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Environmental and Workplace Health

Research on Radiofrequency Energy and Health

For more than two decades, Health Canada has conducted its own research on the biological effects of radiofrequency (RF) energy. This research has increased the scientific knowledge regarding the intensity of RF energy in our environment and has helped to establish the human exposure threshold where potentially adverse health effects can occur. This important information, along with other Canadian and international studies, form the basis for establishing safety standards for RF energy that protects the health of Canadians.

All Health Canada research on RF energy is funded by the Government of Canada. The following is a list of Health Canada studies on this subject:

McNamee JP, Chauhan V. Radiofrequency radiation and gene/protein expression: a review. *Radiat Res.* 2009 Sep;172(3):265-87.

McNamee JP and Bellier PV, "Cytogenetic and Carcinogenetic Effects of Exposure to Radiofrequency Radiation" In: "Chromosomal Alterations: Methods, Results and Importance in Human Health. Obe, Günter; Vijayalaxmi (Eds.) 2007, XXIV, 515 p." Springer-Verlag, Heidelberg, Germany (ISBN:9783540714132).

Chauhan V, Qutob SS, Lui S, Mariampillai A, Bellier PV, Yauk CL, Douglas GR, Williams A, McNamee JP. Analysis of gene expression in two human-derived cell lines exposed in vitro to a 1.9 GHz pulse-modulated radiofrequency field. *Proteomics.* 2007, 7(21):3896-905.

Chauhan V, Mariampillai A, Kutzner BC, Wilkins RC, Ferrarotto C, Bellier PV, Marro L, Gajda GB, Lemay E, Thansandote A, McNamee JP. Evaluating the biological effects of intermittent 1.9 GHz pulse-modulated radiofrequency fields in a series of human-derived cell lines. *Radiat Res.* 2007, 167(1):87-93.

Qutob SS, Chauhan V, Bellier PV, Yauk CL, Douglas GR, Berndt L, Williams A, Gajda GB, Lemay E, Thansandote A, McNamee JP. Microarray gene expression profiling of a human glioblastoma cell line exposed in vitro to a 1.9 GHz pulse-modulated radiofrequency field. *Radiat Res.* 2006, 165(6):636-644.

Chauhan V, Mariampillai A, Bellier PV, Qutob SS, Gajda GB, Lemay E, Thansandote A, McNamee JP. Gene expression analysis of a human lymphoblastoma cell line exposed in vitro to an intermittent 1.9 GHz pulse-modulated radiofrequency field. *Radiat Res.* 2006, 165(4):424-429.

Chauhan V, Mariampillai A, Gajda GB, Thansandote A, McNamee JP. Analysis of proto-oncogene and heat-shock protein gene expression in human derived cell-lines exposed in vitro to an intermittent 1.9 GHz pulse-modulated radiofrequency field. *Int J Radiat Biol.* 2006 May;82(5):347-54.

Moulder JE, Foster KR, Erdreich LS, McNamee JP. Mobile phones, mobile phone base stations and cancer: a review. *Int J Radiat Biol.* 2005, 81(3):189-203.

McNamee JP, Bellier PV, Gajda GB, Lavallée BF, Marro L, Lemay E, Thansandote A. No evidence for genotoxic effects from 24 h exposure of human leukocytes to 1.9 GHz radiofrequency fields. *Radiat Res.* 2003, 159(5):693-697.

Gajda GB, McNamee JP, Thansandote A, Boonpanyarak S, Lemay E, Bellier PV. Cylindrical

waveguide applicator for in vitro exposure of cell culture samples to 1.9-GHz radiofrequency fields. *Bioelectromagnetics*. 2002, 23(8):592-598.

McNamee JP, Bellier PV, Gajda GB, Lavallée BF, Lemay EP, Marro L, Thansandote A. DNA damage in human leukocytes after acute in vitro exposure to a 1.9 GHz pulse-modulated radiofrequency field. *Radiat Res*. 2002, 158(4):534-537.

McNamee JP, Bellier PV, Gajda GB, Miller SM, Lemay EP, Lavallée BF, Marro L, Thansandote A. DNA damage and micronucleus induction in human leukocytes after acute in vitro exposure to a 1.9 GHz continuous-wave radiofrequency field. *Radiat Res*. 2002, 158(4):523-533.

Thansandote A, Gajda GB, Lecuyer DW. Radiofrequency radiation in five Vancouver schools: exposure standards not exceeded. *CMAJ*. 1999, 160(9):1311-1312.

Stuchly MA, Kozlowski JA, Symons S, Lecuyer DW. Measurements of contact currents in radiofrequency fields. *Health Phys*. 1991, 60(4):547-557.

Stuchly MA. Proposed revision of the Canadian recommendations on radiofrequency-exposure protection. *Health Phys*. 1987, 53(6):649-65.




Stuchly MA, Repacholi MH, Lecuyer DW, Mann RD. Radiofrequency emissions from video display terminals. *Health Phys*. 1983, 45(3):772-775.

Stuchly MA, Repacholi MH, Lecuyer DW. Operator exposure to radiofrequency fields near a hyperthermia device. *Health Phys*. 1983, 45(1):101-107.

In addition to its own research activities, Health Canada continuously monitors the peer-reviewed scientific literature as it is published. Some external sites where you can find this research are:


-  [Pubmed](#)
-  [World Health Organisation](#)

Learn more by consulting the following resources:

-  [International Commission on Non-Ionizing Radiation Protection \(ICNIRP\)](#)
This International Commission on Non-Ionizing Radiation Protection (ICNIRP) publication reviews current scientific evidence and health consequences concerning exposure to high frequency electromagnetic fields.
- [It's Your Health: Safety of Cell Phones and Cell Phone Towers](#)
With the growing popularity of cell phones, concerns have been raised about the safety of exposure to RF energy. This document addresses these concerns and outlines the respective responsibilities of Health Canada and Industry Canada for the safety of these devices.
- [Health Canada's radiofrequency exposure guidelines \(Safety Code 6\)](#)
These guidelines describe limits for safe human exposure to radiofrequency energy and outline the safety requirements for the installation and use of devices that emit radiofrequency energy. Industry Canada has adopted a portion of these exposure limits and included them in their regulatory documents.
-  [Industry Canada's Radio Standards Specification 102](#)
Radio Standards Specification 102, *Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)* sets out the requirements and measurement techniques used to evaluate radio frequency (RF) exposure compliance of radiocommunication apparatus designed to be used within the vicinity of the human body.
-  [Electromagnetic Fields and Public Health](#)
This World Health Organization (WHO) fact sheet reviews scientific evidence on the health effects from continuous low-level human exposure to base stations and other local wireless

networks.

To make an inquiry regarding Safety Code 6, contact Health Canada's Consumer and Clinical Radiation Protection Bureau.

To make an inquiry regarding cell phones and base station compliance assessments, contact  Industry Canada's Spectrum Engineering Branch.

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