

APPENDIX A: The entire analysis of the 140 studies omitted by Health Canada, and the Royal Society of Canada during latest revision of Safety Code 6. Source: Health Canada. See Appendix B for a summary and complete references of the 36 studies considered by Health Canada to be “in-scope” and met quality standards for risk

Total # Papers Submitted by C4ST (140 without duplicates)

By C4ST Category	# submitted		# with sufficient quality for inclusion in RA	
	by C4ST	# (in scope)		
Cancer	9	6	6	
Generic Damage	14	13	2	
Infertility	14	13	1	
Dev./Learn./Behavior	30	24	7	*one paper excluded, not English/French
Brain/Nervous System	44	42	13	*one paper excluded, not English/French
Eye	6	5	2	
Cardiovascular	4	4	2	
EHS	8	3	1	
Biochemical	65	58	16	*two papers excluded, not English/French
	194	168	50	(See Note 1)

Note 1: many papers listed in the categories above are duplicates and appear in more than one category.

Total # of unique (in-scope, sufficient quality) technical references submitted by C4ST, with duplicates removed = 36.
Health Canada has evaluated these studies and does not consider them to impact on the previously identified thresholds for established adverse health effects, basic restrictions or derived reference levels in SC6 (2015).

List of "in-scope" technical references submitted by C4ST that meet quality standards for RA

Year	Authors
2010	Ammari, M., Gamez, C., Lecomte, A., Sakly, M., Abdelmelek, H. & De Seze, R.
2010	Augner, C., Hacker, G.W., Oberfeld, G., Florian, M., Hitzl, W., Hutter, J. & Pauser, G.
2009	Bas, O., Odaci, E., Kaplan, S., Acer, N., Ucock, K. & Colakoglu, S.
2010	Belyaev I, Markova E, Malmgren L.
2012	Bouji, M., Lecomte, A., Hode, Y., de Seze, R. & Villégier, A.S.
2013	Byun, Y.H., Ha, M., Kwon, H.J., Hong, Y.C., Leem, J.H., Sakong, J., Kim, S.Y., Lee, C.G., Kang, D., et al.
2011	Carballo-Quintás, M., Martínez-Silva, I., Cadarso-Suárez, C., Alvarez-Figueiras, M. et al.
2013	Cervellati, F., Valacchi, G., Lunghi, L., Fabbri, E., Valbonesi, P., Marci, R., Biondi, C. & Vesce, F.
2010	Céspedes, O., Inomoto, O., Kai, S., Nibu, Y., Yamaguchi, T., Sakamoto, N., Akune, T., Inoue, M., et al.
2014	Coureau, G., Bouvier, G., Lebailly, P., Fabbro-Peray, P., Gruber, A., Leffondre, K. et al.
2009	Dahmen, N., Ghezal-Ahmadi, D. & Engel, A.
2013	Deshmukh, P.S., Megha, K., Banerjee, B.D., Ahmed, R.S., Chandna, S., Abegaonkar, M.P. et al.
2010	Divan, H.A., Kheifets, L., Obel, C. & Olsen, J.
2011	Esmekaya, M.A., Ozer, C. & Seyhan, N.
2014	Furtado-Filho, O.V., Borba, J.B., Dalleggrave, A., Pizzolato, T.M., Henriques, J.A. et al.
2010	Grigoriev, Y.G., Grigoriev, O.A., Ivanov, A.A., Lyaginskaya, A.M., Merkulov, A.V., Shagina, N.B., et al.
2011	Hardell, L., Carlberg, M. & Mild, K.H.
2013	Hardell, L. & Carlberg, M.
2013	Hardell, L., Carlberg, M., Soderqvist, F. & Mild, K.H.
2014	Liu, K., Li, Y., Zhang, G., Liu, J., Cao, J., Ao, L. & Zhang, S.
2013	Loos, N., Thuróczy, G., Ghosn, R., Brenet-Dufour, V., Liabeuf, S., Selmaoui, B., Libert, J.P. et al.
2012	Lu, Y., Xu, S., He, M., Chen, C., Zhang, L., Liu, C., Chu, F., Yu, Z., Zhou, Z. & Zhong, M.
2014	Lv, B., Chen, Z., Wu, T., Shao, Q., Yan, D., Ma, L., Lu, K. & Xie, Y.
2010	Lyaqinskaja, A.M., Grigoriev, Y.G., Osipov, V.A., Grigoriev, O.A. & Shafirkin, A.V.
2014	Maaroufi, K., Had-Aissouni, L., Melon, C., Sakly, M., Abdelmelek, H., Poucet, B. & Save, E.
2014	Maskey, D. & Kim, M.J.
2012	Megha, K., Deshmukh, P.S., Banerjee, B.D., Tripathi, A.K. & Abegaonkar, M.P.
2012	Misa Agostiño, M.J., Leiro, J.M., Jorge Mora, M.T., Rodríguez-González, J.A., Jorge Barreiro, F.J., et al.
2013	Moretti, D., Garenne, A., Haro, E., Poullietier de Gannes, F., Lagroye, I., Lévêque, P. et al.
2012	Nazırođlu, M., Çelik, Ö., Özgül, C., Çiğ, B., Dođan, S., Bal, R., Gümrall, N., et al.
2013	Ni, S., Yu, Y., Zhang, Y., Wu, W., Lai, K. & Yao, K.
2010	Sonmez, O.F., Odaci, E., Bas, O. & Kaplan, S.
2014	Souza, Lda C., Cerqueira, Ede M. & Meireles, J.R.
2013	West JG, Kapoor NS, Liao S-Y, Chen JW, Bailey L, Nagourney RA.
2014	Valbonesi, P., Franzellitti, S., Bersani, F., Contin, A. & Fabbri, E.
2013	Zhang, Y., Yao, K., Yu, Y., Ni, S., Zhang, L., Wang, W. & Lai, K.

assessment (RA).

APPENDIX B: Studies considered by Health Canada to meet quality standards for risk assessment but for which it does not provide a rationale for excluding the findings when setting Safety Code (2015).

Summary of potentially harmful effects documented in thirty-six (36) studies which Health Canada determined to be "in scope" for Safety Code 6 Risk Assessment (see minutes of House of Commons, Standing Committee on Health: HESA, 54, 2nd Session, 41st Parliament, 24 March 2015).

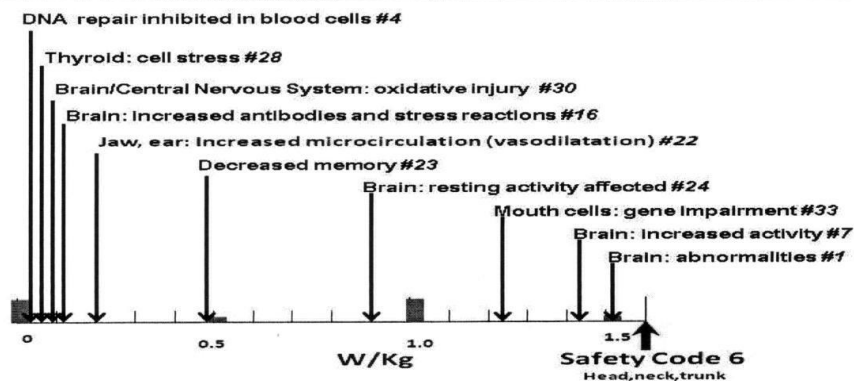
These studies are in the C4ST "140 omitted studies" report submitted to Health Canada, 15 July 2014. None are in Safety Code 6 Rationale (2015) nor in the Royal Society of Canada's Expert Panel report (2014) nor in any of their "Authoritative Reviews". All studies are in the cell/mobile phone frequency range of 900MHz to 2450 MHz, except #26 (2573 MHz) and some in IV. Specific Absorption Rate (SAR) levels were taken from the original papers and from EMF Portal <http://www.emf-portal.de/>

indicates the number of the reference on the next page.

I. Epidemiological-type studies (6), Case report (1), Literature review (1), Laboratory tests (1):

CONDITION	FINDINGS
Brain cancer: #17,18 Swedish case-control studies [note: Hardell et al. recently published a further study]	Dr. Hardell now recommends a World Health Organization, International Agency on Cancer Research (WHO/IARC) Group 1, known carcinogen classification [along with asbestos and cigarette smoke]. Dr. Hardell's work was used by the WHO/IARC to reach a near unanimous Group 2b, possible carcinogen classification in 2011.
Brain cancer: French case-control study #10	Higher cancer incidence among earliest and heaviest mobile phone users; findings are consistent with Hardell's group's work
Breast cancer: #35	USA case report of four (4) young women with no familial history of breast cancer in the precise location where they tucked their cell phones in their bras
Acoustic Neuroma: #19 Benign tumour on 8th cranial nerve	Confirmation of previous studies of an association with mobile/cordless phone use
Infertility: #21	Review found adverse effects. Conclusion: "... men should not keep mobile phone in their trouser pockets or near testicles to avoid potential harmful effect..."
Children: Attention Hyperactivity Deficit Disorder (ADHD) #6	Association with mobile phone use among children with higher lead levels
Children: 7 years in age #13	Behavioural problems associated with prenatal exposure
Electrohypersensitivity (EHS):#11	Laboratory tests: thyroid and liver dysfunction, chronic inflammation

II Biological effects below Safety Code 6 SAR for the head, neck and trunk (1.6 W/kg): Human, animal and cell culture studies



III Biological effects below Safety Code 6 SAR for whole body (0.08) W/kg: Human, animal and cell culture studies

%SC6	BIOLOGICAL EFFECTS	%SC6	BIOLOGICAL EFFECTS
1%	Brain: single strand DNA breaks #12	21%	Thyroid: cell stress #28
1%	Brain: oxidative stress, cognitive impairment, inflammation #27	38%	New born decreased body weight, effects on biochemistry #15
20%	Brain nerve development: increase in damaged cells #3	63%	Brain: dopamine and serotonin changes, impaired behaviour # 25
20%	Brain: cell loss, decrease in Purkinje cells #32	75%	Liver: DNA strand breaks #15

IV Other studies

Other studies (n=10): All >SC6. All showed effects. #5, 8, 9, 14, 20, 26, 29, 31, 34, 36.

Thirty-six (36) studies Health Canada determined to be “in scope” for Safety Code 6 Risk Assessment. See previous page for a summary of the potentially harmful effects reported in these studies.

Name of first author, title, journal and country of first author (in brackets).

1. Ammari (2010). GFAP [Glial Fibrillary Acidic Protein] expression in the rat brain following sub-chronic exposure to a 900 MHz electromagnetic field signal. *International Journal of Radiation Biology*, (France)
2. Augner (2010). Effects of Exposure to GSM Mobile Phone Base Station Signals on Salivary Cortisol, Alpha-Amylase, and Immunoglobulin A. *Biomedical and Environmental Sciences*. (Austria)
3. Bas (2009) 900 MHz electromagnetic field exposure affects qualitative and quantitative features of hippocampal pyramidal cells in the adult female rat. *Brain Research*. (Turkey)
4. Belyaev (2009). Microwaves from Mobile Phones Inhibit 53BP1 Focus Formation in Human Stem Cells Stronger than in Differentiated Cells: Possible Mechanistic Link to Cancer Risk. *Environmental Health Perspectives*. (Sweden)
5. Bouj (2012). Effects of 900 MHz radiofrequency on corticosterone, emotional memory and neuroinflammation in middle-aged rats. *Experimental Gerontology*, 47(6). (France)
6. Byun (2013). Mobile phone use, blood lead levels, and attention deficit hyperactivity symptoms in children: a longitudinal study. *PLoS One*. (Korea)
7. Carballo-Quintás (2011). A study of neurotoxic biomarkers, c-fos and GFAP after acute exposure to GSM radiation at 900 MHz in the picrotoxin model of rat brains. *Neurotoxicology*. (Spain)
8. Cervellati (2013). 17- β -estradiol counteracts the effects of high frequency electromagnetic fields on trophoblastic connexins and integrins. *Oxidative Medicine and Cellular Longevity*. (Italy)
9. Céspedes (2010). Radio frequency magnetic field effects on molecular dynamics and iron uptake in cage proteins. *Bioelectromagnetics*, (Japan)
10. Coureau (2014). Mobile phone use and brain tumours in the CERENAT case-control study. *Occupational and Environmental Medicine* (France)
11. Dahmen, (2009). Blood laboratory findings in patients suffering from self-perceived electromagnetic hypersensitivity (EHS). *Bioelectromagnetics*. (Germany)
12. Deshmukh (2013). Detection of Low Level Microwave Radiation Induced Deoxyribonucleic Acid Damage Vis-à-vis Genotoxicity in Brain of Fischer Rats. *Toxicology International* (India)
13. Divan (2010). Cell phone use and behavioural problems in young children. *Journal of Epidemiology & Community Health*. (USA-Denmark data)
14. Esmekaya (2011). 900 MHz pulse-modulated radiofrequency radiation induces oxidative stress on heart, lung, testis and liver tissues. *General Physiology and Biophysics*. (Turkey)
15. Furtado-Filho (2014). Effect of 950 MHz UHF electromagnetic radiation on biomarkers of oxidative damage, metabolism of UFA and antioxidants in the livers of young rats of different ages. *International Journal of Radiation Biology* (Brazil)
16. Grigoriev (2010). Confirmation studies of Soviet research on immunological effects of microwaves: Russian immunology results. *Bioelectromagnetics*. (Russia)
17. Hardell (2013a). Using the Hill viewpoints from 1965 for evaluating strengths of evidence of the risk for brain tumors associated with use of mobile and cordless phones. *Reviews on Environmental Health*. (Sweden)
18. Hardell (2011). Re-analysis of risk for glioma in relation to mobile telephone use: comparison with the results of the Interphone international case-control study. *International Journal of Epidemiology*. (Sweden)
19. Hardell (2013). Pooled analysis of case-control studies on acoustic neuroma diagnosed 1997-2003 and 2007-2009 and use of mobile and cordless phones. *International Journal of Oncology*. (Sweden)
20. Liaginskaia. (2010). [Autoimmune processes after long-term low-level exposure to electromagnetic fields (the results of an experiment). Part 5. Impact of the blood serum from rats exposed to low-level electromagnetic fields on pregnancy, foetus and offspring development of intact female rats]. *Radiatsionnaia biologii, radioecologii / Rossiiskaia akademiia nauk* (Russia)
21. Liu (2014) Association between mobile phone use and semen quality: a systemic review and meta-analysis. *Andrology*. (China)
22. Loos (2013). Is the effect of mobile phone radiofrequency waves on human skin perfusion non-thermal? *Microcirculation* (France)
23. Lu (2012). Glucose administration attenuates spatial memory deficits induced by chronic low-power-density microwave exposure. *Physiology & Behavior*. (China)
24. Lv (2013). The alteration of spontaneous low frequency oscillations caused by acute electromagnetic fields exposure. *Clinical Neurophysiology: Official Journal of the International Federation of Clinical Neurophysiology*. (China)
25. Maaroufi (2013). Spatial learning, monoamines and oxidative stress in rats exposed to 900MHz electromagnetic field in combination with iron overload. *Behavioural Brain Research*. (France)
26. Maskey (2010). Effect of 835 MHz radiofrequency radiation exposure on calcium binding proteins in the hippocampus of the mouse brain. *Brain Research*. (South Korea)
27. Megha (2012). Microwave radiation induced oxidative stress, cognitive impairment and inflammation in brain of Fischer rats. *Indian Journal of Experimental Biology*. (India)
28. Misa Agustiño (2012). Electromagnetic fields at 2.45 GHz trigger changes in heat shock proteins 90 and 70 without altering apoptotic activity in rat thyroid gland. *Biology Open* (Spain)
29. Moretti (2013). In-vitro exposure of neuronal networks to the GSM-1800 signal. *Bioelectromagnetics* (France)
30. Naziroğlu (2012). Melatonin modulates wireless (2.45 GHz)-induced oxidative injury through TRPM2 and voltage gated Ca(2+) channels in brain and dorsal root ganglion in rat. *Physiology & Behavior*. (Turkey)
31. Ni (2013). Study of oxidative stress in human lens epithelial cells exposed to 1.8 GHz radiofrequency fields. *PLoS One* (China)
32. Sonmez (2010). Purkinje cell number decreases in the adult female rat cerebellum following exposure to 900 MHz electromagnetic field. *Brain Research*. (Turkey)
33. Souza (2014). Assessment of nuclear abnormalities in exfoliated cells from the oral epithelium of mobile phone users. *Electromagnetic Biology and Medicine*. (Brazil)
34. Valbonesi (2014). Effects of the exposure to intermittent 1.8 GHz radio frequency electromagnetic fields on HSP70 expression and MAPK signaling pathways in PC12 cells. *International Journal of Radiation Biology* (Italy)
35. West (2013). Multifocal breast cancer in young women with prolonged contact between their breasts and their cellular phones. *Case Reports in Medicine*. (USA)
36. Zhang (2013). Effects of 1.8 GHz radiofrequency radiation on protein expression in human lens epithelial cells. *Human & Experimental Toxicology*. (China)

APPENDIX C: List of publications of research conducted by Health Canada on radiofrequency radiation-electromagnetic fields, since 1983. Obtained from Health Canada August 4, 2020.

	Year	Study
1.	1983	Stuchly MA, Repacholi MH, Lecuyer DW. Operator exposure to radiofrequency fields near a hyperthermia device. <i>Health Phys.</i> 1983, 45(1):101-107.
2.	1983	Stuchly MA, Repacholi MH, Lecuyer DW, Mann RD. Radiofrequency emissions from video display terminals. <i>Health Phys.</i> 1983, 45(3):772-775.
3.	1987	Stuchly MA. Proposed revision of the Canadian recommendations on radiofrequency-exposure protection. <i>Health Phys.</i> 1987, 53(6):649-65.
4.	1991	Stuchly MA, Kozlowski JA, Symons S, Lecuyer DW. Measurements of contact currents in radiofrequency fields. <i>Health Phys.</i> 1991, 60(4):547-557.
5.	1999	Thansandote A, Gajda GB, Lecuyer DW. Radiofrequency radiation in five Vancouver schools: exposure standards not exceeded. <i>CMAJ.</i> 1999, 160(9):1311-1312.
6.	2002	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. <i>Radiat Res.</i> 2002, 158(4):523-533.
7.	2002	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. <i>Radiat Res.</i> 2002, 158(4):534-537.
8.	2002	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. <i>Bioelectromagnetics.</i> 2002, 23(8):592-598.
9.	2003	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. <i>Radiat Res.</i> 2003, 159(5):693-697.
10.	2005	Moulder JE, Foster KR, Erdreich LS, McNamee JP. Mobile phones, mobile phone base stations and cancer: a review. <i>Int J Radiat Biol.</i> 2005, 81(3):189-203.
11.	2006	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. <i>Int J Radiat Biol.</i> 2006 May;82(5):347-54.
12.	2006	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. <i>Radiat Res.</i> 2006, 165(4):424-429.
13.	2006	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. <i>Radiat Res.</i> 2006, 165(6):636-644.
14.	2007	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. <i>Radiat Res.</i> 2007, 167(1): 87-93.
15.	2007	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. <i>Proteomics.</i> 2007, 7(21):3896-905.
16.	2007	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).

17 .	2009	McNamee JP, Chauhan V. Radiofrequency radiation and gene/protein expression: a review. Radiat Res. 2009 Sep;172(3):265-87.
18 .	2012	Wasoontarajaroen S, Thansandote A, Gajda GB, Lemay EP, McNamee JP, Bellier PV. Dosimetry evaluation of a cylindrical waveguide chamber for unrestrained small rodents at 1.9 GHz. Bioelectromagnetics. 2012 Oct;33(7):575-84.
19 .	2012	Wasoontarajaroen S, Thansandote A, Gajda GB, Lemay EP, McNamee JP, Bellier PV. Cylindrical waveguide electromagnetic exposure system for biological studies with unrestrained mice at 1.9 GHz. Health Phys. 2012 Sep;103(3):268-74
20 .	2016	McNamee JP, Bellier PV, Konkle AT, Thomas R, Wasoontarajaroen S, Lemay E, Gajda GB. Analysis of gene expression in mouse brain regions after exposure to 1.9 GHz radiofrequency fields. Int J Radiat Biol. 2016 Jun;92(6):338-50.
21 .	2019	Gajda GB, Lemay E, Paradis J. Model of steady-state temperature rise in multilayer tissues due to narrow-beam millimeter-wave radiofrequency field exposure. Health Physics. 2019. DOI: 10.1097/HP.0000000000001036 https://journals.lww.com/health-physics/Abstract/publishahead/Model_of_Steady_state_Temperature_Rise_in.99916.aspx#pdf-link