Darkness of 100 millisieverts,

lurking in "Simplified chart of radiation exposure" of Side Reader on Radiation

2025-1-21

Citizen Science Initiative Japan /
Exposure to Low Levels of
Radiation Research Group

Come on! Let's study on radiation today. Open your side reader to page 11.

Let's take a look at what radiation affects our bodies. But this chart is too abbreviated to know what impact it might have.

I'll pass out a simplified chart from the side reader for middle and high school students.

Side Reader on Radiation by the Ministry of Education, Culture, Sports, Science and Technology ⇒ https://www.mext.go.jp/b_menu/shuppan/sonota/detail/1409740.htm

What is the point of this chart?

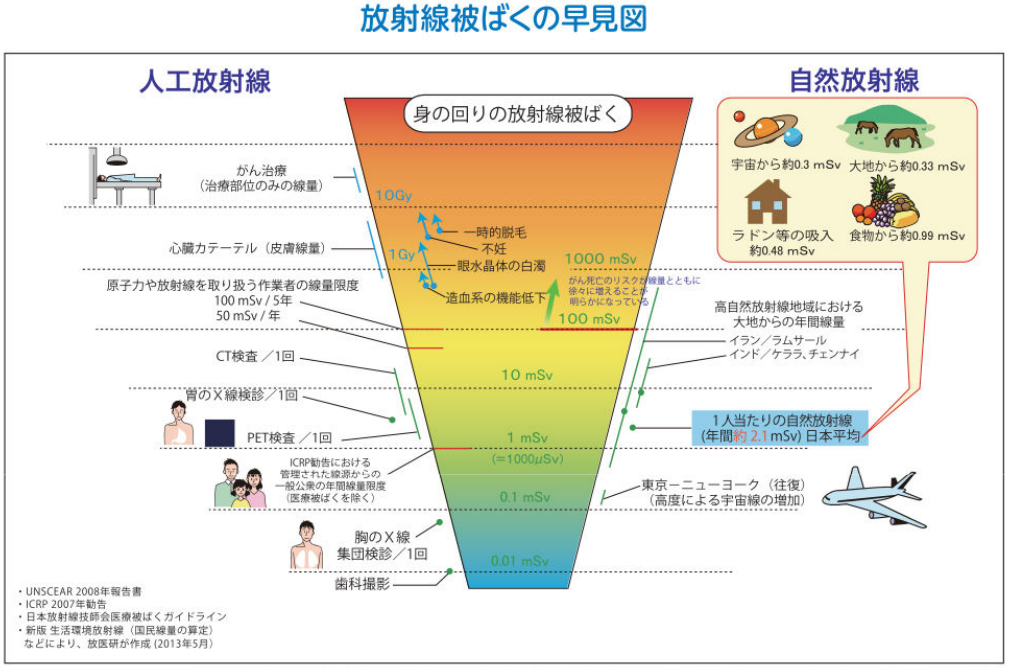
This chart says that radiation causes hair loss and infertility, right?

Lens opacity? Dose it mean blindness?

Impaired function of the hematopoietic system implies leukemia, doesn't it.

I have found an arrow here.

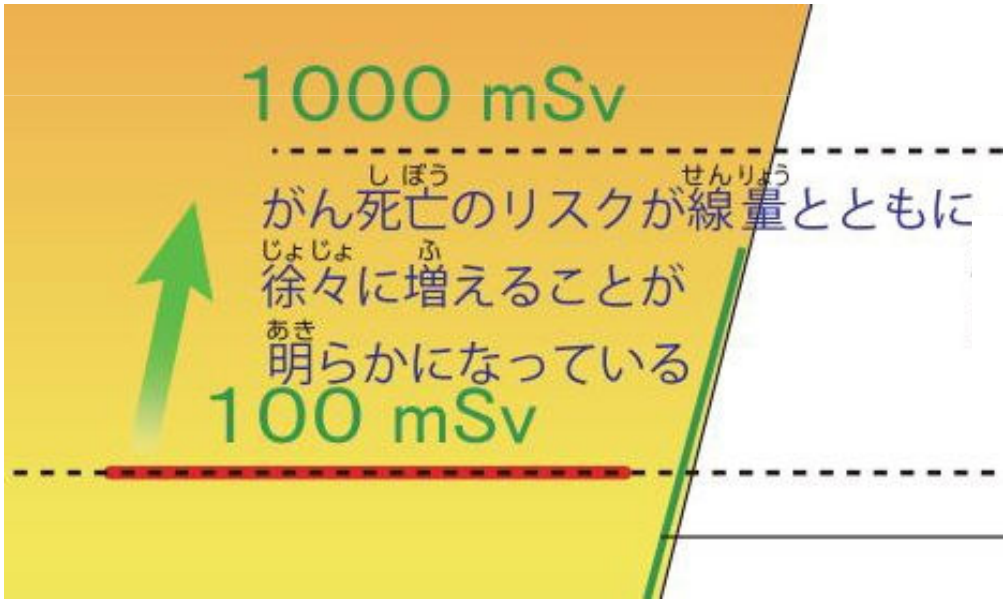
What dose this indicate?



（出典）国立研究開発法人量子科学技術研究開発機構放射線医学総合研究所ウェブサイト「「放射線被ばくの早見表」について」より作成

From 「Side Reader on Radiation」

I have found an explanation above the line of 100 millisievert.



I'll write the explanatory text on the board.

[Explanation of 100 millisieverts or more]

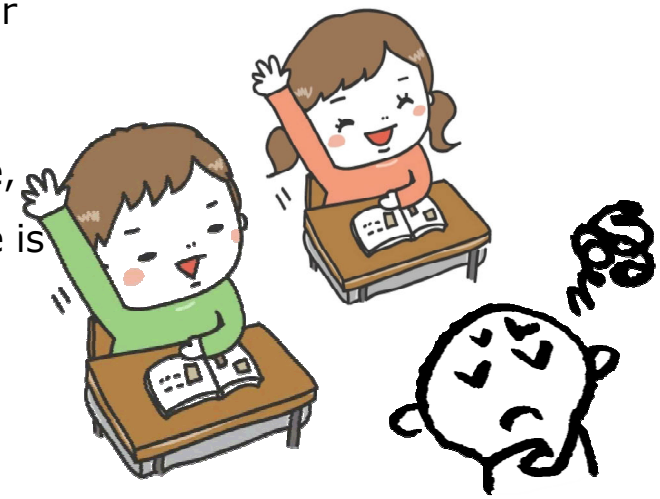
It has been found that the risk of cancer death will gradually increase with radiation dose.

Sensei, can you tell us what that explanation means? (Sensei is a call to teachers in Japan.)

Sensei, doesn't this mean that if people are exposed to more than this amount of sieverts, the number of deaths from cancer will increase?

...So, if it's below this value, can we understand that there is no effect on the body?

(Wai Wai, Gaya Gaya)



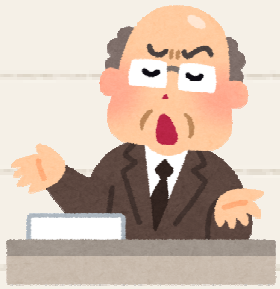
Yes, that's a good point. Let's have the science teacher come and ask him.

(The science teacher is coming to the classroom.)

Hmm, I see, that's an important point. The same question arose in another class. I sent a letter with the question to YAMASHITA Shunichi, the president of the National Institute of Radiological Sciences (NIRS) who made the chart.

(Question) Is radiation below 100 millisieverts safe?

(Answer) We does not mention the effect of radiation below 100 millisievert in the chart.



(Question) Why not?

(Answer) That was simply to reduce the volume of text.

(Question) Putting this aside, what is the truth? Is radiation below 100 millisieverts safe?

(Answer) We have a policy to provide only a scientific consensus to the public.

(Question) What is the consensus?

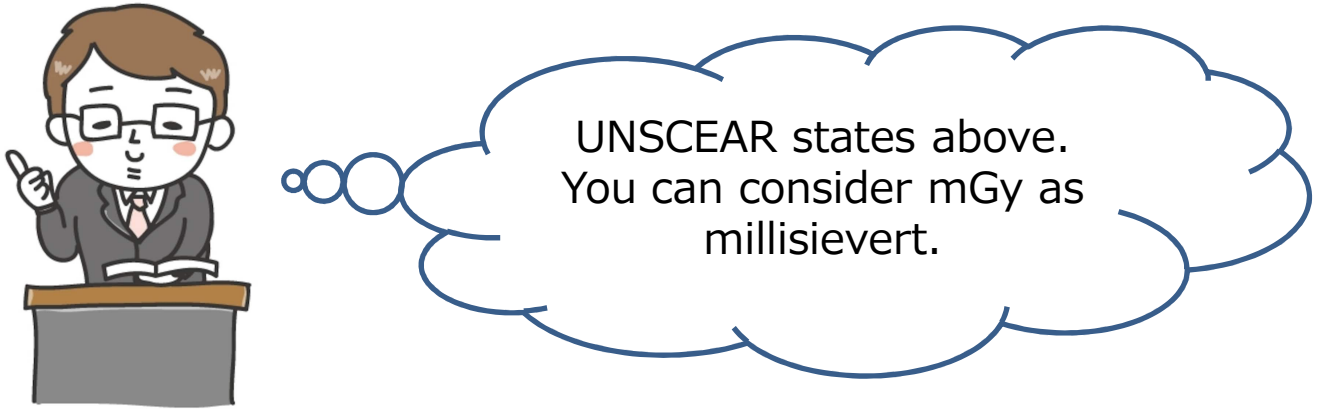
(Answer) The consensus is what UNSCEAR decided. [Note; UNSCEAR is an abbreviation for United Nations Scientific Committee on the Effects of Atomic Radiation.]

Questions to NIRS and answers https://koko.matrix.jp/lab/QST-QandA.pdf

Is the UNSCEAR saying nothing about risk below 100 millisieverts?

Hmm, there is a statement "it is unlikely to find effects below 100 millisievert" in the report of UNSCEAR2010.

Statistically significant elevations in risk are observed at doses of 100 to 200 mGy and above. Epidemiological studies alone are unlikely to be able to identify significant elevations in risk much below these levels.
(UNSCEAR 2010 report on the Effects of Atomic Radiation on the Effects of Atomic Radiation; Paragraph 25)

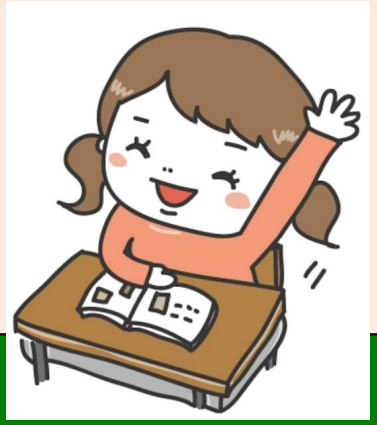


So, does this mean that 100-200 millisieverts or less is safe?

That is a trick of this sentence.

Hmm, I guess some people would think it's safe if significant elevations can not be found.

The subtleties of the text make it so misleading.



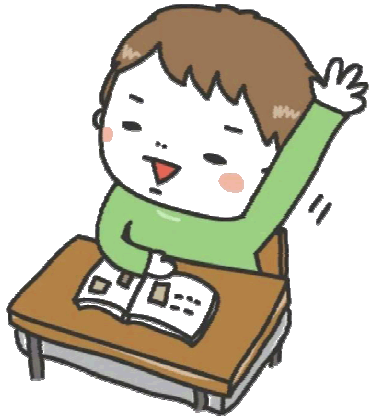
Is that all UNSCEAR is saying?

Sensei, does the UNSCEAR really not say anything about the risk of less than 100 millisieverts?

Wow, that's a good question. There's actually more to this sentence.

Risk estimates vary with age, with younger people generally being more sensitive; studies of in utero radiation exposures show that the fetus is particularly sensitive, with elevated risk being detected at doses of 10 mGy and above. (UNSCEAR 2010, Paragraph 25)

The statement that it is unlikely that any risk will be found below 100 millisieverts does not apply to children. It is said that there is a risk to fetuses even at 10 milligrays.

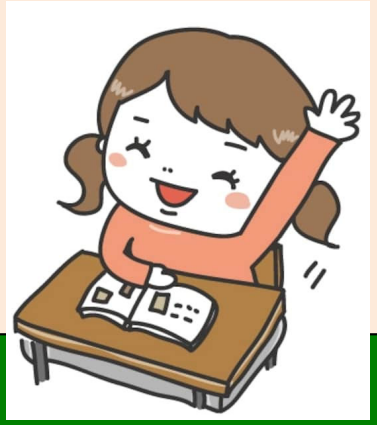


That's what's important for us kids!

I’ve heard from adults that if it’s under 100 millisieverts, there‘s nothing to worry about.

We were nearly get tricked.

I wonder if Mr. Yamashita and his colleagues know that UNSCEAR is saying this. (Pun Pun!)



What is "Statistically significant

elevations in risk"?

Sensei, I'm talking about the text on the board, what does "Statistically significant elevations in risk" mean?

Good point!

The data may happen to show an increased risk due to statistical dispersion ,even though there is no real increased risk . It means that the probability is smaller than a certain level and therefore it has been judged that there is a risk.

However, there is a big problem with the way the threshold is determined.

There's this thing called Bayesian statistics that directly calculates the probability of risk, and it tells us that what makes something "statistically significant" is when the probability of risk is 97.5% or greater.

97.5% or more is too strict, isn't it?

I agree. There are those who obstinately believe that risk can't be proven unless it's statistically significant.

Explanation on hypothesis testing and Bayesian statistics

https://koko.matrix.jp/lab/kaisetu.pdf

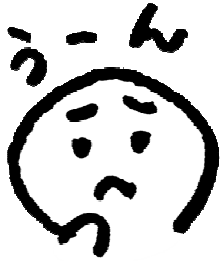
The negative effects of statistical significance have been pointed out by statisticians for a long time.

The American Statistical Association, impatient with the lack of improvement, issued an unusual statement.

This was also covered extensively in the famous scientific journal Nature.

You can find the article online.

I'll write a passage from the statement on the board because it's important.



A conclusion does not immediately become “true” on one side of the divide and “false” on the other.
The widespread use of “statistical significance” as a license for making a claim of a scientific finding (or implied truth) leads to considerable distortion of the scientific process.
("ASA Statement on Statistical Significance and P-Values" , 2016)

Japanese translation of the Statement.⇒ https://biometrics.gr.jp/news/all/ASA.pdf

I asked the NIRS if they are aware of this statement, and they gave me a pointless response that they have no objection to the contents of the statement.

If they know that, then they should change the simplified chart.

Yes, since the chart divides the risk in two at the value of 100 millisieverts.

I feel that many Japanese radiation experts are either unaware of this statement or ignore it.

Sensei, has a statistically significant risk really not found below 100 millisieverts?

That's another good question.

There is a growing body of literature supporting the risk.

The NIRS has not attempted to reflect the findings of these recent studies in the chart.

I wonder if the NIRS says that the increased number of literatures supporting the risk is not the scientific consensus.

They may not want to admit that there is a risk.

There are 26 papers analyzing populations with an average radiation dose of 100 millisieverts or less from 2006 to 2017. An comprehensive analysis of these papers directly support excess cancer risks from these low-dose ionizing radiation. (M. Hauptmann et al., 2020)

https://academic.oup.com/jncimono/article/2020/56/188/5869934

It's also important to note UNSCEAR says the following. I'll write it.

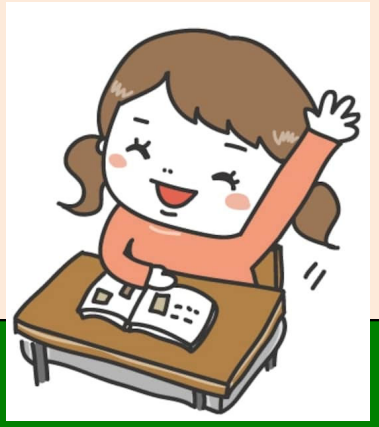
Since there's no threshold, that means there's a risk even below 100 millisieverts.

> Thus, the current balance of available evidence tends to favor a non-threshold response for the mutational component of radiation-associated cancer induction at low doses and low dose rates. (UNSCEAR 2010, Paragraph 31)

What? Mr. Yamashita doesn't explain about that.

Yes, he said that NIRS chose not to say anything about risks below 100 millisieverts.

Maybe NIRS didn't want to mention that the UNSCEAR supports the possibility of no-threshold response.



Is 100 millisieverts lifetime exposure?

Sensei, one thing has come up that I don't understand...

Oh! where is it?

Uh, does 100 millisieverts described in the chart refer to the annual exposure?

I guess it refers the annual dose. Look below the 100 millisievert line on this chart. It says that the exposure limit for nuclear workers is 50 millisieverts per year.

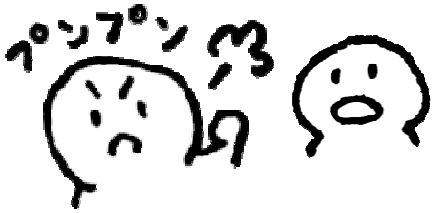
What do you think, Sensei?

Actually, that's the part I couldn't figure out, and I'd contacted the NIRS before.

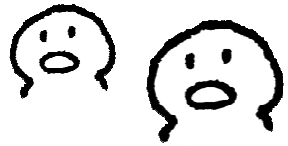
Was the reply yes or no ?

Neither. They say it‘s neither the annual dose nor the cumulative dose.

(Everyone is stunned) Huh? What's that?



It's problematic to just teach the word of 100 millisieverts without clarificaticating that point.



That's right. Think about it.

Well, I'm going back to the staffroom.

Now, let's finish the summary of today's discussion in your notebooks.

- Risks below 100 millisieverts are not apparent from the chart.
- There are many articles that demonstrate the risk below 100 millisieverts.
- The risk to children is greater than to adults, and yet it is not mentioned in the chart.

Well, let's call this good.

Alright, let's clean up the room and go home.

This is the translation of our "Darkness of 100 millisieverts - Side Reader on Radiation- Ver2.1" in Japanese. The "Side Reader on Radiation" distributed to school children by the Ministry of Education, Culture, Sports, Science and Technology includes the "Simplified Chart of Radiation Exposure" by the National Institutes for Quantum Science and Technology (QST), Department of Quantum-Applied Biosciences,
the National Institute of Radiological Sciences (NIRS).
We sent a letter of inquiry to QST, questioning the absence of any information on risks below 100 millisieverts in this chart.

We would like to thank "tokico" and "Tegaki desuno β " for allowing us to use their materials of human illustrations.

https://allabout.co.jp/gm/gp/1492/

https://regeld.com/desi/

2025-1-21

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