AAHP has an established tradition of hosting a Special Session on Tuesday at the annual meeting of the Health Physics Society. The title for this year's Special Session in Baltimore on July 15, 2014 – ***"New Frontiers in Radiation Risk Communication"*** was proposed by Dr. Steven Becker, who co-chaired the program with me. Eight specialists in risk communication were invited as speakers over a year ago. We learned subsequently that five of these speakers: Dr. Robert Brent, Dr. Richard Toohey, Dr. Paul Locke, Dr. Steven Becker, and Dr. Evelyn Bromet were identified by Dr. Fred Mettler, who gave the L.S. Taylor Lecture at the annual NCRP meeting on March 10, as giants on whose shoulders our profession has evolved. Their presentations as described below certainly confirmed Dr. Mettler's assessment. Slides from these presentations are available on line at http://www.hps1.org/aahp/public/wp_sessions.htm.

The program began with a lively presentation by **Mr. Larry Petcovic** on ***"Social Neuroscience Insights for Building Relationships During Radiation Risk Communication."*** Larry is the Director of 3rd Order Communications, a consulting firm in Columbia, MD, where he provides leadership training and communication coaching to executives of Fortune 500 companies. Larry has advanced degrees from Rutgers and Johns Hopkins, and graduate studies at George Washington. Larry and I have presented communication workshops together for 30 years.

He got us off to an energizing start for the day by demonstrating how M&Ms could improve our communication effectiveness. He noted that while most technical people listen carefully to questions to determine their best technical response, they often may have very little awareness of the other person's situation or feelings about the issue. He said, "The most difficult skill for us as leaders is to NOT answer a question for

which we know the answer." He emphasized, "If we knew more about the other person's circumstances, we might give an entirely different answer." To learn more about the other person, Larry proposed that we use three M&Ms as reminders to ask at least three open-ended questions before giving our answer. This is to encourage that we switch from the expert role to a learner role. The three M&M strategy for responding to inquiries will aid in establishing rapport, showing the other person that we care, and determining better what their real question or concern may be. Larry presented this profound insight with humor as he passed out M&Ms for us to practice his strategy. His approach of asking three open-ended questions before giving an answer sounds so simple and yet it could be an incredibly powerful approach to increasing our effectiveness for radiation risk communication.

Dr. Robert Brent gave the second inspiring presentation on ***"Deficiencies in Counseling Education and Methodology."*** Dr. Brent is Distinguished Professor, Louis and Bess Stein Professor of Pediatrics, Radiology, and Pathology at the Jefferson Medical College of Thomas Jefferson University, Emeritus Chairman of Pediatrics, and Director of the Clinical and Environmental Teratology Laboratories at the duPont Hospital in, Wilmington DE. Dr. Brent received his AB, MD with honor, and PhD in radiation biology, physics and embryology from University of Rochester. He trained in Pediatrics at the Massachusetts General Hospital and was Chief of Radiation Biology at the Walter Reed Army Institute of Research. He was Chairman of Pediatrics for 30 years at Thomas Jefferson University and the Alfred I. duPont Hospital for Children. He has over 475 publications and has received numerous national and international awards.

Dr. Brent described how doctors in the first half of the 1900s believed that basic science education and research "could provide all the answers," so that physicians could diagnose, meliorate, treat, or cure most medical problems they encountered. In 1960 Dr. Engle advised that you cannot ignore the impact of the environment on the patient's disease or the behavioral defenses available to them. Drawing upon this advice for 60 years of counseling experience, Dr. Brent emphasized the importance of counseling with compassion and empathy while providing information on options as an educator rather than telling people what they should do. He noted that empathy requires some knowledge of and sensitivity to the social and cultural position of the persons being counseled. Dr. Brent also presented the scientific basis for concluding there is little or no evidence for genetic effects of radiation for children of exposed parents. He explained the carcinogenic risks of radiation in-utero and noted that lifetime risks following in-utero exposure may be considerably lower than for early childhood exposure**.** Dr. Brent concluded by saying, " I have had the good fortune to experience a most memorable and exciting lifetime scientific journey with rewards that would be priceless to any physician; namely, to have concrete evidence that thousands of lives have been saved or changed."

Dr. Richard Toohey gave us insights in ***"The Memetics of Radiation Protection."*** He received his Ph.D. in physics from the University of Cincinnati in 1973 and spent the first part of his career at Argonne National Laboratory in both research and operational health physics. He recently retired from Oak Ridge Associated Universities, where he directed the Radiation Internal Dose Information Center, was Sr. Health Physicist for the Radiation Emergency Assistance Center/Training Site, Director of Dose Reconstruction Programs, and Associate Director of the Independent Environmental Assessment and Verification Program. He is currently a senior health physics consultant with M. H. Chew & Associates of Livermore, CA. He was the 2008-09 President of the Health Physics Society and is a member and Director of the National Council on Radiation Protection and Measurements, Treasurer of the International Radiation Protection Association, and Chair of the Science Advisory Committee for the U.S. Transuranium and Uranium Registries.

Dr. Toohey explained that the term "meme" was applied by the evolutionary biologist Richard Dawkins to a unit of cultural evolution, i.e., an action that spread from an originator to others, such as tool-making. The concept was later expanded to include ideas that spread from one brain to another (their environment) and compete for success (retention and further transmission) under Darwinian rules, i.e., the memes best suited to their environment will survive and propagate, eventually driving out memes less well-suited. The resulting science, developed by Brodie,

Lynch, Blackmore, and others is known as memetics, and deals with the propagation of ideas among humans. Given that the human brain is hard-wired for survival by incorporating automatic analyses of sensory inputs for threats and responds accordingly without higher-level conscious processing, memes that convey a threat will naturally survive and prosper in such an environment. He explained that while LNT has many scientific problems, it has come to be the accepted model (meme) for most people. He said, "You cannot unring the bell." This alone explains why the phrase "deadly radiation" has become commonplace in media coverage of radiological issues. Some memes relevant to radiation risk communication include contagion, dread, autonomy, vulnerability, confirmation bias, justice, and others, all of which thrive in human brains much better than do most of the memes of science. ■

Dr. Paul Locke gave a presentation on ***"Risk Communication and the Safety Culture.*** Dr. Locke holds an M.P.H from Yale University School of Medicine, a Dr.PH. from the Johns Hopkins University Bloomberg School of Public Health, and a J.D. from Vanderbilt University School of Law. He is an environmental health scientist and attorney, and an Associate Professor at the Johns Hopkins University Bloomberg School of Public Health. He holds his primary appointment in the Department of Environmental Health Sciences and a joint appointment in the Department of Health Policy and Management. Dr. Locke directs the Doctor of Public Health Program in Environmental Health Sciences. Dr. Locke's research and practice focus on how decision makers use and communicate scientific data and research in regulation and policy-making and how environmental health sciences influence the policy-making process. Dr. Locke was a member of the National Academy of Sciences Nuclear and Radiation Studies Board from 2003 to 2009, and chaired the National Academy's Committee on Uranium Mining in Virginia. He also served on the Board of the NCRP and is now the Vice-President for NCRP's PAC 7 on Radiation Education, Risk Communication and Policy.

Dr. Locke explained how the concept of nuclear safety culture came into widespread use in the mid-1980s, after the Chernobyl accident. It has been adopted and implemented worldwide. In the United States, the Nuclear Regulatory Commission (USNRC) published a formal safety culture statement in 2011. This policy was adopted after extensive consultation with stakeholders, and is intended to apply to all USNRC licensees. Adoption of this policy is voluntary; it is not a regulation, and is not enforceable. Nevertheless, it has been embraced by the nuclear power industry and the Institute of Nuclear Power Operations. According to the USNRC, nuclear safety culture is defined as "… the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment." USNRC defines 9 traits of a positive safety culture, which include leadership safety values and actions, personal accountability, respectful work environment and effective safety communication.

Dr. Locke explained the interdependent relationship between implementation of a positive nuclear safety culture and risk communication. USNRC's safety culture statement and explanation – as well as almost every other definition of safety culture – makes transparency and openness key attributes. One successful way to foster openness and transparency is through dialogue and the risk communication process. In addition, risk communication can be utilized to explain the idea of nuclear safety culture and the reasons why the nuclear safety culture's core values must be adopted and nurtured by all entities that use nuclear materials. Beyond that, however, risk communication is the most direct way to engage members of the public and the regulated community in discussions about how to build a strong and proactive nuclear safety culture.

Dr. Steven Becker gave a presentation on ***"Public Communication and Radiation Emergency Risk Communication: Continuing Lessons from Fukushima Dai-ichi."*** Dr. Becker is Professor of Community & Environmental Health in the College of Health Sciences at Old Dominion University in Virginia. He has had extensive field experience at the sites of major radiation incidents around the world, including the 1999 nuclear criticality accident in Tokaimura, Japan. He has done Chernobyl disaster follow-up work in Ukraine and Belarus, and was a member of a three-person radiological emergency assistance team invited to Japan in 2011 in response to the earthquake-tsunami disaster and the Fukushima Dai-ichi accident.

Dr. Becker discussed some of the Fukushima Dai-ichi nuclear accident's main lessons regarding public information and radiation emergency risk communication. His presentation drew on recent scholarly research and on his first-hand experience as a member of the team invited to Japan. He discussed several broad types of communication lessons learned: 1) those involving immediately affected areas; 2) those involving locations farther away (outside of the immediately affected areas); and 3) those involving new populations and audiences or groups whose communication needs tend to be overlooked. One communication lesson learned was that the volume of questions people have about population monitoring, screening, and decontamination can be enormous. Effectively meeting people's information needs requires considerable advance planning, training, and the up-front development of information resources. Dr. Becker noted that communication and information needs in areas away from the directly impacted areas can also be immense, particularly in places that receive evacuees. If people's questions, fears, and concerns are not adequately addressed in such receiving communities, the possibility that evacuees may find themselves facing such problems as exclusion, stigma, and discrimination is increased.

With respect to communication needs related to new populations or audiences, he cited the example of children. In the aftermath of the Fukushima Dai-ichi accident, dosimeters were distributed to thousands of preschoolers, children in elementary schools, and students in junior high schools. Not surprisingly, many had questions and some had concerns. Yet today, no nation has much available in the way of age-appropriate and developmentally-appropriate radiation emergency informational materials. This gap needs to be filled. Another communication gap involves healthcare staff and their families (particularly with young children), who can also have many questions, concerns, worries, and information needs. When such needs are not fully understood and addressed, new challenges can result. In the case of Fukushima Dai-ichi, significant numbers of healthcare practitioners have left the Prefecture, and there continues to be difficulty in attracting nurses, trainee doctors, etc. Dr. Becker concluded by saying that although much progress has been made in recent years in terms of radiation emergency risk communication, considerable work remains.

Dr. Evelyn Bromet spoke to us about the ***"Emotional Consequences of Nuclear Power Disasters."*** She is Distinguished Professor of Psychiatry and Preventive Medicine at Stony Brook University. She has her BA from Smith College, PhD in epidemiology from Yale, and post-doctoral training at Stanford. She has done research on the psychological aftermath of TMI and Chernobyl. Her current research is on the illness course of people hospitalized with psychosis and mental-physical co-morbidity in responders to the World Trade Center disaster. She is a consultant to Project Valor (a Registry study of Post Traumatic Stress Disorder), the US army suicide research program headed by Ron Kessler, IAEA, and Fukushima Medical University.

Dr. Bromet noted that after TMI, Chernobyl, and now Fukushima, the official consensus is that the greatest short and long-term public health effect is mental health. The major mental health consequences of such disasters are depression, anxiety, post-traumatic stress, and medically unexplained somatic symptoms, smoking, alcoholism, and suicide. These conditions are often long-term and are associated with stigma, fear of developing cancer, grief, and a lost sense of safety and control. Research on such radiation disasters, including a-bomb survivor studies, indicates that exposed adults from contaminated regions report persistently higher levels of distress, but not diagnosable disorders, than similar people in non-radiation exposed areas. The highest risk groups are clean-up workers and mothers of young children. While demographic and psychiatric history play a role in determining these effects, disaster-related experiences, including being told by a doctor that one's health problems are from exposure, are the most toxic. In contrast, studies of children raised in the shadow of the Chernobyl accident show that they perceive their health more negatively than their peers, but their emotional, neuropsychological, academic, and social development is comparable. Psychological effects are independent of actual exposure level. Preliminary data from Fukushima suggest that the patterns occurring after Three Mile Island and Chernobyl are repeating themselves. It is imperative that the psychological experiences of Fukushima survivors are fully understood by mental health and medical professionals, and that they are addressed early so as to reduce the long-term burdens these survivors will otherwise face.

Ray Johnson gave the next presentation on ***"Radiation Safety Decisions – How we are Prone to Errors."*** Ray is the Director of the Radiation Safety Counseling Institute in Rockville, MD where he provides consulting, training, and workshops on radiation safety and risk communications. He has advanced degrees in engineering from MIT, Harvard, and Rensselaer Polytechnic Institute. In addition to a 50 year career in radiation safety, Ray took three years of training in the 1970s to practice psychological counseling. Since then he has been providing counseling as a volunteer, currently as a Commissioned Stephen Minister in his church. To address health physicists' concerns for radiation risk communication, over the years he has attempted to build bridges between the field of psychology (where they know how to deal with fears, but do not know about radiation) to the field of radiation safety (where we know about radiation, but usually do not know how to deal with fears). He has over 500 publications and presentations on risk communication and radiation safety. He is a Certified Health Physicist and Licensed Professional Engineer. Ray is a Past President of the Health Physics Society and the American Academy of Health Physics and has received over 30 Society awards.

Based on a series of monthly articles in the HPS Newsletter (2012-2013), he noted that health physicists have long been puzzled and often frustrated about how people can make instant decisions regarding radiation with little or no actual data. Studies in psychology show that our ability to make instant decisions for safety is a part of how our brains are wired for our protection. We are programmed to fear first and think second. We have survived by this innate ability to foresee dangers and take protective actions accordingly. Instant prediction of danger is not something we do consciously by evaluation of facts or circumstances. For example, if we took the time to analyze whether a nearby snake looks angry and whether it is close enough or fast enough to strike us, it may be too late. Instead our subconscious has automatically responded with an order to our body which says jump back. Our subconscious functions as a superfast computer processing all incoming signals by associations with images and experiences in our memories (what Dr. Toohey calls memes). Thus we are programmed for instant response without any conscious thought. While this instinct for safety is important for our survival, it is also prone to substantial errors for some dangers, such as radiation.

In the process of making decisions for radiation safety, there are at least 15 or more ways that our subconscious is prone to errors relative to the actual circumstances. My studies are showing that even technical professionals are prone to errors according to what they have come to believe subconsciously based on what they have heard or read about radiation. Out subconscious mind is prone to running ahead of the facts to draw coherent conclusions from a few scraps of evidence. Subconscious impressions then become the basis for instant decisions and long term beliefs. Ray noted that it is OK to be afraid of radiation. Fears are a natural function of our minds for our protection. However, fears can also be harmful as described by Dr. Bromet. Unfortunately radiation fears are often based on radiation mythology (something believed which is not technically true). One of the most prevalent radiation myths is the linear non-threshold dose response model (LNT). This model is shown as a straight line down to zero. The myth of this model is that there is NO zero. In the US, zero on the health effects scale starts at 560,000 cancer deaths a year. Zero on the dose scale starts at background, which is 310 mrem a year in the US. However, background for other parts of the world start at 3,000 to over 20,000 mrem a year. This raises the question about whether it makes any sense to begin looking for health effects above 310 mrem a year in the US when other countries start as levels above 20,000 mrem a year? Ray concluded by saying we can be helpful for frightened persons by affirming it is OK to be afraid and then providing information as a technical resource to help people derive their own answers to what safe means for them (note this is the same guidance offered by Dr. Brent).

Dr. Robert Emery concluded the Special Session with an energetic presentation on ***"Strategies for Correcting Misinformation about Radiation."*** He is Vice President for Safety, Health, Environment & Risk Management for The University of Texas Health Science Center at Houston and Professor of Occupational Health at the University of Texas School of Public Health. Bob has over 30 years of experience in health & safety and holds master's degrees in radiological hygiene and environmental health and a doctorate in occupational health. He is unique in that he possesses national board certification in 7 main areas of health & safety (CHP, CIH, CBSP, CSP, CHMM, CPP, ARM). He is the author of over 70 peer-reviewed articles (31 in the Health Physics Journals) and makes frequent presentations on such issues at the local, national, and international level.

Dr. Emery noted that individuals will most certainly continue to experience apprehensions about possible exposures to radiation both in the workplace and in the environment. These apprehensions can be exacerbated by previously held beliefs, intensive media coverage, and uncontrolled postings on the internet. In the absence of counterbalancing factual information presented in ways individuals can readily comprehend, poor decision making and the wasting of precious public health resources can ensue. So what should the health physics profession be doing to address situations where incorrect or misinformation abounds? He noted that once misinformation (what Ray calls mythology) is acquired it is quite difficult to remove its influence. He discussed an example of misinformation published in a medical journal which said that 14,000 deaths occurred in the US in 2011 as a result of fallout from Fukushima. Upon careful review, he noted that the speculated deaths were determined by comparing the number of deaths in 2010 and 2011 in 122 US cities. He raised a question about such speculations, "Sound science or sounds like science?" He defined how "Lysenkoism" is used to describe the manipulation or distortion of the scientific process as a way to reach a predetermined conclusion as dictated by ideological bias, often related to social or political objectives. Articles as noted above posted by "crusaders, critics, and conspiracy theorists" serve to weaken the messages made by qualified experts. Correcting misinformation is a matter of careful choice of words. For example, when refuting misinformation, avoid mentioning the wrong information as individuals tend to lose the "tag" and actually remember the myth. Don't say, "Irradiation won't make your food radioactive." It is better to focus on the facts you wish to communicate and say, "This procedure eliminates dangerous pathogens from your food and makes it healthier for you." He concluded, as public health professionals, "We hold an ethical obligation to monitor for, and correct, misinformation." Relying on the science behind effective risk communications is "not about manipulating people – it's about giving the facts a fighting chance."