

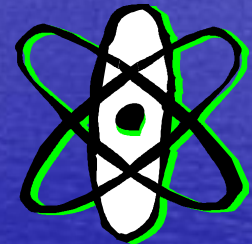
RADIATION BIOLOGY FACTS

IT' Your Right To Know



Dr. JAMES NOL

Chief Medical Radiation Practitioner
Radiology – Radiobiology



Operations Director
BMDH Imaging

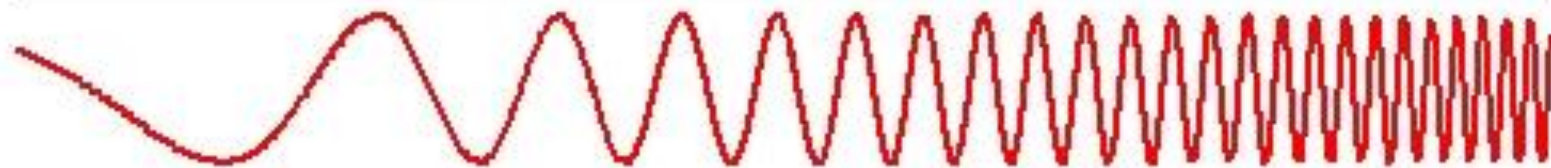


Sources of Radiation

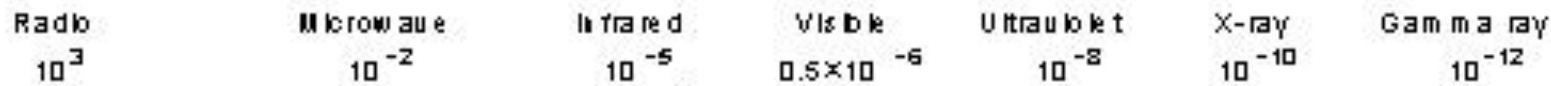
The Full Range of
Electromagnetic Frequency
“EM”

Electromagnetic Spectrum

Penetrates Earth's Atmosphere?



Radiation Type
Wave length (m)

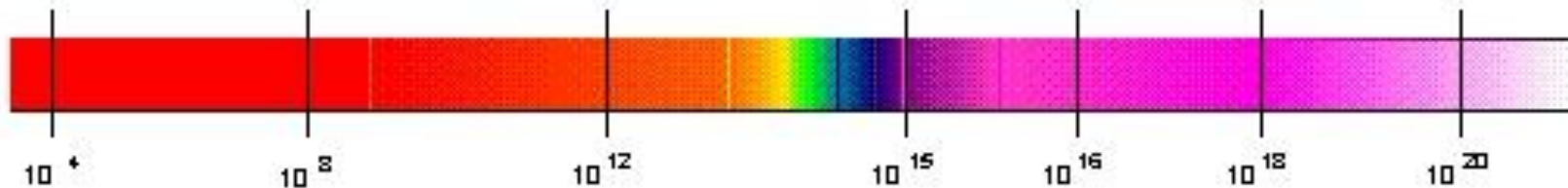


Approximate Scale
of Wave length



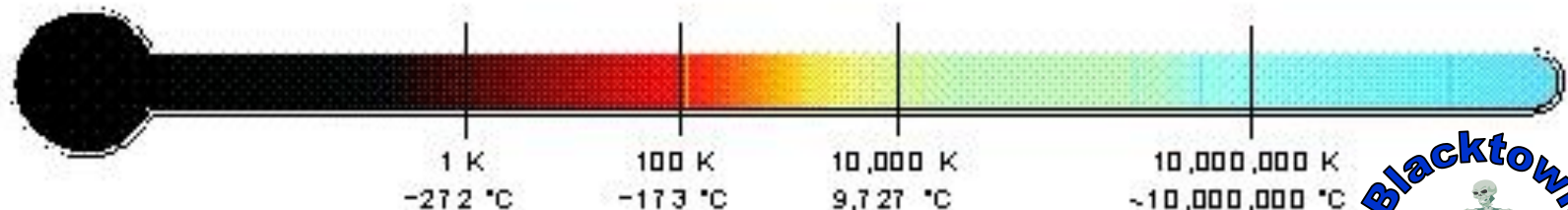
Buildings Humans Butterflies Needle Point Protozoans Molecules Atoms Atomic Nuclei

Frequency (Hz)



10^4 10^8 10^{12} 10^{15} 10^{16} 10^{18} 10^{20}

Temperature of
objects at which
this radiation is the
most intense
wavelength emitted



1 K -273 °C 100 K -173 °C 10,000 K 9,727 °C 10,000,000 K ~10,000,000 °C

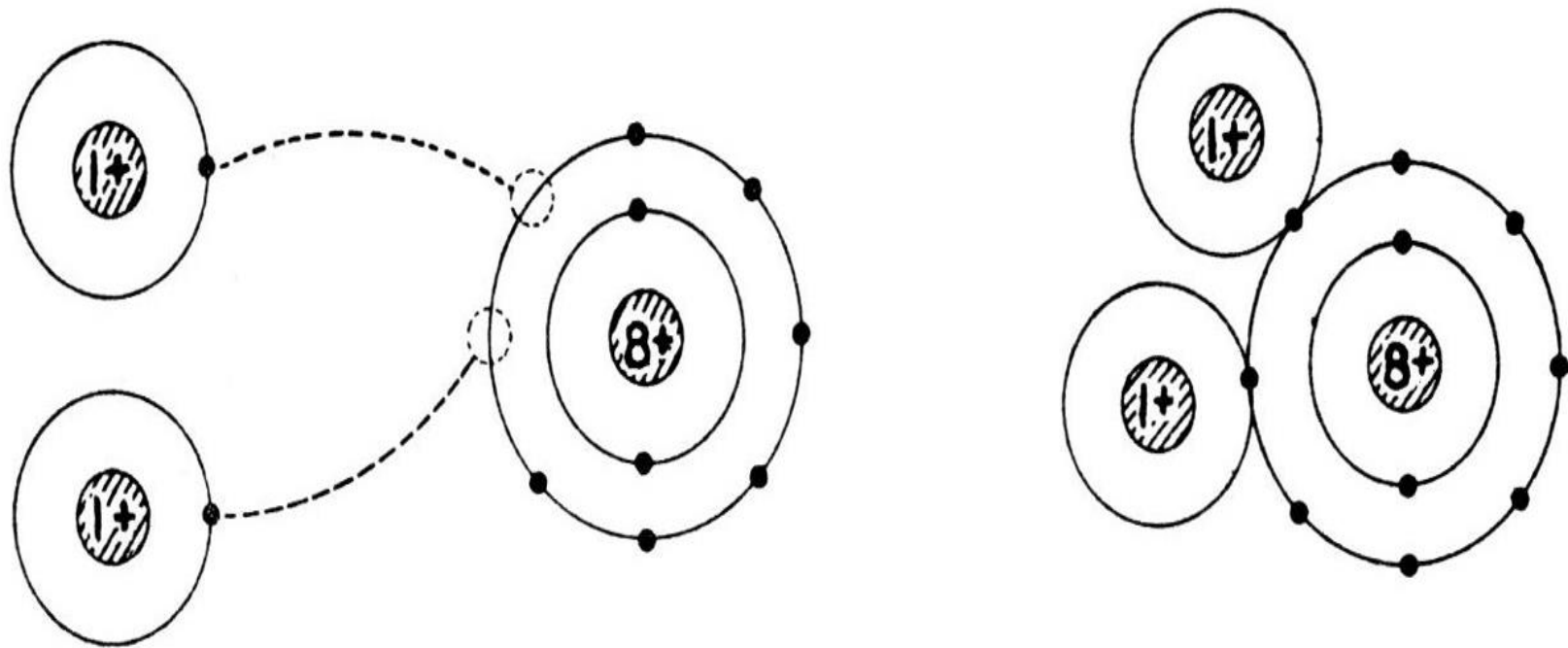
CANCER Caused by exposure to UV



m08-0161_dsot2_girl.mpg



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2 HYDROGEN
ATOMS

+

1 OXYGEN
ATOM



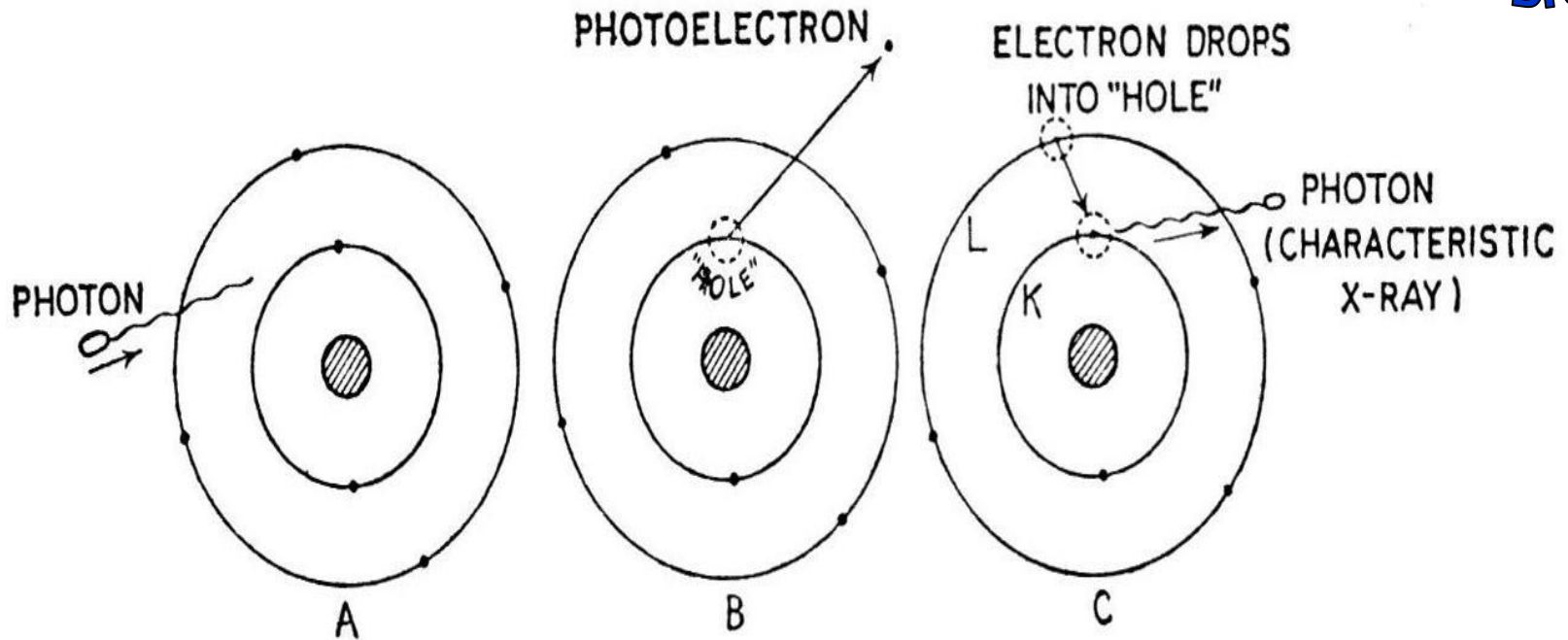
1 WATER
MOLECULE

valence +1

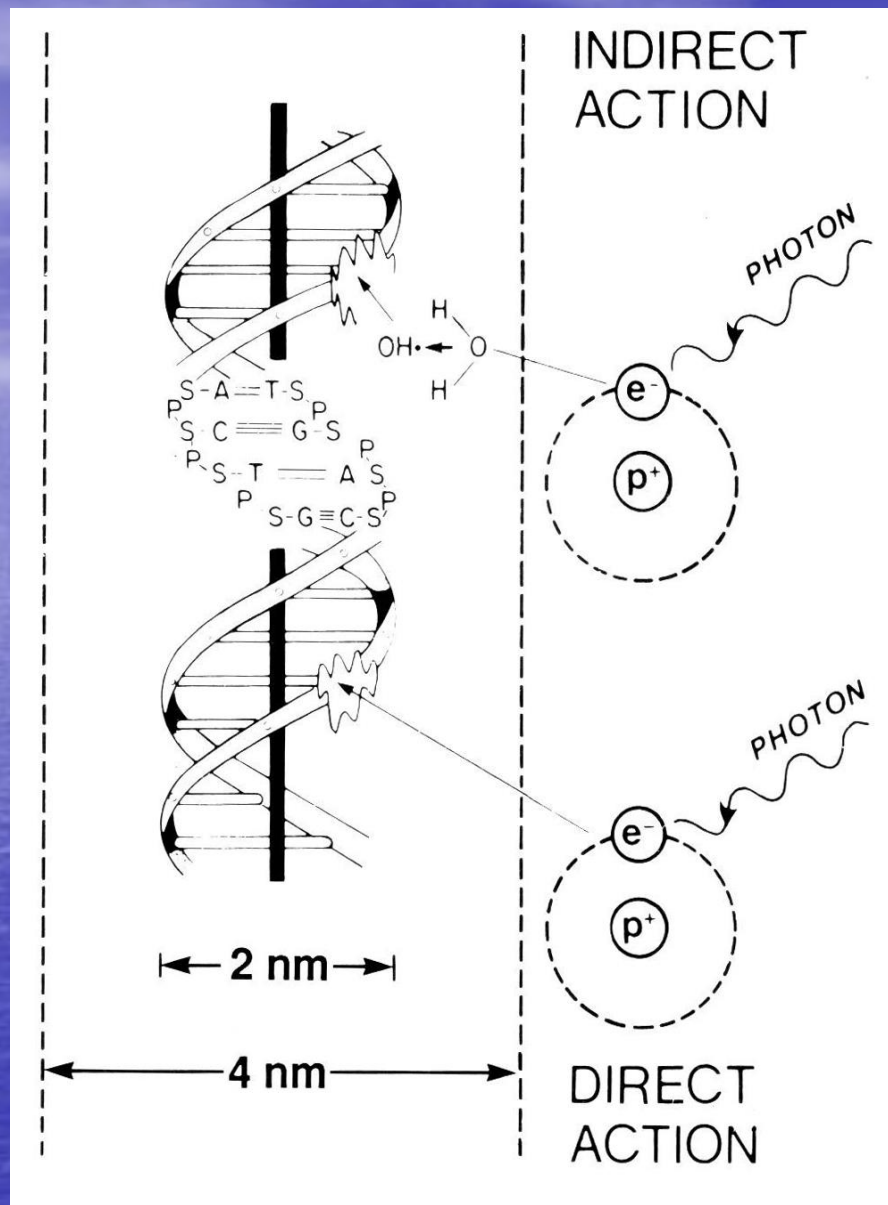
valence -2

H_2O

Formation of Molecules

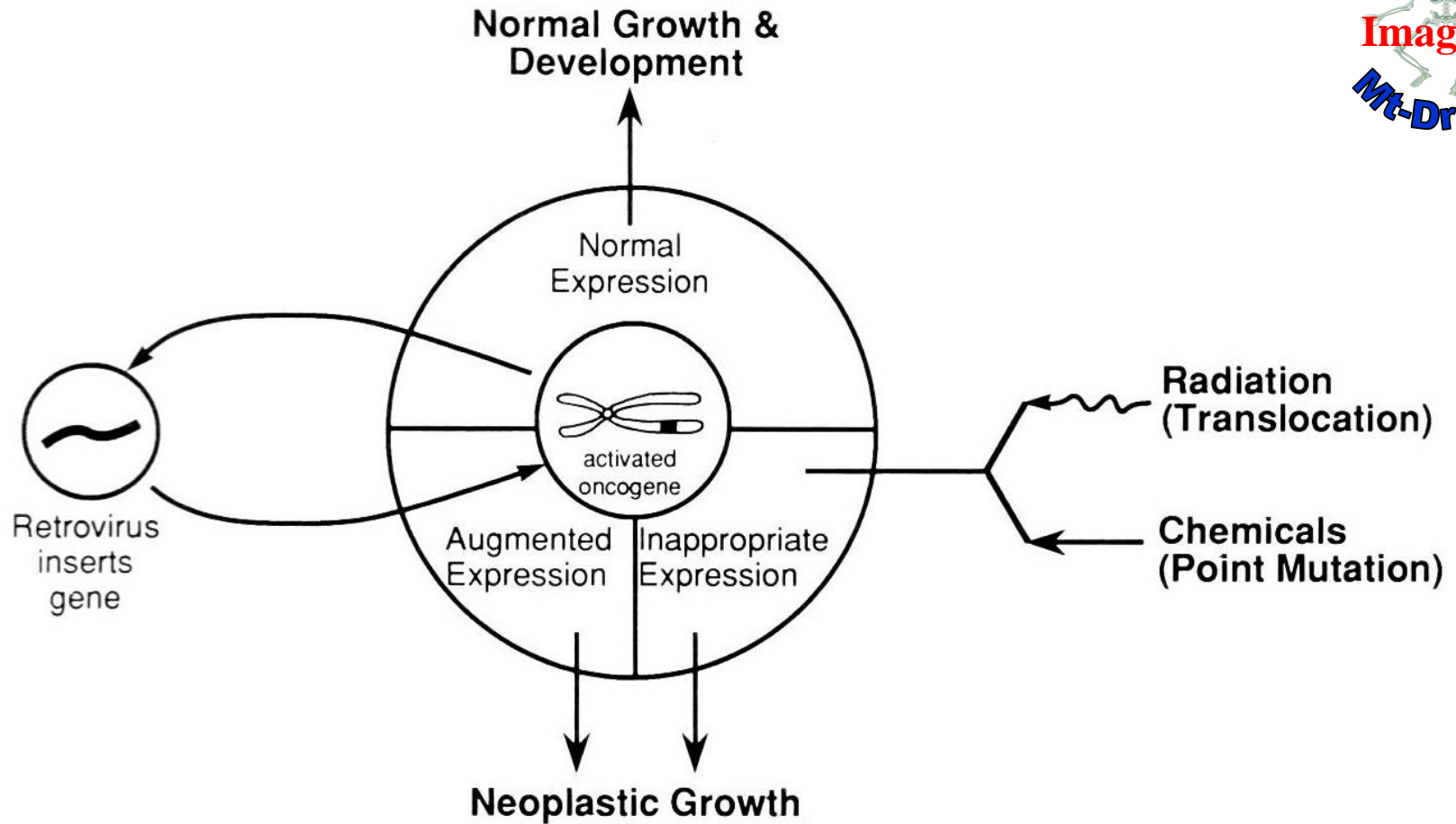


Formation of Characteristic X-Ray



Biological Impact of Ioninsing Radiation





Outcome path in genetic change.

RADIATION DOSES ARE CUMULATIVE

The simple concept is
Damaged or mutated cells produce
identical damaged cells carrying the
mutated genes.



MAGNITUDE

Exposure from Medical **X-ray** and **CT** Examinations

During X-Ray Examinations
1 Square centimeter
is exposed to **15 Million** photons

Radiation Risks



Facts

Delivered Dose

1 Body CT = **350** PA Chest X-Ray

Radiation Risk

1 Body CT = **1500** PA Chest X-ray

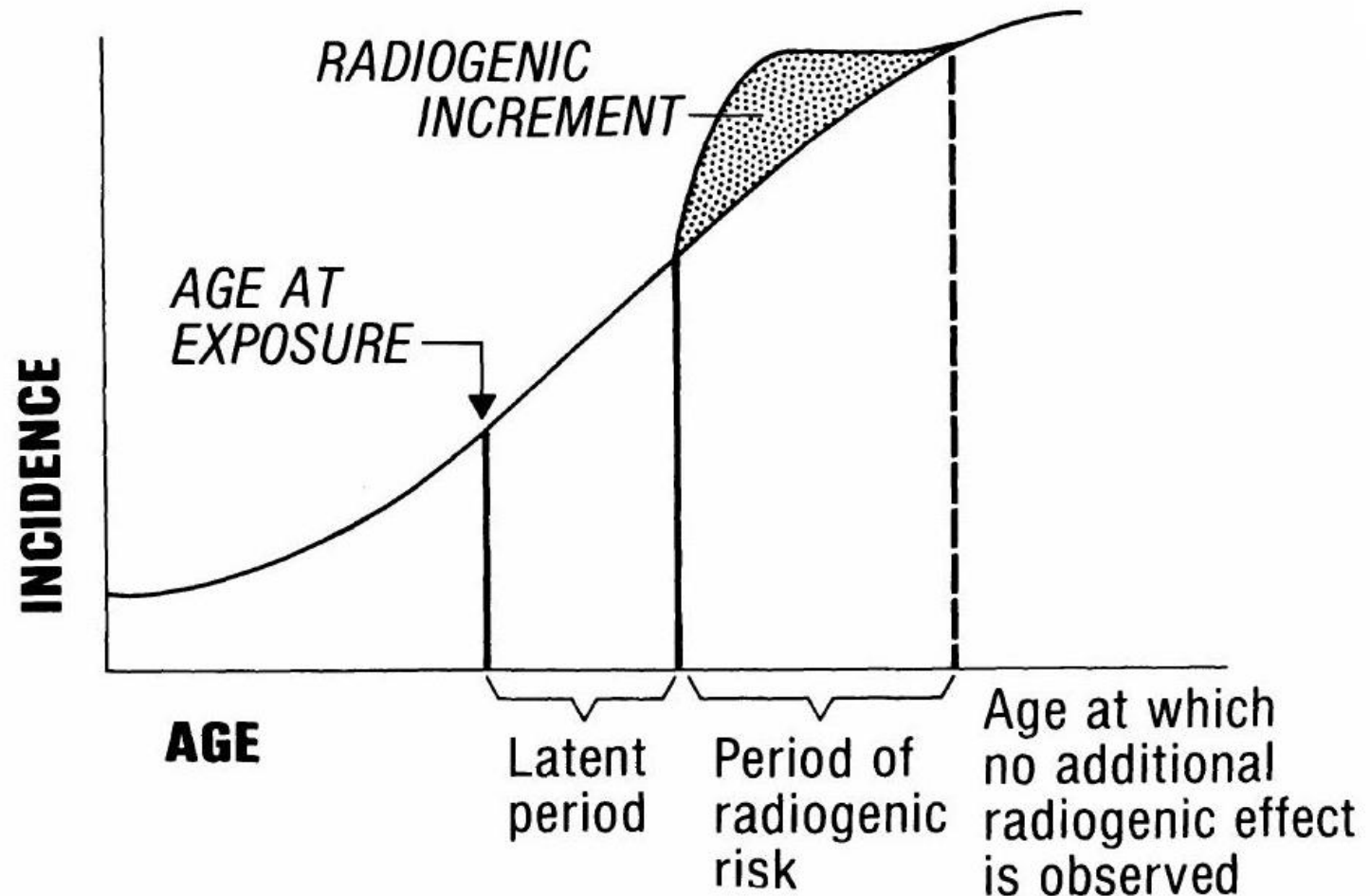
RCR 1988

Delivered Dose

KUB = **50** PA Chest X-Ray

Lumbar Spine = **200** PA Chest X-Ray

Stochastic effects may not be apparent for up to 40 years



Radiation Risks



Facts

The estimated risk of cancer death for those undergoing abdominal CT is **12.5/10,000** population

All Genetic Changes and diseases produced or triggered by Ionising radiation **IN BETWEEN** are not counted for

CT Radiation



Facts

Number of deaths attributable to CT during 1 year in the USA is **700** for head CT and **1,800** for abdominal CT.

Of these deaths, approximately **170** and **310**, respectively, are attributable to Pediatric CT examinations.

Brenner et al, 2001.

CT Radiation



Facts

80 million CT examinations per year in the USA.

5 million CT examinations per year in Australia

10% annual growth rate in the market for CT
scanners.

Kalra et al, 2004.



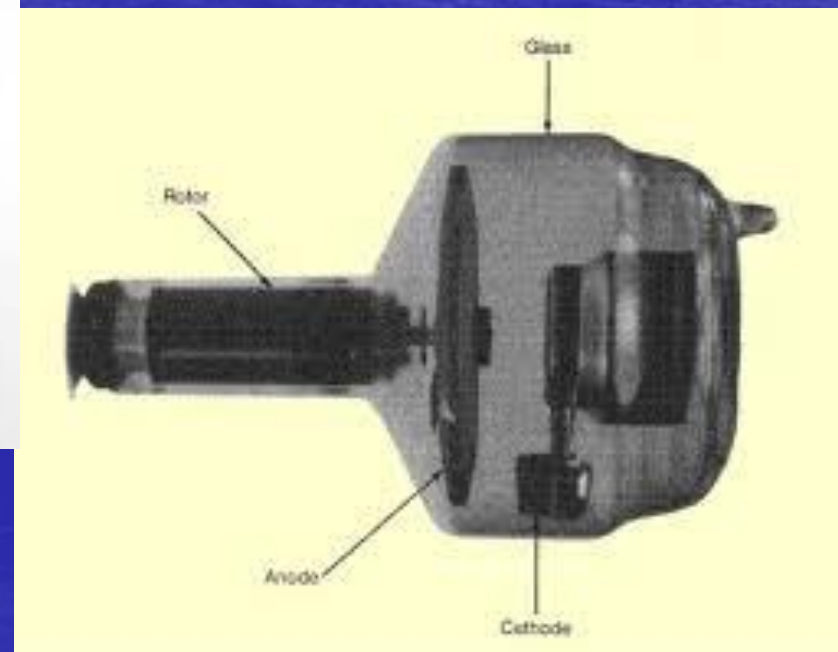
MRI and US do not generate IONISING Radiation.

Its believed that heating is the only side effect

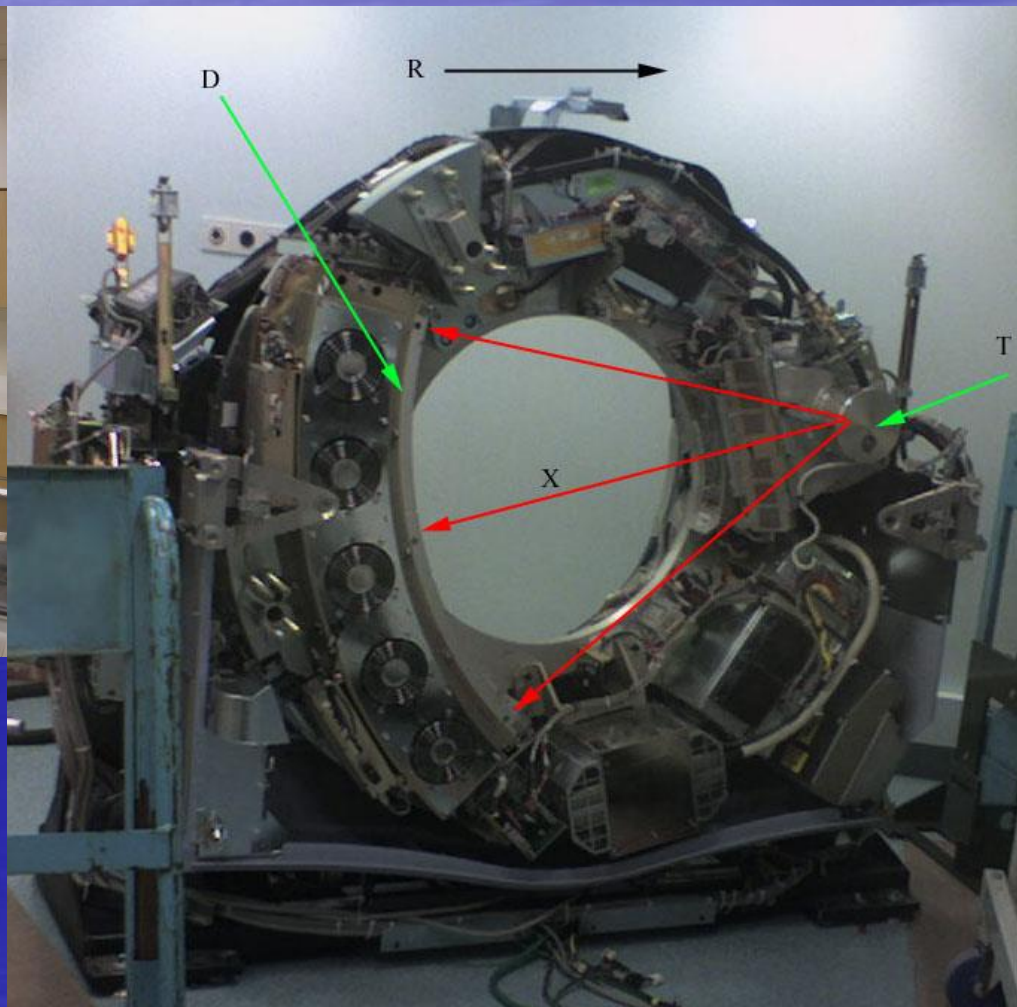
However a research conducted in Western Australia showed that U/S examination effects the weight of the unborn babies.



X RAY Unit



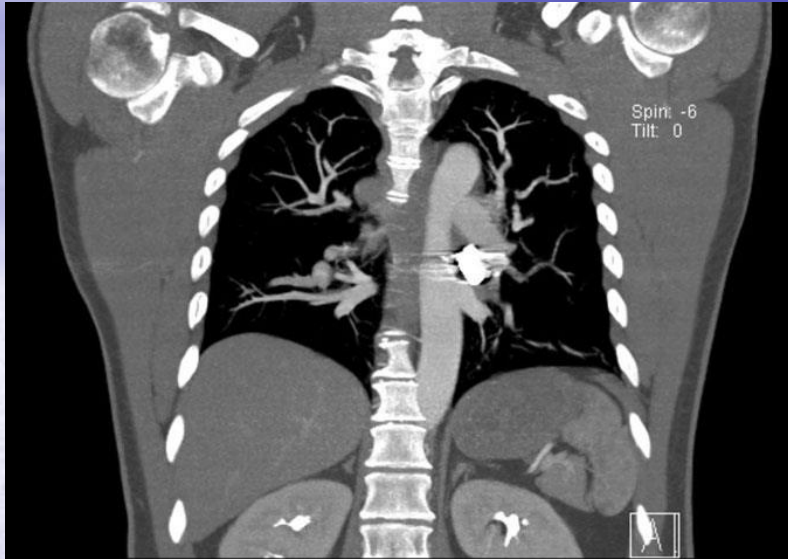
Computed Tomography (CT) SCANNER



Medical Resonance Imaging (MRI) SCANNER



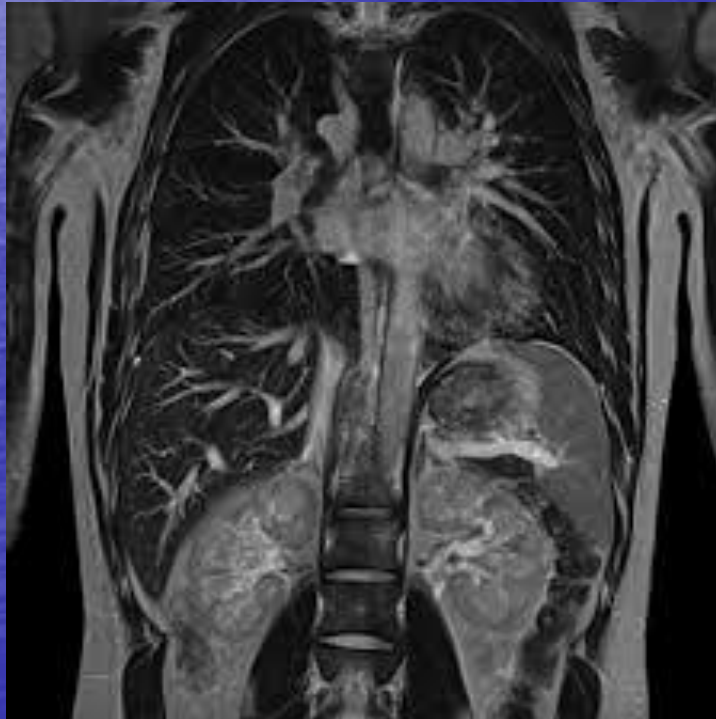
Chest Images



CT



X-RAY



MRI

Spine Images



Figure 1



Figure 2

CT

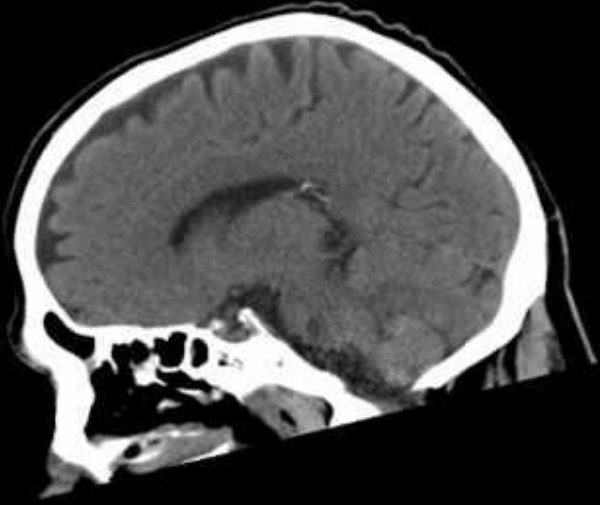


X-RAY



MRI

Head Images



CT



MRI



X-RAY



QUESTIONS ?



If you have any questions or would like to see any of the modalities in operation contact the Imaging Department at 98818429 and we will accommodate your request

You are also welcome to attend any of our lectures regarding
Evidence based Imaging, Radiobiology, MRI or CT