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From: RulemakingComments Resource
Sent: Monday, September 14, 2015 1:59 PM
To: Rulemaking1CEm Resource
Subject: Comment on PRM-20-28, PRM-20-29, and PRM-20-30
Attachments: NRC-2015-0057-DRAFT-0211.pdf

DOCKETED BY USNRC—OFFICE OF THE SECRETARY

SECY-067

PR#: PRM-20-28, PRM-20-29, and PR-20-30

FRN#: 80FR35870

NRC DOCKET#: NRC-2015-0057

SECY DOCKET DATE: 8/27/15

TITLE: Linear No-Threshold Model and Standards for Protection Against Radiation

COMMENT#: 224

Hearing Identifier: Secy_RuleMaking_comments_Public
Email Number: 1019

Mail Envelope Properties (c00c866b4f5e4268bb3ecce72e2e2bc0)

Subject: Comment on PRM-20-28, PRM-20-29, and PRM-20-30
Sent Date: 9/14/2015 1:59:18 PM
Received Date: 9/14/2015 1:59:19 PM
From: RulemakingComments Resource

Created By: RulemakingComments.Resource@nrc.gov

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

Post Office: HQPWMSMRS05.nrc.gov

Files	Size	Date & Time
MESSAGE	296	9/14/2015 1:59:19 PM
NRC-2015-0057-DRAFT-0211.pdf		68650

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

PUBLIC SUBMISSION

As of: 9/5/15 9:24 AM
Received: August 27, 2015
Status: Pending_Post
Tracking No. 1jz-8ksj-rgfp
Comments Due: September 08, 2015
Submission Type: Web

Docket: NRC-2015-0057

Linear No-Threshold Model and Standards for Protection Against Radiation

Comment On: NRC-2015-0057-0010

Linear No-Threshold Model and Standards for Protection Against Radiation; Notice of Docketing and Request for Comment

Document: NRC-2015-0057-DRAFT-0211

Comment on FR Doc # 2015-15441

Submitter Information

Name: Christopher Morrison

Address: United States,

Email: morric7@rpi.edu

General Comment

The LNT model has served the world well but today we can do better. LNT has proven to work well for large acute radiation doses but has been very contentious for low doses and dose rates.

In some ways LNT makes sense, each radiation damage is a damage to a cell and thus a single chance for cancer. However, this view may not be as simple as it seems.

Radiation causes a specific type of damage to a cell. As recent studies have shown this damage mechanism is not unique to radiation. We've learned that bad diet:

<http://www.ncbi.nlm.nih.gov/pubmed/14597554>

or just as a fact of being alive your metabolism causes similar damage at the cellular level

<http://www.ncbi.nlm.nih.gov/pubmed/2079959>

If the LNT model is strictly correct it must include the effects of other damage mechanisms to give an accurate representation of the risk. There are competing effects for DNA damage.

The truth is that any DNA damage is not good, but the truth must also be that we ethically cannot ignore these other mechanisms for DNA damage to gain a holistic view of our health. There is a very strong case that

until DNA damage from radiation reaches similar level to that of other processes then it is comparatively harmless. This would suggest that a linear threshold model may be more accurate.

In addition, we do not fully understand the response of the body to radiation dosages. There is an immune system response to damaged cells that are reproducing (cancer).

<http://www.ncbi.nlm.nih.gov/pubmed/16618710>

Another likely flaw in the LNT model is its lack of timescale modeling. It suggests that getting a 100 rem dose in one second is just as bad as over the course of a year. Getting a dose of radiation over a long period of time allows the body to respond. Getting a dose over a short period of time could overload the immune system. This could be likened to having a glass of wine each day with your meal or drinking 365 glasses of wine once each year. We may find that hormesis (whereby the immune system is stimulated causing a beneficial effect) or even that something else is correct.

More research is needed into the human body's response to DNA damage at different dose rates. Many studies have been conducted whereby a large dose rate over a short period of time has been set equivalent to a small dose over a long period of time. These studies cannot be taken at face value.

The truth is that the LNT model has served its purpose and it is our responsibility to conduct the research necessary to discover greater truth. I personally believe that much of this truth must be found by understanding human biology. Statistics have been used in the past, however statistics are vulnerable to confounding factors and uncertainties. We must understand the fundamental human biology and today we have the technology to do this. LNT must not be held up as a universal truth but must instead be understood as what it is, a rule of thumb that is temporary until we understand more. We now understand more.