The Chernobyl Conundrum: Is Radiation As Bad As We Thought?

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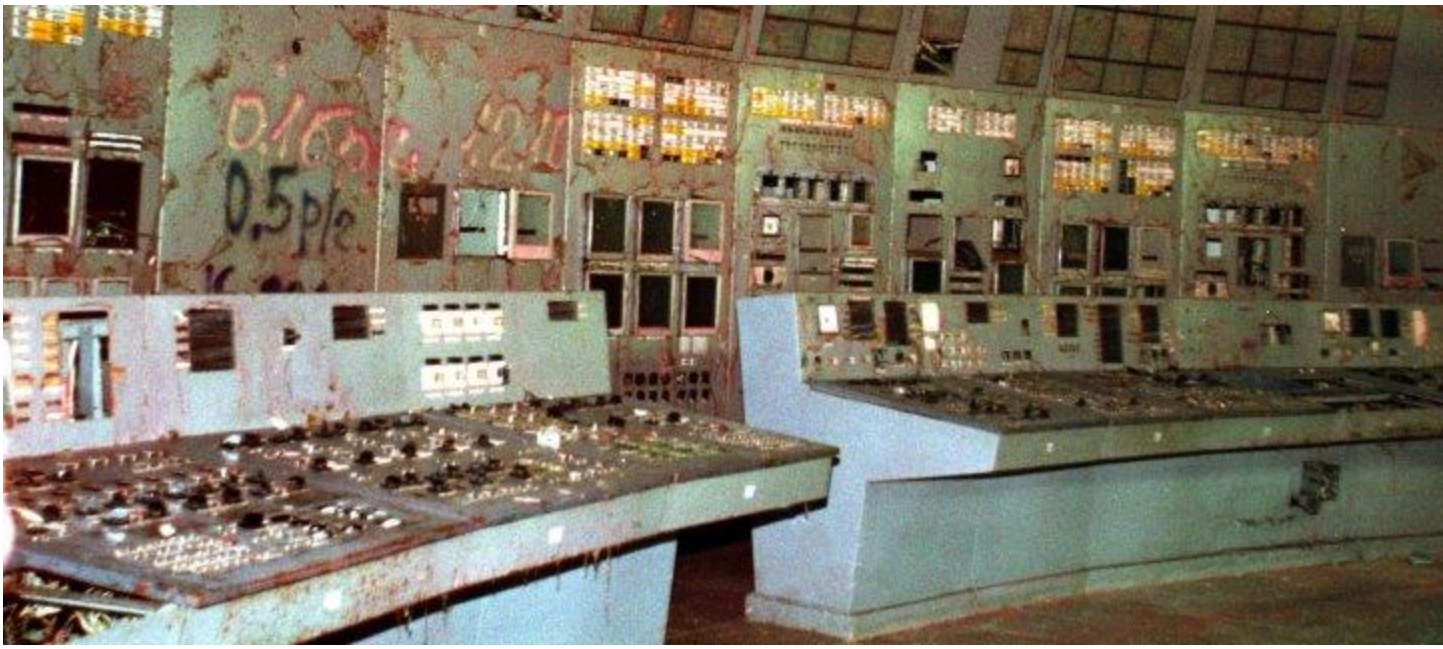
http://www.spiegel.de/international/world/chernobyl-hints-radiation-may-be-less-dangerous-than-thought-a-1088744-2.html

By Manfred Dworschak



Photos

AP

Thirty years after the Chernobyl disaster, it has become clear that radioactivity might be less harmful than originally thought. Some researchers even believe it may be beneficial in small doses.

Who would voluntarily breathe in radioactive gas? These days, there are people who do. They swear by the notorious noble gas radon, created by the decay of uranium: They inhale it deeply.

Most believers in the healing qualities of radiation are suffering from a chronic inflammatory disease: arthritis, asthma or psoriasis, for example. The gas, they argue, alleviates their problems for months, which is why they lay in bubbling radon water offered by some healing spas. In Bad Kreuznach, in the German state of Rhineland-

Palatinate, brave spa guests even trek into the tunnels of an abandoned mercury mine, attracted by the radon-filled air in the mountain. Are they crazy?

As has now become clear, these people are right: Radioactivity is good for them.

These are the initial findings of an ongoing large-scale trial conducted by researchers from four German institutes. The leader is radiobiologist Claudia Fournier, from the Helmholtz Center for Heavy Ion Research in Darmstadt.

Hundreds of patients in the spa resort of Bad Steven, in Upper Franconia, allowed themselves to be thoroughly examined for the study. The researchers found that after a series of radon baths, the blood of the test subjects had fewer signs of inflammation. Their immune defense, which is often in overdrive due to their illnesses, also seemed to have calmed down.

Accompanying experiments on arthritic mice delivered a further surprise. After the experiment, bone loss, which typically goes along with joint inflammation, was also reduced.

Still, radon is in no way harmless and may cause lung cancer in higher doses. How can this same gas have beneficial effects, mitigate inflammation and strengthen bones?

Its advantages for humans and mice have not yet been confirmed beyond all doubt, and further experiments are necessary. But biologist Fournier is reasonably sure that her results point in a new direction: "In low doses, radiation works differently than we had expected," she says.

Esoteric Radon Baths

Thirty years after Chernobyl, that is a surprising finding. Three decades ago, half of Western Europe was contaminated with weakly radioactive precipitation. The public at large was taught to view the ubiquitous radioactivity as particularly insidious.

But now, apparently not everything that gives off radiation is bad after all. The body seems to be able to cope with low doses of radon. "We are continuing to search for damage to the genome," says Fournier, "but so far we aren't seeing anything."

Radon baths had previously been considered curiosities of empirical medicine, often viewed suspiciously as esoteric. Yet they've been around for quite some time. As early as a century ago, the first such spa retreats advertised their supposedly healing rays. But after two atomic bombs were dropped on Japan and several reactor disasters, radioactive treatment came into disrepute. Researchers suspected that, in the best case scenario, it was the heat of the tunnels that had given the patients temporary respite.

DPA

Patients here lie in Germany's only radon bath in the town of Bad Kreuznach.

The official message remains unyielding: The iron-clad rule is that radioactivity can be dangerous, even in small doses. There is no threshold for harmlessness. Even a single damaged cell could eventually become a tumor.

That standard measure of risk largely comes from a study launched in 1950, after the atomic bombs dropped on Hiroshima and Nagasaki. That year, a study of 86,000 survivors began, and is ongoing today. It demonstrated that the risk of cancer rises along with the radiation dosage.

Statistically, though, the effect of radiation only becomes apparent at a relatively high dosage -- at about 100 millisieverts, as the unit biologists use to measure the effects of radiation on the body is called. That is 50 times as much as a person receives each year in Germany from natural background radiation.

Starting from 100 millisievert, the danger becomes fairly easy to predict: If 100 people are irradiated with that dosage, a heightened risk of cancer or leukemia is to be expected. But below that things get tricky. "We simply don't know how the body responds to weaker radiation," says Werner Rühm, director of the Institute of Radiation Protection near Munich.

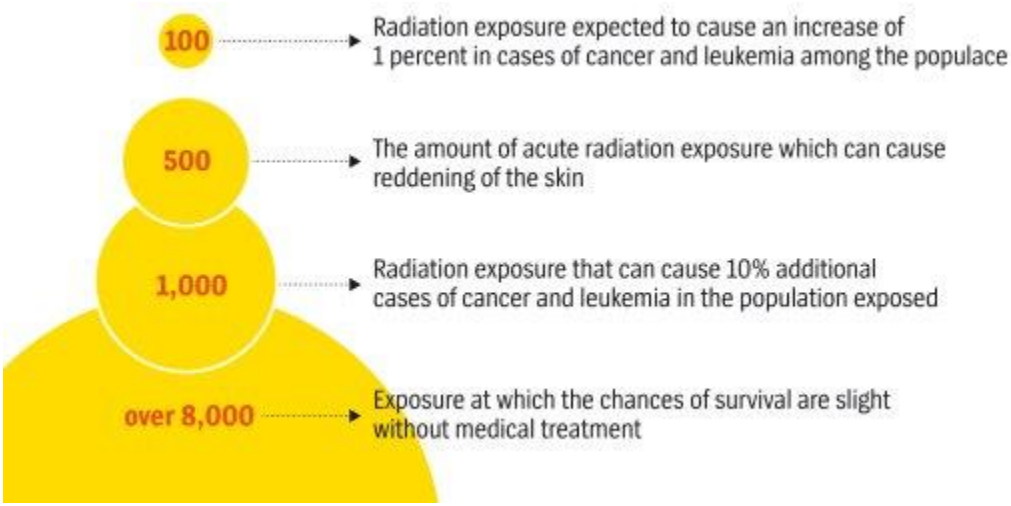
The Limits of Statistics

It's possible that as little as 10 millisieverts lead to increased rates of cancer. But that wouldn't show up in the statistics. "Cancer from other causes is simply too common," says Rühm. "Over 40 percent of people get it at some point." And the risk varies dramatically, depending on lifestyle: Among smokers, for example, it is especially high. It is hard to know if, among 1,000 cancer cases, there is one hidden case that can be traced to cell mutation caused by radiation.

"But society, of course, demands conclusions from us," says Rühm. "So to be safe, we pretend to be able to calculate the danger down to the smallest dosage."

The result is a purely mathematical value, good enough to extrapolate the rules and limits that are broadly seen as necessary. "In any case we have nothing better," says Rühm.

But it makes no sense to project these kinds of abstract figures onto an entire population in the wake of nuclear disasters, as prophets of doom are wont to do. After Chernobyl, horrific victim projections made the rounds. A very small risk, multiplied by 600 million Europeans, resulted in hundreds of thousands additional cancer cases -- a completely fictitious number. It could be that there wasn't even a single case. We simply do not know.



DER SPIEGEL

Graphic: When does radiation become dangerous?

Some researchers believe that even the fundamental assumptions behind the calculations are wrong. One of them is Reinhard Wetzker. He leads the Institute of Molecular Cell Biology at the University of Jena. "The traditional risk model cannot be upheld," he says. "It doesn't take into account that the cells can deal very well with low dosages of radiation."

The scariest consequence is damage to the genome. But for the body, even that kind of damage is not necessarily a dramatic event in the near term. Every single cell experiences it thousands of times every day. Often enough, the attack comes from inside: Cell metabolism creates aggressive molecules, so-called oxygen radicals, that continuously impair DNA.

For this reason, there are tiny maintenance machines in operation around the clock: Special proteins correct defective portions of the genome, while others mend strand

breaks. When nothing will do the trick, molecular guards initiate programmed cell death.

Misplaced Fears?

It has been widely proven how well these repair mechanisms function, as long as the radiation does not become too strong. Furthermore, cells that have been repaired once appear to be better equipped for later attacks. So are the fears misplaced?

Darmstadt biologist Fournier believes the question is misguided. "Something that strengthens the cells doesn't necessarily help a person," she says. "If it mutates, this cell can later be the source of cancer."

It is widely accepted, though, that the grim victim scenarios of the nuclear age have not been fulfilled. Indeed, its biggest catastrophes have caused surprisingly few victims.

Those who travel to Chernobyl today will feel like they are entering a nature paradise. In the area surrounding the reactor that was the epicenter of the disaster, there are once again wolves and Przewalski horses -- and even European bison and lynx have now infiltrated the uninhabited forests. There are probably more animals living in the area than before the disaster. The still-elevated radiation seems to be less damaging to nature than humans are.

The catastrophe began with the explosion of Unit 4 on April 26, 1986. Firefighters tried to extinguish the flames and to cover the open reactor core. Many of the helpers were exposed to extremely high doses of radiation and, by 1998, 39 of them had died as a result.

Whether there was an increase in cancer cases in the area after the accident is an open question, however. The statistics have not proven such a thing: Higher cancer rates in the population have thus far not been determined. That's the conclusion drawn by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) in 2011. There is however one exception: Over 6,000 children contracted thyroid cancer after the accident and 15 of them died. A large number of the cases can be tied to the radioactive iodine that the wind carried into the region in the first days. This tumor is, if identified early enough, easily treated.

An increase in thyroid cancer has also been observed in the area surrounding Fukushima's destroyed nuclear reactor. Last year around 300,000 people who were 18 or younger at the time of the disaster were examined. Researchers found 137 cases. Yet no one knows how many of these tumors were detected because this was the first time a thorough screening had been undertaken.