

CORRESPONDENCE

LN-T Should Go Away and Soon!

*A.N. Tschaeché, CHP
Encinitas, California*

I completely disagree with Dan Strom's statement in the June Newsletter, page 9, that the draft Report of the NCRP Scientific Committee 1-6 is a balanced position on the use of the linear, no-threshold (LN-T) hypothesis in radiation protection. I find complete lack of balance in the draft's consideration of data that demonstrate the LN-T hypothesis does not represent reality. The draft simply dismisses such data as nonconsistent with the LN-T hypothesis, but does not attempt to explain why it is nonconsistent. Nor does the draft consider other hypotheses that might explain ALL the data.

Dan makes a couple of statements that simply are not known to be true (however much he may wish they were):

1. "... a single misrepaired DSB (double strand break) can lead to cancer." It is not known on the basis of data in whole human beings, or even whole other animals, that a single misrepaired DSB can lead to cancer! That idea is a hypothesis that is yet to be proven. Therefore, to make such a statement misrepresents known reality.
2. "On the order of 1 percent of all fatalities, about 4 percent of all cancer fatalities in the United States are due to (ionizing radiation) background." That such is the case is unknown. To make such a statement as if it were known to be true is to mislead the reader.

Then Strom says, "The fact that epidemiology has not, cannot, and never will be able to show cancer deaths due to background radiation doesn't mean that they aren't real, nor does it mean that people don't care about an increment of risk." The first part of the statement is not true unless one adds the idea of cost. By spending enough money, epidemiology could show cancer deaths are not due to background radiation. The next idea is a red herring. If one cannot demonstrate real cancer deaths absolutely caused by background radiation, then, to me, there aren't any. People should care about an increment of real risk, but for them to care about hypothetical risk is not rational. For members of the Health Physics Society to foster the idea that background radiation actually causes any harm is, to me, unethical. I call on the ethics committee to develop a position on this matter, and forward it to the Scientific and Public Issues Committee.

Finally, I guess Dan really believes that the LN-T hypothesis may NOT be true. At least his last parenthetical statement (*if LN-T is true!*) would lead one to think so. ■

Response to Al Tschaeché

*Daniel J. Strom, CHP
Richland, Washington*

1. Al should look up the definition of *hypothesis* and *model*. We use dose-response models in radiation protection, not hypotheses. I recently made a synonym study on this very point (Strom 1998).
2. The monoclonal origin of human (and animal) tumors is well established. Perhaps Al would like to explain how multistage carcinogenesis requires more than one misrepaired double strand break (DSB) as one of the stages. There are clearly cancers that involve a sister chromatid exchange (it is always present), an example of a misrepaired DSB.
3. I have been corrected on the matter about chemicals producing locally multiply damaged sites (LMDSs). A single chemical event cannot produce an LMDS, but several molecules in the same place at the same time evidently can (Stewart 1999).
4. Al's defense of epidemiology contradicts many, including many prominent heads of academic epidemiology departments, who have examined the question of the limits of epidemiology regardless of cost and population size (Taubes 1995). The appropriate uses of epidemiology are stated in the "London paper" (Federal Focus 1995), written by some of the best people in epidemiology and risk analysis from industry, government, and academia.
5. Al insists that if you can't detect something, then it doesn't exist. That is baloney, or, at best, tobacco-company science. If you have a poor detector, you can't detect important amounts of materials. A side-window GM detector with the shield closed can reliably detect weapons-grade ^{239}Pu on the filter of a lapel air sampler in an amount that, if air were breathed at that concentration for eight hours per day, results in a committed lung dose equivalent of 39 Sv (Strom 1998). Al evidently claims that, by choosing a poor enough detector, anything can be made not to exist.
6. "All models are wrong, but some are useful" (Box 1979). Climate models, economic models, and nuclear shell models are all wrong and all useful. I and others have pointed out that *the LN-T model is wrong for some endpoints* such as leukemia, osteosarcoma, and liver cancer (Strom 1998), but probably right for other cancers. Al doesn't seem to understand that a model

that is partially right and partially wrong can be useful in setting radiation protection standards.

7. Adaptive response to radiation requires high doses and fades as quickly as a suntan. AI ought to consider this when making statements about ethics.

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MEMBER'S POINT OF VIEW

Is the Linear, No-Threshold Theory Justifiable for Regulatory Purposes?

Bernard L. Cohen
University of Pittsburgh

A former International Commission on Radiological Protection Chairman supports the linear, no-threshold (LN-T) theory because it simplifies bookkeeping. LN-T is certainly convenient for making health physics calculations. It allows us to calculate the risk from any given radiation exposure in quantitative terms, which is the goal of any risk analysis. Without LN-T, the risk to a person from a given dose depends on the concentration of radon in his home, his experiences with medical x rays, etc.; effectively, there is a synergism between a given exposure and all other radiation exposures. Since most of the latter are unregulated, it is impractical to take them into account. If we abandon LN-T, we largely abandon quantitative risk assessment, which might seem to make regulation more difficult.

But is this really a very serious problem? It is a problem that occurs in nearly every other area of environmental concern. For example, LN-T is not used for air pollution. There are regulations on releases and on ambient levels of SO₂, of NO_x, of total suspended particulates, of fine particulates, of ozone, of lead, etc. For none of these can the risk of each additional exposure be calculated quantitatively, even if no other pollutants are present. No consideration is given to synergisms between these various pollutants, although such synergisms are quite likely to be important. By the standards we apply to radiation, the scientific bases for air pollution regulations are mediocre at best.

But they work quite successfully. They prevent catastrophes and generally avoid identifiable deaths. Most importantly, they give the public confidence that it is being protected. This confidence is not even shaken by studies concluding that tens of thousands of Americans die

annually from air pollution (Ozkaynak, Spengler 1985). The media give scant attention to these studies and the public shows little interest as long as no victims are identifiably tied to the pollution.

Is this situation reprehensible? I think not. It allows our technology to progress and to increase society's wealth, and technology and wealth create health, far outstripping the harm to health done by the pollution. Air pollution reduces our life expectancy by something like 30 days (Cohen 1991), whereas technology and the wealth it has created have increased our life expectancy by 30 years in this century.

We thought we could do much better with radiation, using LN-T to calculate risks in quantitative terms. For every little bit of radiation, we calculate the number of deaths, and killing is something the media are quick to report. People are moved by such reports and view these deaths as real, perhaps even afflicting themselves or their loved ones. The public has thus been driven insane over fear of radiation, losing all contact with reality. As a result, we have largely lost the benefits of nuclear power which could be averting tens of thousands of deaths per year from air pollution (and also solving other environmental problems like global warming, acid rain, etc.). We are losing many other benefits of radiation such as food irradiation which could be averting millions of cases of food poisoning, saving thousands of lives each year. We are wasting our society's wealth on ridiculous clean-up programs at nuclear facilities; this wasted wealth could save thousands of lives each year if it were spent on biomedical research, on public health programs, or on highway safety.

Our passion for doing much better for radiation than



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Highlights and photos from the Annual Meeting will appear in the September issue.

Goodwyn's Editorial Cartoons Speak Truths

Mary Walchuk

In *The Ring and the Book* Robert Browning wrote, "It is the glory and good of Art, That Art remains the one way possible Of speaking truths, to mouths like mine at least." In the *Newsletter*, we like to include the art of editorial cartoons to speak truths that are sometimes hard to put into words. Health physicist Al Goodwyn is a regular contributor of cartoons to the *Newsletter* and is also an editorial cartoonist for *The Aiken Standard*. This month we get to learn a little more about him.

Newsletter: When did you first start drawing cartoons?

Goodwyn: I always liked to doodle and usually drew cartoon-type doodles. As far as my start at drawing real (as in published) cartoons, there are two unlikely individuals involved in my cartooning career: Bud Grace and Mike Tyson. When I joined the Health Physics Society in 1986 Bud Grace was providing syndicated cartoons for the *Newsletter*. Grace's cartoons were dropped in 1988 (due to several that were controversial, as I recall). Lew Pitchford, who was the editor at that time, put out a call for interested health physicists to provide cartoons. Feeling that my sense of humor was above average, I sent him a batch and

have been providing cartoons for the *Newsletter* ever since. My first paid cartoon was for the *Newsletter* and it was quite a thrill to get a check for drawing silly pictures.

Moving ahead to July of 1997, Mike Tyson bites the ear of Evander Holyfield and the boxing world is in an outrage. Don't get me wrong, I'm a boxing fan but I wasn't as shocked as most that blood was drawn in a boxing match. I didn't recall as much outrage over Tyson's wife-beating incidents or rape conviction. The situation was ripe for a cartoon. I drew one up and pitched it to our local paper, *The Aiken Standard*. They were encouraging but a little lukewarm on the idea of buying cartoons from me since the syndicates provided them so cheap. It surprised me a little that they weren't eager to print my cartoon. Not willing to give up, I provided them several batches on local issues. They enjoyed these and asked me to continue providing cartoons. Since then I've provided three cartoons each week. Incidentally, they eventually printed the Tyson cartoon.

Newsletter: Did you have any classes or formal training?

Goodwyn: I've never had formal

[see COVER, page 3]