* In 2009, National Cancer Institute researchers estimated that the 72 million [CT scans](http://www.health.com/health/gallery/0,,20852416,00.html) performed in 2007 could lead to as many as 29,000 future cases of cancer. And a couple of years ago, when the Institute of Medicine looked broadly at the environmental causes of breast cancer, it concluded that one factor that’s strongly associated with risk of developing the disease is ionizing radiation.
* CT scans can, in fact, be lifesaving. “They’ve revolutionized medicine in almost every area you can imagine, including helping prevent unnecessary exploratory surgeries and diagnosing and treating cancers, heart disease and stroke
* Limiting exposure to medical radiation should be on every woman’s
* Yet the tests are widely overused, research finds. “About a third of CT scans are clinically unnecessary or could be avoided by using conventional X-rays or an imaging test that doesn’t use radiation, like ultrasound or MRI
* Price and time can also be a factor since CT scans are cheaper and faster than an MRI
* When you receive a [traditional X-ray](http://www.health.com/health/gallery/0,,20733029,00.html), a small amount of radiation passes through your tissues in order to create a two-dimensional image of your insides in shades of gray. Air is black because it doesn’t absorb any X-rays, while bones are white because they absorb a lot, and organs are somewhere in between. CT scanners, on the other hand, rotate around the body, sending numerous X-ray beams (and multiple times the amount of radiation) from a variety of angles. A computer processes the data to create three-dimensional pictures, providing a far more detailed view. “CTs allow us to see behind and around structures in the body in three dimensions with exquisite resolution,” Brenner says. As a result, they’re an indispensable tool in diagnosing all sorts of frightening health problems, such as finding small, early cancers (particularly in the lungs, liver and kidneys) or spotting internal injuries after a serious accident.
* They can detect differences between normal and abnormal tissue about 1,000 times better than a traditional X-ray
* But the ease and accuracy of CTs has also fueled an alarming level of overuse… Yes, this is a great test, but is it really necessary?’ If you have a CT when it’s not necessary, it won’t do any good—which means it can only do harm
* CT is done first to create anatomic pictures of the organs and structures in the body, and then PET is done to create colored pictures that show chemical or other functional changes in tissues. provide a more complete picture of a tumor’s location and growth or spread
* companies that manufacture scanners are developing new technology to lower the radiation doses
* If you’re smaller or thinner, technicians can often get a clear image at a lower dose. (The bigger your body, the more radiation you require, since fat absorbs some of the beams.)
* Avoid unnecessary radiation from even low-level sources, like dental X-rays, which you probably don’t need every year unless you have ongoing problems with tooth decay.
* The idea is not to refuse all medical radiation but to do your best to discriminate between what’s essential and what’s not
* Women are particularly vulnerable to ionizing radiation. In childhood, females are more susceptible to radiation than males, largely due to superficial and dormant breast tissue. In the reproductive years, concerns are focused on preventing the inadvertent irradiation of a fetus as well as managing radiation exposure in the context of a declared pregnancy. During lactation, special procedures need to be followed in the context of some nuclear medicine examinations. It is important, therefore, that radiologists understand the background of and rationale for these concerns and are cognizant of why they have become so important in the imaging of female patients.
* accumulating evidence points to the long-term carcinogenic effects of ionizing radiation on children, adolescents, and medical professionals. Several medical specialists are subjected to regular radiation exposure, including nuclear medicine physicians, radiologists, orthopedic surgeons, and interventionists. Thus, there has been increasing interest on the effects of low-dose radiation for this population
* Use of CT scans in children to deliver cumulative doses of about 50 mGy might almost triple the risk of leukaemia and doses of about 60 mGy might triple the risk of brain cancer. Because these cancers are relatively rare, the cumulative absolute risks are small: in the 10 years after the first scan for patients younger than 10 years, one excess case of leukaemia and one excess case of brain tumour per 10,000 head CT scans is estimated to occur.
* Rarely, people have an allergic reaction to the contrast medium. This most often starts with weakness, sweating and difficulty breathing. The dye may be given by mouth, injected into a vein, given by [enema](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000044204&version=Patient&language=English), or given in all three ways before the procedure. The [contrast dye](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000409764&version=Patient&language=English) highlights specific areas inside the body, resulting in clearer pictures. [Iodine](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000044548&version=Patient&language=English) and [barium](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000046514&version=Patient&language=English) are two dyes commonly used in CT.

Ask these key questions—especially if your doc suggests a CT scan:

1. Will the outcome of the test change the treatment I’m likely to receive?” If the answer is no, the test may not be necessary
2. Are there alternatives without radiation, like ultrasound or MRI?” In some cases, such as many abdominal CT scans, other scans work as well or better
3. If you’ve just had a scan at another facility, ask, “Is there a reason to repeat the scan I just had?” “It doesn’t make sense to do tests twice, yet it does happen.”
4. If a CT scan is crucial, ask, “Is there a way to minimize the dose?” Doctors may be able to use a lower-dose technique
5. After a CT scan, ask, “How much radiation was I exposed to?

Applications:

CT is used in cancer in many different ways:

* To detect abnormal growths
* To help diagnose the presence of a tumor
* To provide information about the [stage](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000045885&version=Patient&language=English) of a cancer
* To determine exactly where to perform (i.e., guide) a [biopsy](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000045164&version=Patient&language=English) procedure
* To guide certain local treatments, such as [cryotherapy](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000045985&version=Patient&language=English), [radiofrequency ablation](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000044865&version=Patient&language=English), and the implantation of radioactive seeds
* To help plan [external-beam radiation therapy](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000046751&version=Patient&language=English) or surgery
* To determine whether a cancer is responding to treatment
* To detect [recurrence](https://www.cancer.gov/Common/PopUps/popDefinition.aspx?id=CDR0000045861&version=Patient&language=English) of a tumor

**How much radiation you get from…**

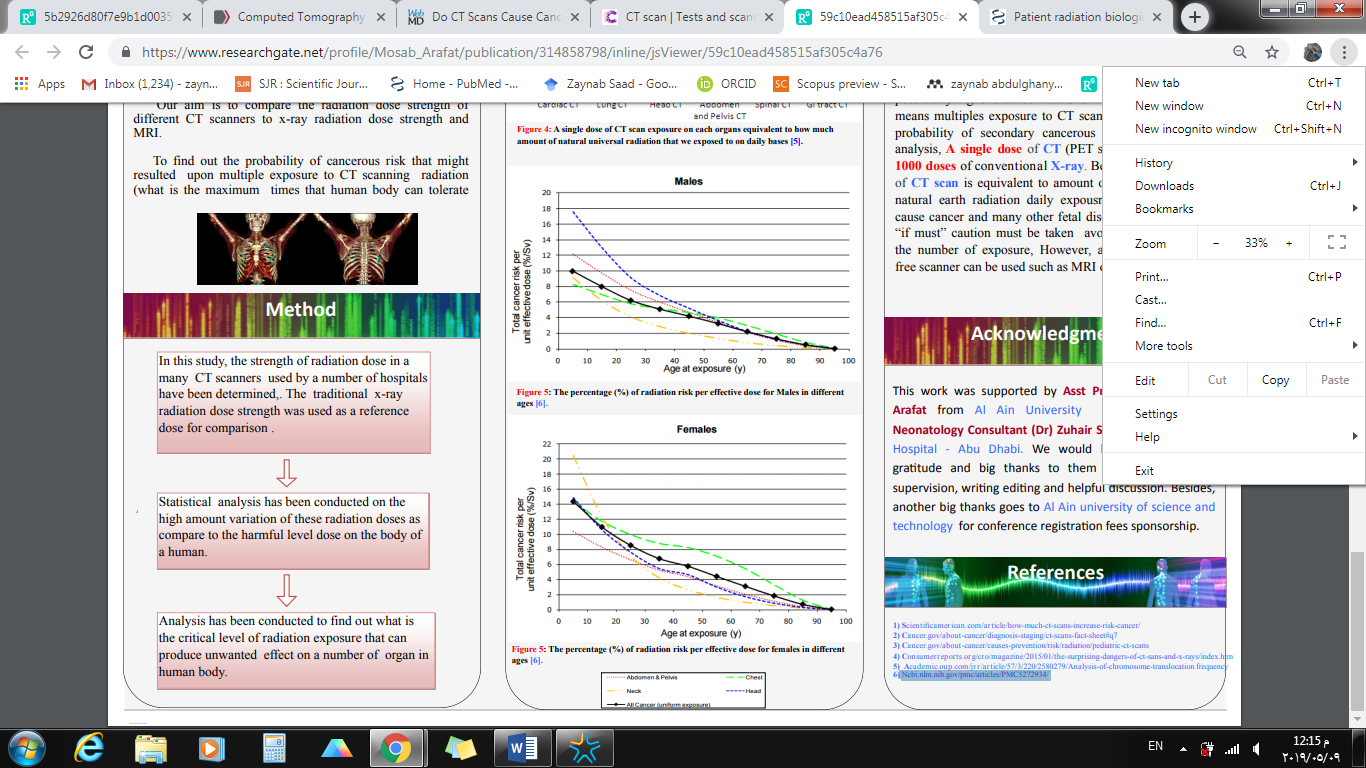
* Bone-density scan: 0.001 mSv
* Dental posterior bite-wing X-ray series (two to four images): 0.005 to 0.055 mSv\*
* Panoramic dental X-rays (standard single image): 0.009 to 0.024 mSv\*
* Single chest X-ray: 0.1 mSv
* Digital mammogram: 0.4 mSv
* Average yearly dose from the sun and other environmental sources: 3 mSv
* Chest CT: 7 mSv
* Virtual (CT) colonoscopy: 10 mSv
* PET/CT (often used to diagnose cancer): 25 mSv

Units used to measure radiation exposure: (These units relate to different ways of describing ionizing radiation exposure)

1. absorbed dose (measured in grays [Gy] or rad): is simply a measurement of the total amount of radiation energy absorbed per volume of tissue exposed. provides little information on biologic effects. it can be used to compare the different amounts of radiation to which the whole body has been exposed from different imaging sources, it bears no relation to the type of tissues involved
2. effective dose (measured in sieverts [Sv] or rem): is a much more relevant measurement, given that a weighting factor is applied to the radiation dose; this factor is determined on the basis of the tissue or organs exposed as well as the type of radiation involved.

The weighting factor represents the proclivity of a tissue to develop stochastic effects, with (for example) breast (0.12) and ovaries (0.08) having a greater weighting factor than brain or salivary glands (both 0.01).

Thus, identical ionizing radiation exposures to the breast and head might have similar absorbed doses, but the breast exposure would have a much higher effective dose, reflecting the increased cancer risk.



**Your anti-radiation diet**

* Antioxidants from food can sop up the free radicals that cause DNA damage.
* And some research has hinted that what you eat may shield your body from radiation’s harmful effects. A study mentioned who tend to be exposed to elevated levels of ionizing radiation, found that those with diets highest in vitamins C and E, beta-carotene, beta-cryptoxanthin (found in pumpkin, papaya and red peppers) and lutein-zeaxanthin (in leafy greens, egg yolks and squash) had fewer biomarkers of cumulative DNA damage.
* -Researchers in Toronto have recently shown that taking antioxidants before a scan can reduce the number of DNA breaks caused by the radiation.
* “In light of what we’ve found, making sure you have a diet rich in antioxidant-packed fruits and vegetables could be beneficial.”

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