

# The Dangers of Medical Radiation

It is one of the ironies of medicine that radiation, as in x-rays, CT scans, radiation therapy and nuclear medicine can cause cancer yet can be used to detect and treat cancer. Perhaps because of this irony, most of us know very little about radiation dangers. Often we simply trust our doctors and caregivers to do what is right. In the majority of cases, this mutual trust system works well.

## **However, what happens when the system fails?**

A recent study suggests that 15,000 people are projected to die within the coming years from the radiation they received from x-ray procedures!

## **How can we protect ourselves?**

There have been reports of patients experiencing serious radiation overdose causing reddening of the skin, hair loss, cataract formation, or burns that cannot heal.

## **A lack of knowledge will not protect you!**

Radiation cannot be seen, felt, tasted or heard and organ and tissue damage from radiation, and radiation-induced cancer, may take years or even decades to manifest.

## **However, the dangers are real!**

Last year 3000 patients were treated for serious radiation burns at a wound care facility.

## **Read how to protect yourself from medical radiation!**

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**DLite Press**

P.O. Box 1644

New York N.Y. 10150

<http://www.dlitepress.com>

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**The dangers of Medical Radiation**

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DLite Press/ published by arrangement with the author

PRINTING HISTORY

DLite Press/ December 2010

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Cover design and digital illustration

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For purchase information contact:

Peltrovijan Publishing

[peltrovijan@yahoo.com](mailto:peltrovijan@yahoo.com)

P.O. Box 13

Shrub Oak NY 10588

eBook 978-0-9829774-2-2

Printed in the United States of America

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# The Dangers of Medical Radiation

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Olive Peart has taught radiography students for over ten years. She writes regular columns for radiologic journals and newsmagazines. Her published works include: *Spanish for Professionals in Radiology*; *Lange Mammography Examination*; and *Mammography and Breast Imaging-Just the Facts*. She is also the author of two young adult novels *The Intruders & Linked*.

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## **INTRODUCTION**

It is one of the ironies of medicine that radiation, as in x-rays, can cause cancer yet can be used to treat cancer. Perhaps because of this irony, most of us know very little about radiation dangers. Often we simply trust our doctors and care givers to do what is right. In the majority of cases this mutual trust system works well, but what happens when the system fails.

A recent study suggests that 15,000 people are projected to die within the coming years from the radiation they received from x-ray procedures!

There have been reports of patients experiencing acute radiation effects including reddening of the skin, hair loss or cataract formation, all resulting from the overuse of medical radiation.

The amount of radiation patients are exposed to have dramatically increased over the past twenty years. A new study by the National Council on Radiation Protection and Measurement (NCRP) concluded that Americans were exposed to seven times more radiation from medical procedures in 2006 than in the 1980s.

Organ and tissue damage from radiation and radiation-induced cancer may take years, even decades, to manifest. It is therefore seldom that a radiation mistake will result in a law suit. Yet, in 2009 the nation's largest wound care company treated 3000 patients with serious radiation burns. Many required hyperbaric oxygen chambers to promote healing.

The problem is that in many states the people who operate radiation-producing equipment do not need a license. That means the person taking your x-ray, CT scan (CAT scan), nuclear medicine scan or giving you radiation therapy has little or no training. Even worse, often the doctor or physician is unaware of the dangers of radiation and the medical physicist, who is responsible for calibrating the radiation emitting equipment, has no license or no certification.

Many states do not require the reporting of errors and even if an error is reported the penalty is nonexistent or not enforced.

The American College of Radiology notes that only about 20 percent of radiotherapy units in the country are accredited.

We worry about radiation dose at airport security systems. We worry about electromagnetic radiation from power lines and cell phones yet we are willing to tolerate the massive doses of radiation given to us by our health care providers. Americans are getting the

One of the first x-ray images. Anna Bertha Röntgen's hand

Source: wikipedia:en.



most medical radiation in the world. The US accounts for half of the most advanced procedures that use radiation. A report documents a New Hampshire teen who was about to get a CT scan to check for kidney stones. Fortunately, the radiologist discovered the child had already had 14 CT scans for previous checks of kidney stones. This child is now a cancer risk!

It's hard for us to conceive of the danger of something we cannot see, feel or hear. However, the effects are real and unfortunately, radiation dose never goes away. For a patient age seventy this may not be a significant factor but think of the 2-year-old or even the 10-year-old. The effects of radiation will simply accumulate in their bodies showing up years later as radiation induced cancer.

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## WHAT IS RADIATION?

X-radiation was first discovered in 1895 by Wilhelm Conrad Röntgen (1845–1923). In 1895 while conducting experiments with electric currents passed through a vacuum tube, Röntgen noted that a nearby fluorescent screen glowed when the current was being passed. When the current was switched off the screen stopped glowing. Röntgen recognized that the tube was emitting a strange and unusual ray. After spending weeks trying to determine exactly what he had discovered, Professor Röntgen brought his wife into his lab. He asked her to place her hand on a photographic plate and after turning on his new machine, he aimed it at her hand. He later developed the plate and produced the first known radiograph. These new rays were termed Röntgen rays, later called x-rays, and scientists and the public soon recognized the potential of these new rays, capable of penetrating the body.

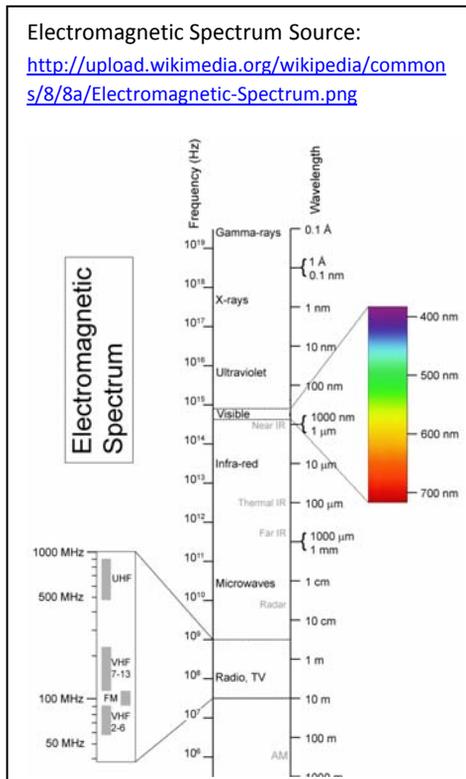
Within a few years of the discovery of x-rays, three other scientists Henri Becquerel (1852–1908), Pierre Curie (1859–

1906) and Marie Curie (1867–1934) were able to isolate radium from uranium allowing the use of even higher energy radiation to kill cancer cells. Further experiments lead to the discovery of radioactivity, the property of certain elements to spontaneously emit rays or subatomic particles from matter. Today, these high-energy rays are used in radiation therapy to kill or treat cancer.

## The Electromagnetic Spectrum

X-rays are electromagnetic radiation. All electromagnetic radiation travels at the speed of light although they are photons with various energy levels. There are many types of electromagnetic radiation and they can be grouped together to make what is called the electromagnetic spectrum. In the middle of the spectrum is visible light (red, orange, yellow, green, blue, and violet). Visible light is the smallest part of the spectrum and

the only portion that we can see. At the long wavelength, low energy end of the spectrum are radio and TV waves. These are called radiofrequency (RF) waves. They are commonly used in magnetic resonance imaging (MRI) and to broadcast signals to and from television and radio stations. Other long wavelength rays are microwaves and infrared waves. Microwaves are used in cellular telephone communication, highway speed monitoring and in food preparation. With



slightly higher photon energy, infrared light is given off by the sun. Objects subjected to infrared light will increase in temperature. Despite the variety of rays at this end of the spectrum, if they are carefully used these rays are all relatively safe.

However, as the wavelengths get smaller the photon energy of the rays increase and there is a resulting increase in danger. After visible light, there is ultraviolet light, x-ray and gamma-rays. Ultraviolet light is also given off by the sun and because of its interaction with molecules, it is responsible for sunburns and can cause skin cancer. X-rays have short wavelengths in the range of 0.01 to 10 nanometers and energies in the range 120 electron volts (eV) to 120 kilo electron volts (keV). X and gamma rays have the power to disrupt or ionize matter by interacting with electrons and atoms. This has the potential to cause harm to living tissue. The name given to these high-energy radiation photons is ionizing radiation.

The machines used to take x-ray images can produce x-rays with energies as high as 120,000 electron volts. The x-rays used for cancer treatment are much more powerful, with energies of between 2 million and 20 million electron volts. The basic difference between these two types of photons is their origin. The most basic of all matter is the atom and in the center of the atom is the nucleus. X-rays are emitted by electrons outside the nucleus of an atom, while gamma rays are emitted by the nucleus of the atom and are associated with alpha or beta particle emission.

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