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### What is 5G?

How could 5G affect our health and environment?

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**Microcells  
Mission B.C. Canada**

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WE ARE HEARING A LOT OF BUZZ about faster “5G” for a new interconnected world, but do we really know all we should know on how it may affect us and the environment?

What is 5G?

5<sup>th</sup> Generation (5G) radiofrequency (RF) technologies follow 2G, 3G and 4G. So far, we can communicate and research on the move, with cell phones, texting, Internet connectivity and more. The long-term goal with 5G technologies is that anything that can be connected, will be connected with an emphasis on “*machine to machine*” connections. The motto of the CTIA, the organization that represents the wireless communications industry in the USA is, “*Everything wireless*” (9).

5G is intended to carry more data and download faster. To accomplish this, 5G technology needs to use higher and shorter frequency millimeter radiowaves, in addition to the current spectrum. The problem is that, unlike 2G to 4G, the higher frequencies for 5G are more easily

blocked by trees, buildings and other structures. Therefore, a dense buildout of small cell antennae (microcells) is required – one transmitter every few hundred meters. Microcells will show up on streetlight poles, attached to apartment buildings, etc., directly outside our homes and schools. Many locations will be flooded with overlapping coverage from multiple transmitters.



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The upsides of upcoming 5G technologies have been widely touted: driverless cars and the vast interconnected Internet of Things (IoT), to the point of even tracking the number of eggs in your fridge.

We hear very little about the downsides, such as possible implications for our health and the environment. In 2017, scientists and doctors, leaders in RF radiation and electromagnetic field (EMF) research, launched “*The 5G Appeal*” (1) calling for the European Commission to stop the deployment of 5G. Previously, scientists specializing in non-ionizing radiation launched the “*International EMF Scientist Appeal*” (11) that states that today’s “*safety guidelines*” from health authorities, including Canada (21), are outdated, and, for telecommunications frequencies, aim only to prevent excessive heating (thermal effects). Put simply: no heating, no harm.

There is ample scientific evidence that thermally-based guidelines and standards are obsolete. Evidence is strong that cell phone type radiation causes cancer and can damage sperm and DNA. In 2011, the International Agency for Research on Cancer of the World Health Organization (IARC-WHO), classified wireless radiation in the RF range (including Wi-Fi and millimeter wavelengths) as a *possible* (2B) human carcinogen (3) (41). Since then, newer science on humans (8) (20) (33) and animals has supported an upgrade of RF radiation to *probable* (2A) or Group 1 *known* human carcinogen, in the same group as cigarette smoke and asbestos. Following smaller animal cancer studies (26) (39), the \$30 million USA National Toxicology Program of the National Institute of Environmental Health Sciences (NTP-NIEHS) found statistically significant “*clear evidence of carcinogenicity*” with non-thermal exposures in the

same type of cells found in human tumours (29). The NTP-NIEHS findings were replicated in a large-scale study (15) by Italy's Ramazzini Institute that used even lower intensity exposures. Adverse effects on sperm quality and quantity at everyday exposure levels of RF radiation have been detailed in three systematic reviews published from 2014 to 2016 (2) (23) (28).

When a potentially game-changing study showing DNA damage from RF radiation was published in 1995 (24), there was a quick “*war gaming*” of these results into inconsequential findings. This is described in an article called “*How Big Wireless Made Us Think Cell Phones are Safe*” (22) by investigative reporters Mark Hertsgaard and Mark Dowie. (In the 1970s, Mark Dowie exposed the Ford Pinto story where fatal accident claims were considered to be part of the cost of doing business). Since the mid-1990s, more than 30 studies published in peer-reviewed journals have reported that RF radiation can damage DNA at non-thermal exposure levels (31).

Although RF radiation is non-ionizing and has lower energy than ionizing radiation (e.g. X-rays), it has been shown to cause oxidative stress. A review of 100 peer-reviewed studies found: “*in general, 93 confirmed that RF radiation induces oxidative effects in biological systems*”(42). Prolonged oxidative stress basically causes biological dysfunction, leading to many conditions including cancer, Parkinson's and other degenerative diseases.

Environmental implications also merit major consideration. Adverse effects related to RF radiation have been found in wildlife including amphibians, birds, insects, fish and mammals (4) (5) (12) (16) (27) (30) (37). RF radiation at ambient levels can disorient birds (10) (36). A study on trees found that they were visibly damaged on the sides nearest the cell tower antennae (40). Of particular concern are effects, both thermal and non-thermal, of millimeter waves on insects (38). A major field study on insect pollinators and cell towers found that abundance of beetles, wasps and hoverflies were negatively affected. The authors conclude: “*... these changes ...associated with electromagnetic smog may have important ecological and economic impacts on the pollination service that could significantly affect the maintenance of wild plant diversity, crop production and human welfare*”(25).

In Europe, some jurisdictions are heeding the 5G Appeal. Regions, such as the Cantons of Geneva, Vaud and Neuchâtel in Switzerland, are issuing decrees calling for moratoriums on the rollout of 5G technology until the health effects are better understood (34) (7) (17). Brussels, Belgium and parts of Italy are reevaluating 5G deployment (13). In the USA, tough battles are being waged to retain local control over placement of microcells (14).

Will Canadians have a say, as some places in the USA do, on the placement of microcells that could be in front of our homes and schools? Not likely. Innovation, Science and Economic

Development Canada (ISED) CPC-2-0-03 (18) (19) excludes microcells placed on existing structures like utility poles from requiring local and public consultation. Excluded structures are meant to be those that have "*minimal impact*" on communities. Are we to understand that higher risk of cancer and DNA damage are "*minimal impacts*"?

To address the original question... there is no clear definition of what 5G is, or will be. We do know that the public health and environmental consequences could be substantial. Experience has shown us that once cell antennae are in place, it is difficult to have them removed. In Ripon, California, it took intense pressure from the community to force the removal of a cell tower located close to a local school, and only after four children and three teachers were diagnosed with cancer in a three-year period (32).

There are safer alternatives. A report, "*Re-Inventing Wires: The Future of Landlines and Networks*" by Dr. Timothy Schoechle of the National Institute for Science, Law and Public Policy, Washington, DC, goes into detail on alternatives, as well as privacy, security and long-term sustainability issues of communication networks (35). Relevant to climate change is a section on these networks' energy consumption, approaching 5-10% of the world electricity supply - and growing.

There seems to be a great sense of urgency for 5G rollout. In reality, what we need to do is outlined in *The Lancet* comment article "*Planetary electromagnetic pollution: it is time to assess its impact*" (6).

Until such an assessment is properly done, and we can find out what those halting the deployment of this technology in Belgium, Italy, Switzerland and the USA know, that we don't know, in reality, we urgently need a moratorium on 5G.

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