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CT Scans Can Expose The Body To Radiation Levels More Than 1000 Times Greater Than a Standard X-Ray

CT (computed tomography) scans are now a well established medical imaging procedure which both the government and the scientific community have confirmed increases cancer risk. CT scanners bombard the human body with radiation levels more than 1000 times greater than a standard x-ray. They damage DNA and create mutations that spur cells to grow into tumors.



Currently, more than 80 million CT scans are performed annually in the United States, around half in women, reflecting the large number of individuals who are exposed to this source of radiation. Thought leaders in radiology are often quoted as estimating that 30% or more of advanced imaging tests may be unnecessary, and while there are few scientific data to precisely estimate the amount of overuse, many radiologists believe the proportion may be even higher.

Doctors have always assumed, however, that the benefits outweigh the risks. The x-rays, which rotate around the head, chest or another body part, help to create a three-dimensional image that is much more detailed than pictures from a standard x-ray machine. But a single CT scan subjects the human body to between 150 and 1,100 times the radiation of a conventional x-ray, or around a year's worth of exposure to radiation from both natural and artificial sources in the environment.

A study in the [Journal Korean Medical Science](#) showed that some patients with Crohn's disease and other bowel disorders are receiving cumulative effective doses of greater than 75mSv (microsieverts). 1 mSv is the dose produced by exposure to 1 milligray (mG) of radiation. 10mSv is equivalent to 1 rem or 1 rad. If we compare the doses these patients were receiving to that of conventional X-rays of the extremities (.001mSv) there is a profound increase in exposure. This quantity of radiation exposure has been definitively correlated with increased mortality from cancer.

A handful of studies published in the past decade have rekindled concerns of cancer risk. Researchers at the National Cancer Institute estimate that 29,000 future cancer cases could be attributed to the millions of CT scans performed. That increase is linked to a growing percentage of cancers diagnosed nationwide every year. A 2009 study of medical centers in the San Francisco Bay Area also calculated an elevated risk: one extra case of cancer for every 400 to 2,000 routine chest CT exams.

The average yearly environmental exposure to radiation is approximately 3000mSv. One CT scan of the abdomen is equal to 15,000mSv. That's **5 times the yearly dose** of exposure in one sitting.

Radiation doses of more than 5000 mrem/year are considered unsafe, regardless of source. You can use our [radiation dose calculator](#) to measure the amounts you are exposed to yearly.

About 25,000 atomic bomb survivors were exposed to relatively low doses of radiation comparable to between one and three CT scans. The number of cancer cases that developed over the rest of their lives is not, however, large enough to provide the necessary statistical power to reliably predict the cancer risk associated with CT scans in the general population today. Given these difficulties, as well as renewed concerns about radiation levels and the lack of mandatory standards for safe CT exposure (in contrast to such procedures as mammography), a dozen groups of investigators around the world have decided to reevaluate the risk of CT radiation based on more complete evidence.

A growing number of clinicians and medical associations are not waiting for definitive results about health risks and have already begun figuring out how to reduce radiation levels. Two radiologists at Massachusetts General Hospital, for example, think that they can decrease the x-ray dosage of at least one common type of CT scan by 75 percent without significantly reducing image quality. Likewise, a few medical associations are trying to limit superfluous imaging and prevent clinicians from using too much radiation when CT scanning is necessary.

Unsafe at Any Dose

Radiation can cause an increase in the incidence, but not necessarily the severity, of malignant disease (e.g., cancer). For this type of effect, it is the probability of occurrence that increases with dose rather than the severity. For radiation protection purposes it is assumed that [any dose above zero can increase the risk of radiation-induced cancer](#) (i.e., that there is no threshold). Epidemiologic studies have found that the **estimated lifetime risk** of dying from cancer is greater by about 0.004% per mSv (0.04% per rem) of radiation dose to the whole body (NRC, 1990)."

Doctors argue that the amount of radiation emitted from regular medical X-rays is so low that there is no cancer risk. This flies in the face of data showing that any amount of radiation inflicts free radical damage to DNA that adversely affects our genes. Radiation-induced cancers occur in response to mutations in genes that regulate cellular proliferation.

Radiation-induced cancers have tripled in the last two decades and diagnostic imaging has been already been admitted as a cause by the U.S. government. According to a study of seven U.S. healthcare systems, the use of computed tomography (CT) scans of the head, abdomen/pelvis, chest or spine, in children younger than age 14 more than doubled from 1996 to 2005, and this associated radiation is projected to potentially increase the risk of radiation-induced cancer in these children in the future, according to a study published Online First by [JAMA Pediatrics](#).

Developing radiation-induced cancer is at higher risk for children. The reason is children are much more sensitive to radiation because of the way their cells divide. Their DNA is much more susceptible to damage. While the risk of an adult developing cancer from a CT scan is about 1 in 2000, for a child the risk goes up to 1 in 500. Compounding the problem, it's not always easy to tell when a CT scan's levels are in the danger zone.

Findings from the Institute of Medicine (IOM) have found that CT (computed tomography) scans are a major cause of the breast cancer they are supposed to detect, and women should avoid all 'just-in-case' and routine screening, a [US government report concluded](#).

"Developing tissues in children are more sensitive to radiation and their longer expected life spans also allows additional time for the emergence of detrimental effects," says co-author, Reza Fazel, M.D., M.Sc., a cardiologist at the Emory School of Medicine.

While doctors state that radiation is safe as long as it is kept at a certain level, it can be argued that even the smallest particle of radiation inflicts DNA damage. For radiation to be safe, all of the DNA damage must be repaired perfectly. Any damage not perfectly repaired creates mutations, any one of which has the potential to lead to further mutations that cause cancer. In fact, the lowest possible dose of radiation is not only unsafe, but also does far more damage than previously thought and is indeed mutagenic. In June 2005, the National Academy of Sciences released a report stating that even very low doses of radiation can cause cancer. In its report, the National Academy defined low dose as being as low as “near zero.”

While the researchers indicated that the cancer risk from any given X-ray is very small, their report stated: **“Risk would continue at a linear fashion at lower doses without a threshold and that the smallest dose has the potential to cause a small increase in risk to humans.”**

The National Academy of Sciences stated that there is no radiation threshold below which exposure can be viewed as harmless. This finding means that everyone who has had a medical X-ray is at some increased risk for developing leukemia or a solid cancer. Considering how many X-rays people are exposed to in a lifetime, the risk of developing cancer from the cumulative effects of so many X-rays and CT scans is a serious concern.

John W. Gofman, MD, PhD, was Professor Emeritus of Molecular and Cell Biology at the University of California, Berkeley and one of the world's most distinguished medical and nuclear scientists. His research showed that **no amount of radiation--no matter how small--is safe.**

Dr. Gofman's data analysis conflicts with other reports from the standpoint that he believed far more cancers are caused by medical radiation. Further, he came to the conclusion that exposure to radiation from medical procedures is a “highly important (probably principal) cause” of cancer and ischemic heart disease in America.

"For many patients an MRI is the better choice," said Radiologist Isabella Montera. Unlike CT scans, which use X-rays, MRI scans use powerful magnetic fields and radio frequency pulses to produce detailed pictures of organs, soft tissues, bone and other internal body structures. Differences between normal and abnormal tissue is often clearer on an MRI image than a CT. There there is no radiation involved in an MRI scan. "It can be a noisy exam and takes typically a longer period of time than CTs," said Montera

No matter how much clinicians lower the levels of radiation used in individual CT exams, however, a problem remains. Many people still receive unnecessary CT scans and, along with them, unneeded doses of radiation. Bruce Hillman of the University of Virginia and other researchers worry that emergency room physicians in particular order too many CT scans, making quick decisions in high-pressure situations. In a 2004 poll 91 percent of ER doctors did not think a CT scan posed any cancer risk. Doctors and their patients may finally be getting the message. A 2012 analysis of Medicare data suggests that the previously rampant growth in CT procedures is flattening out and possibly waning.

Sources:

[ratical.com](#)

[scientificamerican.com](#)

[jamanetwork.com](#)

[medstak.com](#)

[lef.org](#)