

On February 8, 1996, President Bill Clinton signed the 1996 Telecommunications Act into law, ushering in an era of unparalleled innovation and marketing of wireless communications that has fundamentally changed the way people interact with the world around them. It was a landmark event, hailed by the telecom industry as a great step forward into the future.

Few people outside of the industry knew that Dr. Henry Lai and Narendra Singh at the University of Washington in Seattle had just published a study documenting a breakthrough discovery - single strand DNA breaks resulting from exposure to wireless radiation, the energy produced by virtually all wireless communications devices.² DNA strand breaks can impair cell function, change cell structure and even lead to cell death. It's how we age, and how we develop cancer.

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The finding was especially remarkable because biological damage from exposure to wireless radiation was something that electrical engineers and telecom companies had steadfastly claimed was impossible. Exposure could heat tissue if you got too close to an antenna, the engineers and physicists told legislators and regulators, but non-ionizing radiation was too weak to damage any biological systems.

Lai and Singh couldn't explain exactly how or why the DNA strands were damaged. *Was it a direct effect of the radiation? Or did the radiation interfere with the body's normal DNA repair mechanisms?* More research was needed.

We are all electric

Unless we happen to have a pacemaker, few of us appreciate the role that electricity plays in our bodies. Human beings evolved over millions of years in a natural electrical environment. The earth itself is a giant dipole magnet with poles north and south. There are constant oscillations emanating from the earth's core, and a natural static magnetic field that shifts slightly with the seasons. These magnetic fields play an important role in nature, dictating migration patterns and controlling our own circadian rhythms, among many other things.³

Like all animals on earth, our biological systems use an interplay of tiny electrical charges and chemical signals to control and direct precise responses to internal and external stimuli, thus influencing function and development. External influences, both chemical and electrical, can interfere with and adversely affect these biological processes. External influences include both natural and man-made electromagnetic fields (EMFs).

While most public health experts and scientists understand how environmental factors influence our cell biology, the idea that we can acquire a chronic illness from non-ionizing RF microwave radiation, even at low levels, has not yet taken hold in the medical community. Everyone now knows the hazards of exposure to cigarette smoke and lead, but how soon will we recognize the adverse health effects of the increasing and involuntary exposure to wireless radiation?

Dr. Robert O. Becker, surgeon and researcher who was twice nominated for the Nobel Prize, once observed, "I have no doubt in my mind that, at the present time, the greatest polluting element in the earth's environment is the proliferation of electromagnetic fields."⁴

Early studies on wireless radiation and biological effects

The work of Lai and Singh at the University of Washington was not the first study to suggest biological effects from wireless radiation. Studies conducted by the U.S. military between 1940 and 1960, primarily concerned with personnel exposure to radar, had documented biological effects and impacts on behavior from exposure to wireless radiation.⁵ In 1973 the EPA hosted a meeting in collaboration with the American Public Health Association to discuss the growing concern over non-ionizing radiation and its potential impact on human health.

In the same year, at an international symposium on the “Biologic Effects and Health Hazards of Microwave Radiation” held in Warsaw, Poland, it was stated that “The reaction of the central nervous system to microwaves may serve as an early indicator of disturbances in regulatory functions of many systems.”⁶

In 1977 the *Journal of Microwave Power* published an article citing new research demonstrating that exposure could affect nervous system function at power levels far below those that could heat tissue.⁷ The following year, scientists at the

The electromagnetic spectrum is roughly divided into ionizing and non-ionizing radiation. It is well established that ionizing radiation can cause direct harm by removing electrons from atoms with resultant DNA damage resulting in fixed mutations.⁸ It also produces “free radical” molecules (those with an imbalance of electrons) which can cause widespread injury to cell structures via oxidation of tissues and cell death. Non-ionizing radiation acts as an environmental stressor, with direct, toxic oxidative effects on biological processes unrelated to heat or to ionization.⁹ The effect of non-ionizing radiation is indirect, inducing biochemical changes in cellular structures and their membranes.¹⁰