Radiation Review: Some People May be 'Allergic' to Cell Phones, Computers

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Cell phone tower in Nyakrom, Agona District, Ghana. Credit: Wikimedia Commons.

(PhysOrg.com) -- How exactly does the radiation from electromagnetic fields (EMF) affect the human body? Is it possible that cell phones, computer monitors, TVs, and other electronic devices - which operate within current EMF safety standards - cause illnesses, or are the people who claim to be sensitive to these devices just paranoid? The topic is one of the most controversial subjects in technology today, having important consequences in politics, consumerism, human rights, and health costs.

Olle Johansson, an associate professor and head of the Experimental Dermatology Unit, Department of Neuroscience at the Karolinska Institute in Stockholm, has been investigating the effects of electromagnetic fields on human physiology since the early '80s. Johansson's research has led him to become an outspoken supporter of the view that the dangers of EMF radiation from our gadgets are real, and that existing safety standards, which are based on acute thermal effects only, do not adequately protect public health.

In a review to be published in an upcoming issue of *Pathophysiology*, Johansson has summarized the results from dozens of studies that have investigated the effects of EMFs on the immune system in particular. As he explains, EMFs can act like an allergen, disturbing immune function by eliciting various allergic and inflammatory responses. Johansson hopes that this review, along with the reviews in the extensive Bioinitiative Report published in 2007 that have identified harmful effects from wireless technologies, will urge policymakers to create new public safety limits and limit the future deployment of untested technologies.

"The paper acts like a very strong warning signal and should evoke action," Johansson told *PhysOrg.com*, noting that the Bioinitiative Report has already had an influence. For example, in the "European Parliament resolution of 4 September 2008 on the mid-term review of the European Environment and Health Action Plan 2004-2010 (2007/2252(INI))," the European Parliament acknowledges that exposure levels need to be based on biological factors, not just heating effects. A report from the European Parliament on February 23, 2009, "On health concerns associated with electromagnetic fields," also investigates stricter exposure limits.

In the current review, Johansson explains that the human immune system has evolved to deal with its known enemies, and not with

electromagnetic “allergens” (e.g. TV signals, radiowaves, microwaves from cell phones or WiFi, radar signals, X-rays, artificial radioactivity, etc.) which have been introduced within the last 100 years. Our immune systems have developed under the influence of the sun’s radiation and the practically static geomagnetic field, he explains, but not under electromagnetic waves at other frequencies, or the magnetic and microwave pulses generated, for example, by cell phones.

As Johansson explains, antigens are substances that cause the immune system to react in an excessive manner, so that the immune system becomes damaging to local tissue and the entire body in general. Such hypersensitivity reactions can be caused by environmental disturbances that are small enough to enter the immune system. Examples can include dust and drugs, which can enter the respiratory tract or at site-specific locations. Another example is EMFs, which penetrate the entire body.

Different electronic devices produce EMFs that vary in strength, frequency, and pattern. While some studies have found associations between, for example, power lines and leukemia, or brain tumors and cell phones, other studies point out that no biological mechanism causing these illnesses has been identified. As Johansson argues, many studies assume that the only biological mechanism that causes adverse effects is the acute heating of cells and tissues, although he says that non-thermal effects, such as EMFs acting as antigens in the immune system, can occur before heating can be detected, especially after long-term exposure.

In some of the studies that Johansson summarizes, people claim to suffer from subjective and objective symptoms when exposed to electronic devices. Electrohypersensitivity (EHS) affects an estimated 3% to 10% of the population, he says, and often leads to lost work and productivity. In Johansson’s review, some studies hypothesize that people who claim adverse skin reactions after exposure to computer screens or mobile

phones may actually have a correct avoidance reaction to the radiation. As he explains, the skin contains mast cells, which are known to react to external radiation such as radioactivity, X-rays, and UV light. Studies have found that skin samples of EHS people after radiation exposure have a higher number of mast cells in the upper dermis, and mast cells infiltrate other layers of the skin that don't normally have them. EMFs may also cause mast cells to "degranulate," releasing inflammatory substances that are involved in allergic hypersensitivity, itching, and pain. In previous theoretical studies, Johansson has proposed a model for how a proliferation of mast cells (mastocytosis) could explain sensitivity to EMFs. As in an allergic reaction, EMFs likely affect people differently based on varying immune functions due to variations in genetic make-up.

Johansson points out that some of the studies in his and other's papers have not been included in surveys by the World Health Organization (WHO) and Institute of Electrical and Electronics Engineers (IEEE), suggesting that these organizations have ignored relevant research due to incorrect assumptions of the levels of EMFs that can have a biological influence.

Johansson's overall argument is that more research needs to be done on possible non-thermal mechanisms of EMFs' damage to the human body, and investigations into immune system response in particular could lead to the discovery of a specific mechanism for biological damage. Considering that hundreds of thousands of individuals are estimated to have electrohypersensitivity, there is a lot at stake in the issue, including how to accommodate people with this functional impairment. Understanding the biological effects of EMF also makes economic sense, Johansson says, in terms of future public health costs. Importantly, he argues for a biologically based EMF exposure limit that can be presumed to cause no adverse impacts on human health. A completely protective safety limit based on today's information, he says, would be

zero.

“Of course, philosophically we can discuss this forever, but practically one has to allow for a certain level of uncertainty if a specific gadget or technique has unique advantages,” Johansson said. “If such unique advantages cannot be proven, then maybe the consumers should demand for a complete ban? It quickly boils down to if, for example, the future public health is less important than people's freedom today to use wireless technologies.”

More information: O. Johansson, Disturbance of the immune system by electromagnetic fields - A potentially underlying cause for cellular damage and tissue repair reduction which could lead to disease and impairment, *Pathophysiology* (2009), doi: 10.1016/j.pathophys.2009.03.004.