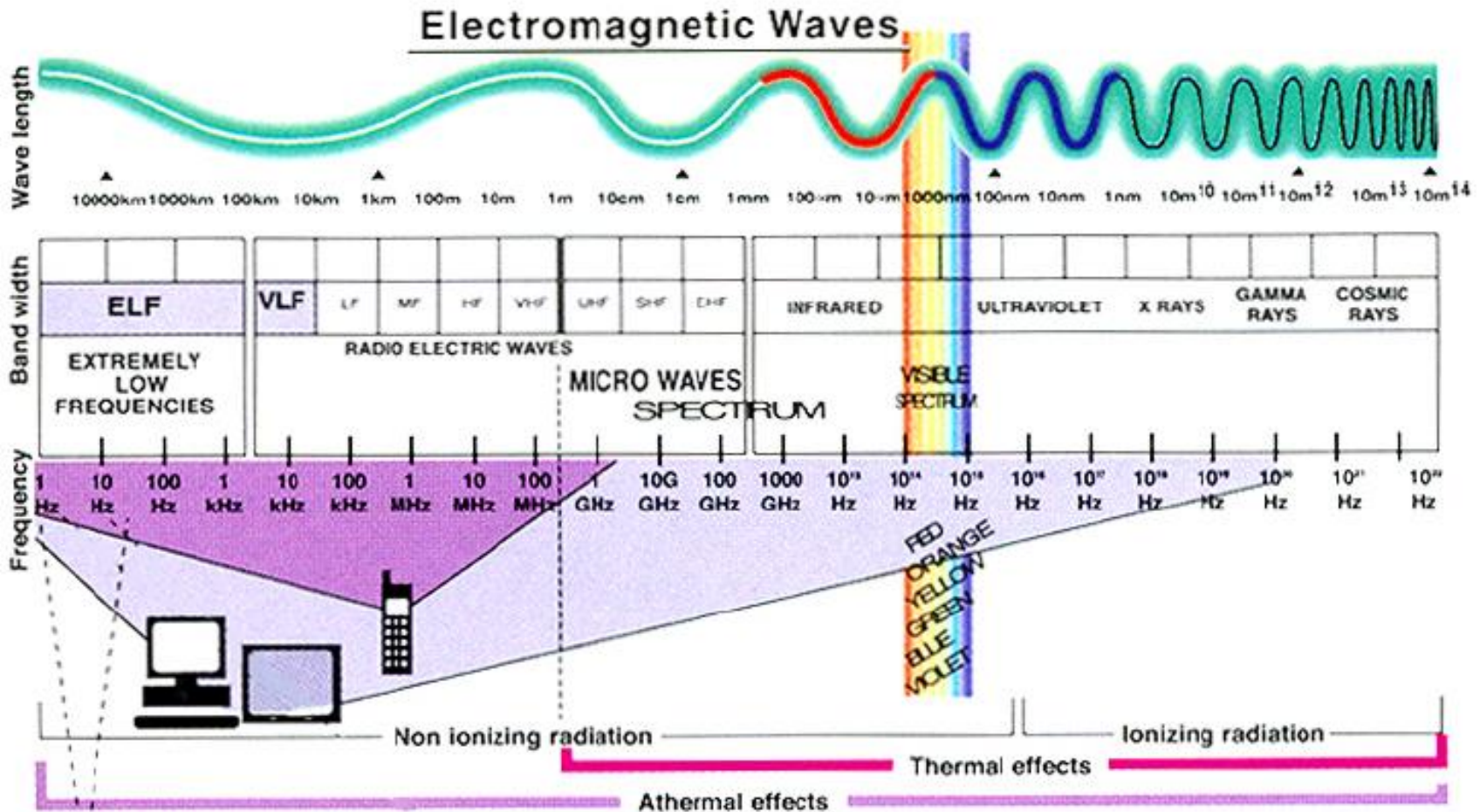


What is 5G and what do we know about the health effects of 5G?

- David O. Carpenter, MD
- Director, Institute for Health and the Environment
- University at Albany

Electromagnetic spectrum



Radiofrequency (RF) EMFs

- These are the communications frequencies, ranging from AM and FM radio, TV, mobile phones, and radar.
- WiFi, smart meters and wireless anything use RF fields to communicate between a generator and a receiver.
- Driverless automobiles will use EMFs for navigation.
- Microwave ovens use RF. The fact that you can cook your potato in a microwave oven is proof that communication frequencies can have biological effects.

RF in the Ambient Environment

- It used to be that the urban RF environment was dominated by radio and television transmission RF.
- In the past few years we have increased the RF in the ambient environment enormously, coming from use of cell phones, cell phone towers, WiFi and smart meters, often using higher energy RF. Now there is a 5G rollout.
- What does this sudden increase in RF exposure suggest regarding human health?

Health Risks to Humans From Existing Radiofrequency Radiation

- **Cancer:**

- Brain Cancer: Gliomas on the side of the head where the cell phone is normally used and glioblastoma, a very dangerous cancer that is almost always fatal.
- Acoustic neuroma, a Schwannoma of the auditory nerve. This is a tumor, not a cancer, but in a bony canal.
- Cancer of the parotid gland in the cheek, near to where a cell phone is used.
- Probably other kinds of cancer, depending upon what part of the body is most exposed.

National Toxicology Report.

- This was a 2-year exposure of rats to cell phone intensities of RF-EMFs.
- “Following exposure to GSM- or CDMA-modulated cell phone RFR there were increases in the incidence of malignant Schwannoma of the heart....Several other weaker responses were observed with both modulations, including malignant glioma in the brain, adenomas in the pituitary gland... and pheochromocytomas of the adrenal cortex,”
- “A significant increase in DNA damage was observed in hippocampus cells of male rats exposed to CDMA modulation.”

Ramazzini Institute Study

- This was a life-time exposure of rats to RF-EMFs like those emitted by a cell phone tower.
- There was a statistically significant increase in incidence of heart Schwannomas in male rats.
- There was an increase in Schwann cell hyperplasia in in male and female rats, but not statistically significant.
- There was an increase in glial cell tumors in both males and females, although not statistically significant. (Falcioni et al., Environ Res)

Other Health Effects

- Reproductive harm: Reduced sperm counts and infertility in men, some increase in spontaneous abortion and premature birth in women.
- Effects on brain function: Reduced learning ability, especially in children. Impaired memory in adults. This is a special problem in wireless computer classrooms in schools.
- Electro-hypersensitivity: In some people development of headaches, insomnia, heart palpitations, tinnitus and a general feeling of ill health.

Emerging wireless technologies

- 5G (5th generation cellular technology)
- Internet of Things (IoT)
 - Smart appliances, TVs, thermostats, etc.
- Smart cities
- Autonomous motor vehicles
- Wearable wireless devices
 - Watches, glasses, ear buds, medical implants, etc.

5G – The Fifth Generation

- Current 3G and 4G transmission uses frequencies of less than 1 GHz.
- 5G will use frequencies from 0.6 to 24 GHz, and perhaps even higher (ultimately up to 71 GHz). Research is being done on frequencies up to 300 GHz.
- Industry ads say that 5G will be 100x faster than 4G, yield 3 million new jobs and add \$500 billion in economic growth.
- These are millimeter waves that have the potential for higher speed and greater capacity.

Limitations of 5G

- The higher the frequency the shorter the range and the easier the signal is to being blocked. Trees, energy efficient glass windows and standard housing materials will all block the signals. Rain and snow will also interfere with transmission.
- Because they don't travel so far 5G will require mini-cell towers placed in front of every 5-8 houses. Current 3G and 4G cell towers have a range of 2015 km, but with higher frequencies the range will be 20-150 m.
- One will not be able to walk down the sidewalk without be continuously exposed.

What are the Health and Safety Concerns of 5G?

- There is almost no research at present on health effects of 5G. It is thought that most of the energy will be absorbed by the skin surface.
- There is strong evidence that current cell phones, if used extensively, increase risk of brain cancer. Active cell phones in your bra increases risk of breast cancer.
- Men who use wireless lap tops on their lap have reduced sperm counts.
- Some people develop a syndrome of electro-hypersensitivity when exposed to RF EMFs. They experience headaches, fatigue and “brain fog”.

Is There Anything Uniquely Bad About 5G?

- This question cannot be answered at present because of the lack of study.
- However it is likely that what is dangerous is each person's total exposure to radiofrequency radiation.
- Already our exposure has increased greatly as we have wireless everything – radio, TV, cell phones, cell towers, WiFi, smart meters, and now the development of driver-less cars.
- The increased exposure to these multiple forms of RF has great potential to increase human disease.

Who is Acting to Protect Us?

- In the US it is the Federal Communications Commission that has this responsibility. Almost all members come from the industry. They have absolutely no health expertise.
- The position of the FCC is that the only concern due to RF radiation is tissue heating, like that you get from your microwave oven.
- There are thousands of scientific studies showing adverse effects at much lower intensities than those causing tissue heating.

The Federal Communications Act of 1996

- A provision inserted into this act by the industry specifically rules that one cannot object to the placement of a cell tower on the basis of health concerns. You can object if it is ugly or reduces property values but not if it is likely to harm your health!
- In spite of many attempts to have this provision removed it is still in place. But many local and city governments are fighting for local control in courts.

How Strong is the Evidence of Harm?

- On subjects like this one must look at the “weight of the evidence”, as is done in meta-analyses.
- Every meta-analysis done to date has confirmed elevated risk of brain cancer and acoustic neuroma with excessive cell phone use.
- Evidence for elevated risk of electro-hypersensitivity, harm to learning and memory and male infertility is strong and growing.

What About Other Sources of RF?

- The RF exposure from a mobile phone held to the head is intense, but most people do not use it for long periods of time.
- Other sources are usually at much lower intensity, but may result in exposure 24/7. This includes WiFi and smart meters. The new global roll-out of 5G is going to dramatically increase exposure.
- Total RF exposure (and therefore risk to health) from these sources of lower intensity may be greater than that from mobile phone use.

Conclusions:

- 5G may allow you to download a movie more quickly.
- But the potential effects on human health are major.
- We can benefit from modern technology at the same time that we protect the health of the public.
- We should not be rolling out 5G until we understand that the health hazards are and how to protect against them.
- This is the essence of the “precautionary principle”.