EM Radiation and Cancer

By Kolby Graham

This document explains the relationship between electromagnetic radiation from everyday devices, and their respective cancer risks. I get asked this question a lot, so I figured I'd make a document explaining it in greater detail. A lot of this text is copy-pasted from reputable sources such as peer reviewed papers. Eventually, I'll list sources for everything, but I'm feeling lazy right now and can't be bothered.

What causes cancer?

In short, gene mutations.

Mutations happen often, and the human body is normally able to correct most of them. Depending on where in the gene the change occurs, a mutation may be beneficial, harmful, or make no difference at all. So, one mutation alone is unlikely to lead to cancer. Usually, it takes multiple mutations over a lifetime to cause cancer. This is why cancer occurs more often in older people who have had more opportunities for mutations to build up.

Tumor suppressor genes are protective genes. Normally, they limit cell growth by monitoring how quickly cells divide into new cells, repairing mismatched DNA, and controlling when a cell dies. When a tumor suppressor gene is mutated, cells grow uncontrollably and may eventually form a mass called a tumor.

How do gene mutations occur?

Chemicals and ionizing radiation can damage genes. However, most mutations occur when the cell makes errors as it copies its genes. Genes are made out of DNA, a chemical code with four different 'letters'. Each time one of your cells divides, it must copy around 6 billion letters of DNA code. Occasionally, mistakes are made, causing mutations. Most of these are corrected immediately, but a few manage to escape unnoticed.

What is Ionizing Radiation?

Ionizing radiation is any type of particle or electromagnetic wave that carries enough energy to ionize or remove electrons from an atom. Examples of this form of radiation would be: ultraviolet, alpha particles, beta particles, x-rays, gamma rays, and cosmic rays.

You are exposed to ionizing radiation constantly from the natural background radiation (NBR) occurring everywhere on the planet. The average level of NBR is between 0.1 and 0.3uSV. This radiation is responsible for minor random mutations, and is the driving force behind evolution. As mentioned above, most mutations do nothing, some are helpful, others are damaging or can cause cancer.

What is Non-Ionizing Radiation?

Non-Ionizing radiation is anything in contrast to the above, any radiation that does NOT have enough energy to ionize or remove electrons from an atom. Examples of this form of radiation would be: AM/FM radio, cellphones and their towers, WiFi, Bluetooth, infrared, and visible light.

Since non-ionizing radiation does not carry enough energy to ionize atoms, it is incapable of causing cell mutations. This makes it impossible to cause cancer in the same way that ionizing radiation can.

This type of radiation can cause dielectric heating in some molecules, this method is what your microwave oven uses to heat food. The molecules in your food align themselves with the constantly changing electromagnetic field. As the field alternates, the molecules reverse direction. Rotating molecules push, pull, and collide with other molecules (through electrical forces), distributing the energy to adjacent molecules and atoms in the material. Once distributed, this energy appears as heat.

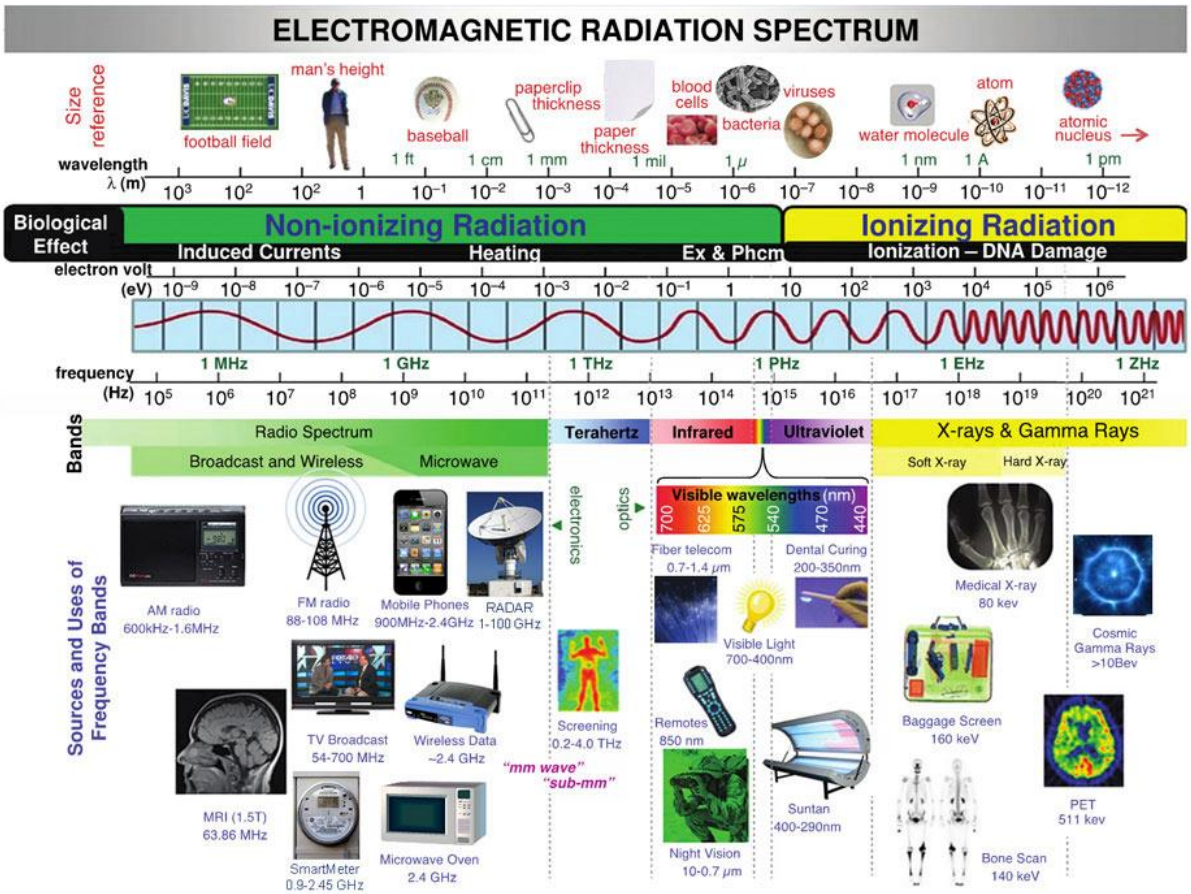
Can Cellphones Cause Cancer?

In short, no. If you've made it this far, you will understand the differences in the type of radiation used in cellphones vs the type that is known to be associated with an increased cancer risk.

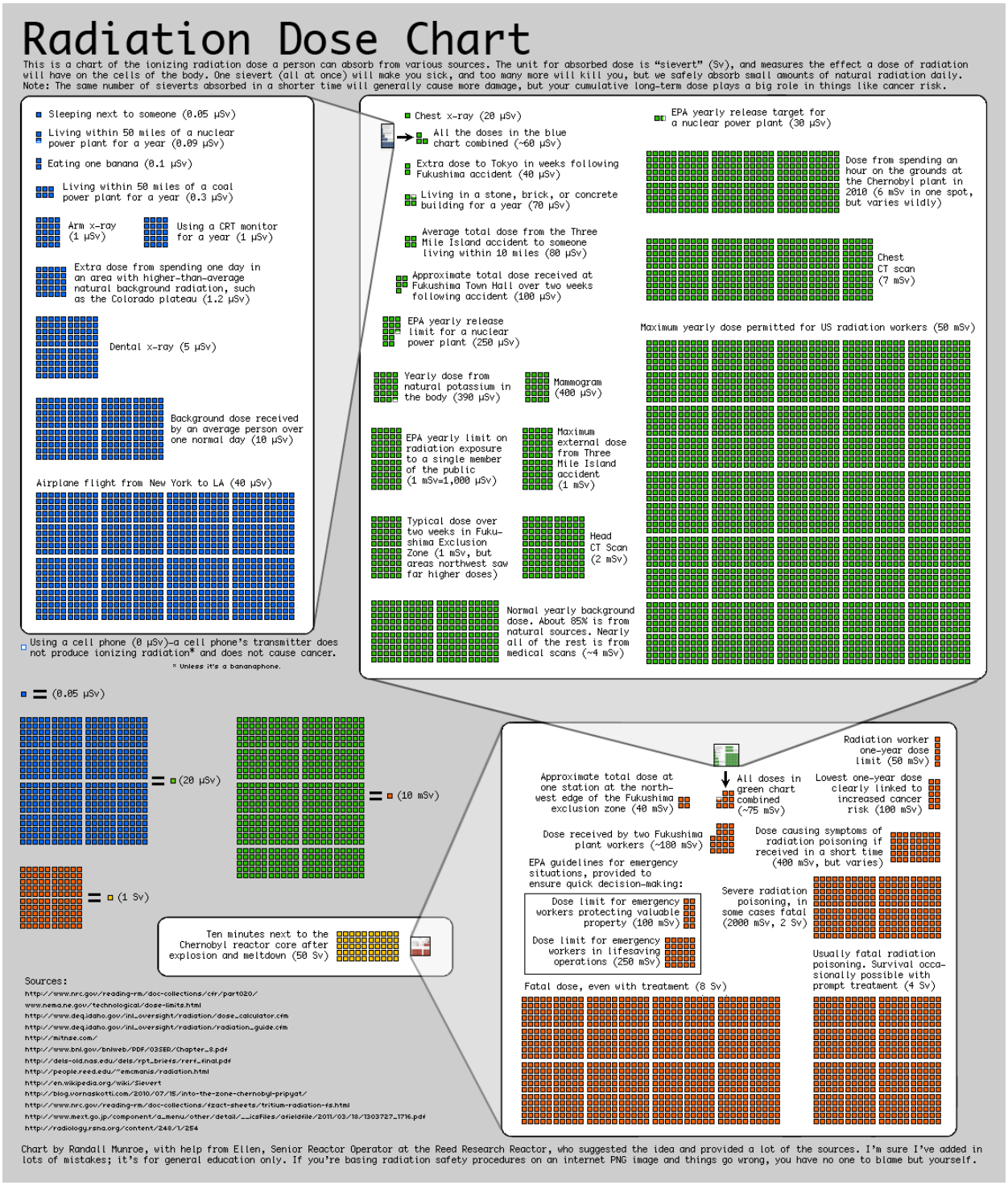
There have been multiple studies done about this issue, all have returned inconclusive data, or reported that there was no link found between cellphone use and rates of cancers. All of these studies are looking at the relationship between localized heating caused by excessive use.

Images and References

The image below shows the electromagnetic spectrum, and may help you to understand the difference between ionizing and non-ionizing radiation.



The image below outlines the different doses of ionizing radiation coming from everyday sources.



Conclusion

Eventually, I will probably add more information to this document as I see the need. This should cover the majority of the times when people have asked me about this topic, and I am too lazy to retype it over and over again.

Contact info

If you have gotten ahold of this paper and have questions or concerns you may email me at my public email address:

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The current version of this document will always be avaialble on my website
http://kolbygraham.net/em-radiation-and-cancer