EXPOSURE TO RADIO-FREQUENCY ELECTROMAGNETIC FIELDS

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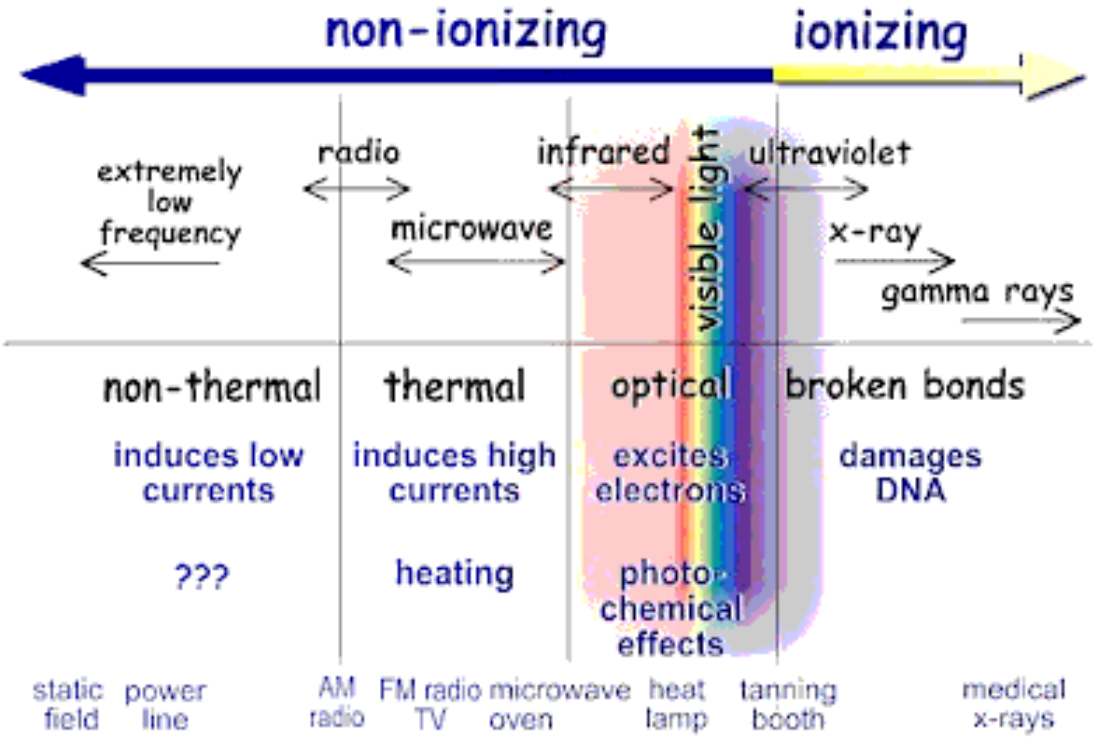
PUBLIC HEALTH ONTARIO

- Arm's length agency funded by Province of Ontario.
- Became operational in 2008.
- Provide science and technical advice and support to the health care system (e.g. public health units) and the Government of Ontario.
- Also run the Public Health Labs.
- Environ monitoring equipment available for loan to HUs.
- Do not have regulatory or statutory powers; do not make policy.
- Role in research and teaching through links to, and appointments at, Ontario universities.

Ionizing vs. Non-ionizing effects



Does cell phone use cause cancer?

- May 2011 IARC meeting, 30 scientists 14 countries to assess carcinogenicity of Radio Frequency (RF) electromagnetic fields.
- Frequency 30kHz-300GHz.
- Sources: cell phones, cordless phones, Bluetooth, amateur radio, dielectric and induction heaters, pulsed radar, broadcast antennas, medical applications.
- The ‘hazard’ isn’t new, the applications are.
- Effects other than cancer currently being reviewed by WHO

RF Exposures

- Workers –highest exposures are near field
- Public – Use of transmitters held close to the body, can give greater dose to brain than work exposures
- Exposures from cell phone base stations, TV, radio, Bluetooth are all orders of magnitude lower than cell phones
- New 3G phones emit 100 times less RF than GSM phones
- For energy deposition to brain, cell phone use is unique

Exposure Standards for RF

- Based on tissue heating as mechanism for adverse effects
- Canadian (Safety Code 6) and international stds (ICNIRP) similar
- Critics argue limits set on tissue heating are not stringent enough
- Regulatory bodies argue lack of consistency in research with non-thermal end points and whether there is link to '*adverse*' effects on health.
- Despite proliferation of wireless technologies, measurements done in community settings are typically small fraction of current limits.

Evidence for Carcinogenicity of RF?

- Time trend, case-control, cohort studies
- Time trend – surveillance data have *not* indicated evidence of increase in gliomas or other tumours of interest potentially linked to cell phone use
- While some interpret as reassuring, this is a relatively insensitive indicator of risk
- IARC considered one cohort and 5 case-control studies

Cell Phone studies

Danish cohort – 257 gliomas in 420,095 subscribers between 1982 and 1995, subscriber incidence close to national average.

INTERPHONE - 2708 glioma cases, 2972 controls

OR 0.81 (95% CI 0.70 -0.94) for ever versus never users

For highest decile of exposure **OR 1.40 (95% CI 1.03-1.89)**

Suggestion of increased risk for ipsilateral and temporal lobe tumours (where RF dose would be greatest)

Hardell -pooled analysis based on cases ascertained up to 2003.

OR glioma >1 year of use **1.3 (95% CI 1.1-1.6)** increasing to **3.2 (95% CI 2.0-5.1)** for >2000h use

Ipsilateral use assoc w/ higher risk, cordless phones similar

Sato – some evidence ipsilateral risk of acoustic neuroma

Conclusion of IARC Working Group

- Inconsistencies across studies; recall, selection bias possible; inadequate observations to meet latency

  Findings cannot be dismissed as reflecting bias alone.
- Human evidence '*limited*', animal evidence '*limited*'
- IARC Classification 2B 'possibly carcinogenic' supported by 'large majority' of the working group.
- This is based on exposure from cell phone use.
- *"In reviewing studies that addressed the possible association between environmental exposure to RF-EMF and cancer, the working group found the available evidence insufficient for any conclusion".*

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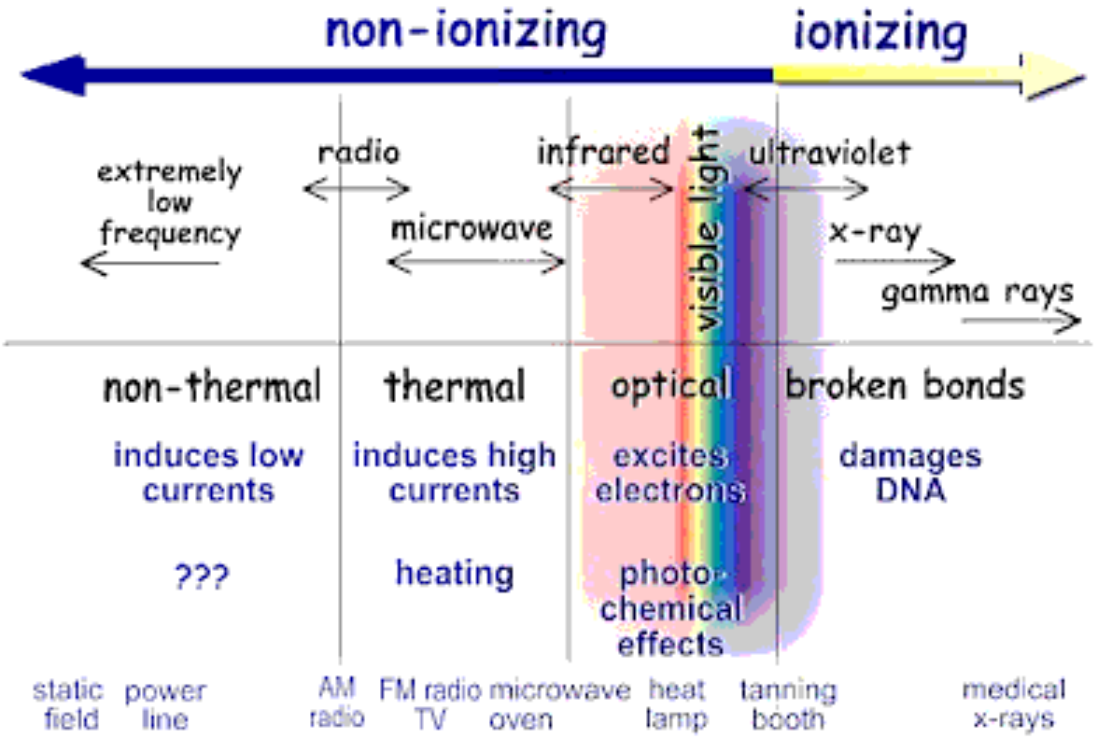

Radiation agents reviewed in the International Agency for Research on Cancer's (IARC) monograph series from Samet 2011

Agent	Group	IARC Monograph Volume No.	Year
Ultraviolet radiation	1	40, 55	1986, 1992
Radon-222 and its decay products	1	43, 78	1988, 2001
Ultraviolet radiation A (NB: Overall evaluation upgraded from 2B to 2A with supporting evidence from other relevant data)	2A	55	1992
Ultraviolet radiation B (NB: Overall evaluation upgraded from 2B to 2A with supporting evidence fromother relevant data)	2A	55	1992
Ultraviolet radiation C (NB: Overall evaluation upgraded from 2B to 2A with supporting evidence from other relevant data)	2A	55	1992
Solar radiation	1	55	1992
X- and Gamma (γ)-Radiation	1	75	2000
Radium-224 and its decay products	1	78	2001
Radium-226 and its decay products	1	78	2001
Radium-228 and its decay products	1	78	2001
Radioiodines, short-lived isotopes, including iodine-131, from atomic reactor accidents and nuclear weapons detonation (exposure during childhood)	1	78	2001
Radionuclides, α-particle-emitting, internally deposited (NB: Specific radionuclides for which there is sufficient evidence for carcinogenicity to humans are also listed individually as Group 1 agents)	1	78	2001
Radionuclides, β-particle-emitting, internally deposited (NB: Specific radionuclides for which there is sufficient evidence for carcinogenicity to humans are also listed individually as Group 1 agents)	1	78	2001
Magnetic fields (extremely low-frequency)	2B	80	2002
Magnetic fields (static)	3	80	2002

Classification of carcinogenic hazards to humans:
Group 1: Carcinogenic to humans.
Group 2A: Probably carcinogenic to humans.
Group 2B: Possibly carcinogenic to humans.
Group 3: Not classifiable as to carcinogenicity to humans.
Group 4: Probably not carcinogenic to humans.

Reducing RF Exposure

- Cell phone use dominates exposures
- Can reduce exposure through:
  - reducing use
  - texting
  - selection of phone with lower SAR
  - use of speaker, headset
  - avoid use where there is weak signal
- Unclear whether this reduces risk of adverse effects
- Potential for exposure reduction in other settings less clear, although using wireless laptops on desk rather than lap may also be effective in exposure reduction