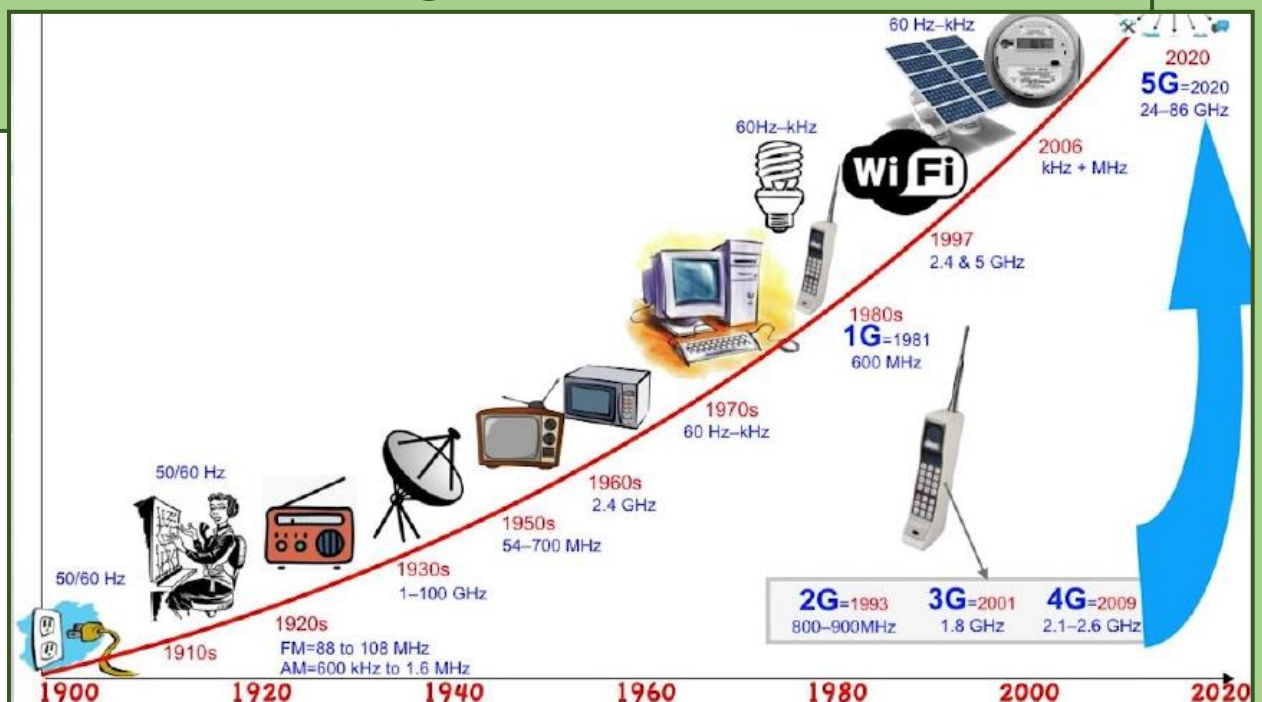


2020

9 bardzo dobrze naukowo udokumentowanych skutków
nietermicznego narażenia na
promieniowanie elektromagnetyczne (PEM).
Rola pulsacji oraz inne czynniki wpływające na skutki
biologiczne.



I. Uszkodzenie komórkowego DNA: Jedno- i dwuniciowe pęknięcia w komórkowym DNA i utlenionych zasad w komórkowym DNA, prowadzące do zmian chromosomalnych i innych mutacyjnych:

1. Glaser ZR, PhD. 1971 Naval Medical Research Institute Research Report, June 1971. Bibliography of Reported Biological Phenomena ("Effects") and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation. Report No. 2 Revised.
https://scholar.google.com/scholar?q=Glaser+naval+medical+microwave+radio-frequency+1972&btnG=&hl=en&as_sdt=0%2C38 (Accessed Sept. 9, 2017)
2. Goldsmith JR. 1997 Epidemiologic evidence relevant to radar (microwave) effects. *Environ Health Perspect* 105(Suppl 6):1579-1587.
3. Yakymenko IL, Sidorik EP, Tsybulin AS. 1999 [Metabolic changes in cells under electromagnetic radiation of mobile communication systems]. *Ukr Biokhim Zh* (1999), 2011 Mar-Apr:20-28.
4. Aitken RJ, De Luliis GN. 2007 Origins and consequences of DNA damage in male germ cells. *Reprod Biomed Online* 14:727-733.
5. Hardell, L., Sage, C. 2008. Biological effects from electromagnetic field exposure and public exposure standards. *Biomed. Pharmacother.* 62, 104-109.
6. Hazout A, Menezo Y, Madelenat P, Yazbeck C, Selva J, Cohen-Bacrie P. 2008 [Causes and clinical implications of sperm DNA damages]. *Gynecol Obstet Fertil* ;36:1109-1117.
7. Phillips JL, Singh NP, Lai H. 2009 Electromagnetic fields and DNA damage. *Pathophysiology* 16:79-88.
8. Ruediger HW. 2009 Genotoxic effects of radiofrequency electromagnetic fields. *Pathophysiology.* 16:89-102.
9. Makker K, Varghese A, Desai NR, Mouradi R, Agarwal A. 2009 Cell phones: modern man's nemesis? *Reprod Biomed Online* 18:148-157.
10. Yakymenko I, Sidorik E. 2010 Risks of carcinogenesis from electromagnetic radiation and mobile telephony devices. *Exp Oncol* 32:729-736.
11. Yakymenko IL, Sidorik EP, Tsybulin AS. 2011 [Metabolic changes in cells under electromagnetic radiation of mobile communication systems]. *Ukr Biokhim Zh* (1999). 2011 Mar-Apr;83(2):20-28.
12. Gye MC, Park CJ. 2012 Effect of electromagnetic field exposure on the reproductive system. *Clin Exp Reprod Med* 39:1-9. doi.org/10.5653/cerm.2012.39.1.1
13. Pall, ML. 2013. Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects. *J Cell Mol Med* 17:958-965. doi: 10.1111/jcmm.12088.
14. Pall, M. L. 2015 Scientific evidence contradicts findings and assumptions of Canadian Safety Panel 6: microwaves act through voltage-gated calcium channel activation to induce biological impacts at non-thermal levels, supporting a paradigm shift for microwave/lower frequency electromagnetic field action. *Rev. Environ. Health* 3, 99-116. doi: 10.1515/reveh-2015-0001.
15. Houston BJ, Nixon B, King BV, De Luliis GN, Aitken RJ. 2016 The effects of radiofrequency electromagnetic radiation on sperm function. *Reproduction* 152:R263-R276.
16. Batista Napotnik T, Reberšek M, Vernier PT, Mali B, Miklavčič D. 2016 Effects of high voltage nanosecond electric pulses on eukaryotic cells (in vitro): A systematic review. *Bioelectrochemistry.* 2016 Aug;110:1-12. doi: 10.1016/j.bioelechem.2016.02.011.
17. Asghari A, Khaki AA, Rajabzadeh A, Khaki A. 2016 A review on Electromagnetic fields (PEMs) and the reproductive system. *Electron Physician.* 2016 Jul 25;8(7):2655-2662. doi: 10.19082/2655.
18. Pall ML. 2018 How cancer can be caused by microwave frequency electromagnetic field (PEM) exposures: PEM activation of voltage-gated calcium channels (VGCCs) can cause cancer including tumor promotion, tissue invasion and metastasis via 15 mechanisms. Chapter 7 in *Mobile Communications and Public Health*, Marko Markov, Ed., CRC press, pp 167-188.
19. Pall ML. 2018 Wi-Fi is an important threat to human health. *Environ Res* 164:404-416.

II. Obniżona płodność, w tym zmiany przebudowy tkanek jąder, obniżona liczba i jakość plemników, obniżona płodność kobiet, w tym przebudowa jajników, utrata oocytów (pęcherzyków), obniżony poziom estrogenów, progesteronu i testosteronu (czyli hormonów płciowych), zwiększona częstotliwość spontanicznych aborcji, obniżone libido:

1. Glaser ZR, PhD. 1971 Naval Medical Research Institute Research Report, June 1971. Bibliography of Reported Biological Phenomena ("Effects") and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation. Report No. 2 Revised.
https://scholar.google.com/scholar?q=Glaser+naval+medical+microwave+radio-frequency+1972&btnG=&hl=en&as_sdt=0%2C38 (Accessed Sept. 9, 2017)
2. Tolgskaya MS, Gordon ZV. 1973. Pathological Effects of Radio Waves, Translated from Russian by B Haigh. Consultants Bureau, New York/London, 146 pages.
3. Goldsmith JR. Epidemiological evidence relevant to radar (microwave) effects. *Environ Health Perspect* 105(Suppl 6):1579-1587.
4. Aitken RJ, De Iuliis GN. 2007 Origins and consequences of DNA damage in male germ cells. *Reprod Biomed Online* 14:727-733.
5. Hazout A, Menezo Y, Madelenat P, Yazbeck C, Selva J, Cohen-Bacrie P. 2008 [Causes and clinical implications of sperm DNA damages]. *Gynecol Obstet Fertil* ;36:1109-1117.
6. Makker K, Varghese A, Desai NR, Mouradi R, Agarwal A. 2009 Cell phones: modern man's nemesis? *Reprod Biomed Online* 18:148-157.
7. Kang N, Shang XJ, Huang YF. 2010 [Impact of cell phone radiation on male reproduction]. *Zhonghua Nan Ke Xue* 16:1027-1030.
8. Gye MC, Park CJ. 2012 Effect of electromagnetic field exposure on the reproductive system. *Clin Exp Reprod Med* 39:1-9. doi.org/10.5653/cerm.2012.39.1.1
9. La Vignera S, Condorelli RA, Vicari E, D'Agata R, Calogero AE. 2012 Effects of the exposure to mobile phones on male reproduction: a review of the literature. *J Androl* 33:350-356.
10. Carpenter DO. 2013 Human disease resulting from exposure to electromagnetic fields. *Rev Environ Health* 2013;28:159-172.
11. Nazıroğlu M, Yüksel M, Köse SA, Özkaya MO. 2013 Recent reports of Wi-Fi and mobile phone-induced radiation on oxidative stress and reproductive signaling pathways in females and males. *J Membr Biol* 246:869-875.
12. Adams JA, Galloway TS, Mondal D, Esteves SC, Mathews F. 2014 Effect of mobile telephones on sperm quality: a systematic review and meta-analysis. *Environ Int* 70:106-112.
13. Liu K, Li Y, Zhang G, Liu J, Cao J, Ao L, Zhang S. 2014 Association between mobile phone use and semen quality: a systematic review and meta-analysis. *Andrology* 2:491-501.
14. K Sri N. 2015 Mobile phone radiation: physiological & pathophysiological considerations. *Indian J Physiol Pharmacol* 59:125-135.
15. Houston BJ, Nixon B, King BV, De Iuliis GN, Aitken RJ. 2016 The effects of radiofrequency electromagnetic radiation on sperm function. *Reproduction* 152:R263-R276
16. Pall ML. 2018 Wi-Fi is an important threat to human health. *Environ Res* 164:404-416.

III. Efekty neurologiczne/neuropsychiatryczne:

1. Marha K. 1966 Biological Effects of High-Frequency Electromagnetic Fields (Translation). ATD Report 66-92. July 13, 1966 (ATD Work Assignment No. 78, Task 11).
<http://www.dtic.mil/docs/citations/AD0642029> (accessed March 12, 2018)
2. Glaser ZR, PhD. 1971 Naval Medical Research Institute Research Report, June 1971. Bibliography of Reported Biological Phenomena ("Effects") and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation. Report No. 2 Revised.
https://scholar.google.com/scholar?q=Glaser+naval+medical+microwave+radio-frequency+1972&btnG=&hl=en&as_sdt=0%2C38 (Accessed Sept. 9, 2017)
3. Tolgskaya MS, Gordon ZV. 1973. Pathological Effects of Radio Waves, Translated from Russian by by Haigh. Consultants Bureau, New York/London, 146 pages.
4. Bise W. 1978 Low power radio-frequency and microwave effects on human electroencephalogram and behavior. *Physiol Chem Phys* 10:387-398.
5. Raines, J. K. 1981. Electromagnetic Field Interactions with the Human Body: Observed Effects and Theories. Greenbelt, Maryland: National Aeronautics and Space Administration 1981; 116 p.

6. Frey AH. 1993 Electromagnetic field interactions with biological systems. *FASEB J* 7:272-281.
7. Lai H. 1994 Neurological effects of radiofrequency electromagnetic radiation. In: *Advances in Electromagnetic Fields in Living Systems*, Vol. 1, J.C. Lin, Ed., Plenum Press, New York, pp. 27- 88.
8. Grigor'ev IuG. 1996 [Role of modulation in biological effects of electromagnetic radiation]. *Radiats Biol Radioecol* 36:659-670.
9. Lai, H 1998 Neurological effects of radiofrequency electromagnetic radiation. http://www.mapcruzin.com/radiofrequency/henry_lai2.htm.
10. Aitken RJ, De lullis GN. 2007 Origins and consequences of DNA damage in male germ cells. *Reprod Biomed Online* 14:727-733.
11. Hardell, L., Sage, C. 2008. Biological effects from electromagnetic field exposure and public exposure standards. *Biomed. Pharmacother.* 62, 104-109.
12. Makker K, Varghese A, Desai NR, Mouradi R, Agarwal A. 2009 Cell phones: modern man's nemesis? *Reprod Biomed Online* 18:148-157.
13. Khurana VG, Hardell L, Everaert J, Bortkiewicz A, Carlberg M, Ahonen M. 2010 Epidemiological evidence for a health risk from mobile phone base stations. *Int J Occup Environ Health* 16:263-267.
14. Levitt, B. B., Lai, H. 2010. Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays. *Environ. Rev.* 18, 369-395. doi.org/10.1139/A10-018
15. Carpenter DO. 2013 Human disease resulting from exposure to electromagnetic fields. *Rev Environ Health* 2013;28:159-172.
16. Politański P, Bortkiewicz A, Zmysłony M. 2016 [Effects of radio- and microwaves emitted by wireless communication devices on the functions of the nervous system selected elements]. *Med Pr* 67:411-421.
17. Pall ML. 2016 Microwave frequency electromagnetic fields (PEMs) produce widespread neuropsychiatric effects including depression. *J Chem Neuroanat* 75(Pt B):43-51. doi: 10.1016/j.jchemneu.2015.08.001.
18. Hecht, Karl. 2016 Health Implications of Long-Term Exposures to Electrosmog. Brochure 6 of A Brochure Series of the Competence Initiative for the Protection of Humanity, the Environment and Democracy. http://kompetenzinitiative.net/KIT/wp-content/uploads/2016/07/KI_Brochure-6_K_Hecht_web.pdf (accessed Feb. 11, 2018)
19. Sangün Ö, DüNDAR B, ÇöMLEKÇİ S, BÜYÜKGEBİZ A. 2016 The Effects of Electromagnetic Field on the Endocrine System in Children and Adolescents. *Pediatr Endocrinol Rev* 13:531-545.
20. Belyaev I, Dean A, Eger H, Hubmann G, Jandrisovits R, Kern M, Kundi M, Moshammer H, Lercher P, Müller K, Oberfeld G, Ohnsorge P, Pelzmann P, Scheingraber C, Thill R. 2016 EUROPAEM PEM Guideline 2016 for the prevention, diagnosis and treatment of PEM-related health problems and illnesses. *Rev Environ Health* DOI 10.1515/reveh-2016-0011.
21. Zhang J, Sumich A, Wang GY. 2017 Acute effects of radiofrequency electromagnetic field emitted by mobile phone on brain function. *Bioelectromagnetics* 38:329-338. doi: 10.1002/bem.22052.
22. Lai H. 2018. A Summary of Recent Literature (2007–2017) on Neurological Effects of Radio Frequency Radiation. Chapter 8 in *Mobile Communications and Public Health*, Marko Markov, Ed., CRC press, pp 189-224.
23. Pall ML. 2018 Wi-Fi is an important threat to human health. *Environ Res* 164:404-416.

IV. Apoptoza/śmierć komórek (ważny proces w produkcji chorób neurodegeneracyjnych, który jest również ważny w produkcji odpowiedzi na niepłodność):

1. Glaser ZR, PhD. 1971 Naval Medical Research Institute Research Report, June 1971. Bibliography of Reported Biological Phenomena (“Effects”) and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation. Report No. 2 Revised. https://scholar.google.com/scholar?q=Glaser+naval+medical+microwave+radio-frequency+1972&btnG=&hl=en&as_sdt=0%2C38 (Accessed Sept. 9, 2017)
2. Tolgskaya MS, Gordon ZV. 1973. *Pathological Effects of Radio Waves*, Translated from Russian by B Haigh. Consultants Bureau, New York/London, 146 pages.
3. Raines, J. K. 1981. *Electromagnetic Field Interactions with the Human Body: Observed Effects and Theories*. Greenbelt, Maryland: National Aeronautics and Space Administration 1981; 116 p.
4. Hardell L, Sage C. 2008. Biological effects from electromagnetic field exposure and public exposure standards. *Biomed. Pharmacother.* 62:104-109. doi: 10.1016/j.biopha.2007.12.004.
5. Makker K, Varghese A, Desai NR, Mouradi R, Agarwal A. 2009 Cell phones: modern man's nemesis? *Reprod Biomed Online* 18:148-157.

6. Levitt, B. B., Lai, H. 2010. Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays. *Environ. Rev.* 18, 369-395. doi.org/10.1139/A10-018
7. Yakymenko I, Sidorik E. 2010 Risks of carcinogenesis from electromagnetic radiation and mobile telephony devices. *Exp Oncol* 32:729-736.
8. Yakymenko IL, Sidorik EP, Tsybulin AS. 2011 [Metabolic changes in cells under electromagnetic radiation of mobile communication systems]. *Ukr Biokhim Zh (1999)*. 2011 Mar-Apr;83(2):20-28.
9. Pall, ML. 2013. Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects. *J Cell Mol Med* 17:958-965. doi: 10.1111/jcmm.12088.
10. Pall ML. 2016 Microwave frequency electromagnetic fields (PEMs) produce widespread neuropsychiatric effects including depression. *J Chem Neuroanat* 75(Pt B):43-51. doi: 10.1016/j.jchemneu.2015.08.001.
11. Batista Napotnik T, Reberšek M, Vernier PT, Mali B, Miklavčič D. 2016 Effects of high voltage nanosecond electric pulses on eukaryotic cells (in vitro): A systematic review. *Bioelectrochemistry*. 2016 Aug;110:1-12. doi: 10.1016/j.bioelechem.2016.02.011.
12. Asghari A, Khaki AA, Rajabzadeh A, Khaki A. 2016 A review on Electromagnetic fields (PEMs) and the reproductive system. *Electron Physician*. 2016 Jul 25;8(7):2655-2662. doi: 10.19082/2655.
13. Pall ML. 2018 Wi-Fi is an important threat to human health. *Environ Res* 164:404-416.

V. Stres oksydacyjny/uszkodzenia spowodowane przez wolne rodniki (ważne mechanizmy zaangażowane w prawie wszystkie choroby przewlekłe; bezpośrednia przyczyna uszkodzenia DNA komórkowego):

1. Raines, J. K. 1981. *Electromagnetic Field Interactions with the Human Body: Observed Effects and Theories*. Greenbelt, Maryland: National Aeronautics and Space Administration 1981; 116 p.
2. Hardell, L., Sage, C. 2008. Biological effects from electromagnetic field exposure and public exposure standards. *Biomed. Pharmacother.* 62, 104-109.
3. Hazout A, Menezo Y, Madelenat P, Yazbeck C, Selva J, Cohen-Bacrie P. 2008 [Causes and clinical implications of sperm DNA damages]. *Gynecol Obstet Fertil* ;36:1109-1117
4. Makker K, Varghese A, Desai NR, Mouradi R, Agarwal A. 2009 Cell phones: modern man's nemesis? *Reprod Biomed Online* 18:148-157.
5. Desai NR, Kesari KK, Agarwal A. 2009 Pathophysiology of cell phone radiation: oxidative stress and carcinogenesis with focus on the male reproductive system. *Reproduct Biol Endocrinol* 7:114.
6. Yakymenko I, Sidorik E. 2010 Risks of carcinogenesis from electromagnetic radiation and mobile telephony devices. *Exp Oncol* 32:729-736.
7. Yakymenko IL, Sidorik EP, Tsybulin AS. 2011 [Metabolic changes in cells under electromagnetic radiation of mobile communication systems]. *Ukr Biokhim Zh (1999)*. 2011 Mar-Apr;83(2):20-28.
8. Consales, C., Merla, C., Marino, C., et al. 2012. Electromagnetic fields, oxidative stress, and neurodegeneration. *Int. J. Cell Biol.* 2012: 683897.
9. LaVignera et al 2012 La Vignera S, Condorelli RA, Vicari E, D'Agata R, Calogero AE. 2012 Effects of the exposure to mobile phones on male reproduction: a review of the literature. *J Androl* 33:350-356.
10. Pall, ML. 2013. Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects. *J Cell Mol Med* 17:958-965. doi: 10.1111/jcmm.12088.
11. Nazıroğlu M, Yüksel M, Köse SA, Özkaya MO. 2013 Recent reports of Wi-Fi and mobile phone- induced radiation on oxidative stress and reproductive signaling pathways in females and males. *J Membr Biol* 246:869-875.
12. Pall, M. L. 2015. Scientific evidence contradicts findings and assumptions of Canadian Safety Panel 6: microwaves act through voltage-gated calcium channel activation to induce biological impacts at non-thermal levels, supporting a paradigm shift for microwave/lower frequency electromagnetic field action. *Rev. Environ. Health* 3, 99-116.
13. Yakymenko I, Tsybulin O, Sidorik E, Henshel D, Kyrylenko O, Kysylenko S. 2015 Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation. *Electromagnetic Biol Med: Early Online* 1-16. ISSN: 1536-8378.
14. Houston BJ, Nixon B, King BV, De Iulii GN, Aitken RJ. 2016 The effects of radiofrequency electromagnetic radiation on sperm function. *Reproduction* 152:R263-R276.
15. Dasdag S, Akdag MZ. 2016 The link between radiofrequencies emitted from wireless technologies and oxidative stress. *J Chem Neuroanat* 75(Pt B):85-93.

16. Wang H, Zhang X. 2017 Magnetic fields and reactive oxygen species. *Int J Mol Sci.* 2017 Oct 18;18(10). pii: E2175. doi: 10.3390/ijms18102175.
17. Pall ML. 2018 Wi-Fi is an important threat to human health. *Environ Res* 164:404-416.

VI. Endokrynologia, efekty hormonalne:

1. Glaser ZR, PhD. 1971 Naval Medical Research Institute Research Report, June 1971. Bibliography of Reported Biological Phenomena ("Effects") and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation. Report No. 2 Revised.
https://scholar.google.com/scholar?q=Glaser+naval+medical+microwave+radio-frequency+1972&btnG=&hl=en&as_sdt=0%2C38 (Accessed Sept. 9, 2017)
2. Tolgskaya MS, Gordon ZV. 1973. Pathological Effects of Radio Waves, Translated from Russian by B Haigh. Consultants Bureau, New York/London, 146 pages.
3. Raines, J. K. 1981. Electromagnetic Field Interactions with the Human Body: Observed Effects and Theories. Greenbelt, Maryland: National Aeronautics and Space Administration 1981; 116 p.
4. Hardell, L., Sage, C. 2008. Biological effects from electromagnetic field exposure and public exposure standards. *Biomed. Pharmacother.* 62, 104-109.
5. Makker K, Varghese A, Desai NR, Mouradi R, Agarwal A. 2009 Cell phones: modern man's nemesis? *Reprod Biomed Online* 18:148-157.
6. Gye MC, Park CJ. 2012 Effect of electromagnetic field exposure on the reproductive system. *Clin Exp Reprod Med* 39:1-9. doi.org/10.5653/cerm.2012.39.1.1
7. Pall, M. L. 2015. Scientific evidence contradicts findings and assumptions of Canadian Safety Panel 6: microwaves act through voltage-gated calcium channel activation to induce biological impacts at non-thermal levels, supporting a paradigm shift for microwave/lower frequency electromagnetic field action. *Rev. Environ. Health* 3, 99-116.
8. Sangün Ö, Dündar B, Çömlekçi S, Büyükgebiz A. 2016 The Effects of Electromagnetic Field on the Endocrine System in Children and Adolescents. *Pediatr Endocrinol Rev* 13:531-545.
9. Hecht, Karl. 2016 Health Implications of Long-Term Exposures to Electrosmog. Brochure 6 of A Brochure Series of the Competence Initiative for the Protection of Humanity, the Environment and Democracy. http://kompetenzinitiative.net/KIT/wp-content/uploads/2016/07/KI_Brochure-6_K_Hecht_web.pdf (accessed Feb. 11, 2018)
10. Asghari A, Khaki AA, Rajabzadeh A, Khaki A. 2016 A review on Electromagnetic fields (PEMs) and the reproductive system. *Electron Physician.* 2016 Jul 25;8(7):2655-2662. doi: 10.19082/2655.
11. Pall ML. 2018 Wi-Fi is an important threat to human health. *Environ Res* 164:404-416.

VII. Podwyższony wewnątrzkomórkowy poziom wapnia: wewnątrzkomórkowy poziom wapnia jest utrzymywany na bardzo niskim poziomie (zazwyczaj około 2×10^{-9} M), z wyjątkiem krótkotrwałych podwyżek wykorzystywanych do wytwarzania odpowiedzi regulacyjnych, takich, że trwałe podniesienie poziomu wapnia wewnątrzkomórkowego produkuje wiele patofizjologicznych odpowiedzi, czyli powodujących choroby).

1. Adey WR. 1988 Cell membranes: the electromagnetic environment and cancer promotion. *Neurochem Res.*13:671-677.
2. Walleczek, J. 1992. Electromagnetic field effects on cells of the immune system: the role of calcium signaling. *FASEB J.* 6, 3177-3185.
3. Adey, WR. 1993 Biological effects of electromagnetic fields. *J Cell Biochem* 51:410-416.
4. Frey AH. 1993 Electromagnetic field interactions with biological systems. *FASEB J* 7:272-281.
5. Yakymenko IL, Sidorik EP, Tsybulin AS. 1999 [Metabolic changes in cells under electromagnetic radiation of mobile communication systems]. *Ukr Biokhim Zh* (1999), 2011 Mar-Apr:20-28.
6. Gye MC, Park CJ. 2012 Effect of electromagnetic field exposure on the reproductive system. *Clin Exp Reprod Med* 39:1-9. doi.org/10.5653/cerm.2012.39.1.1
7. Pall, ML. 2013. Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects. *J Cell Mol Med* 17:958-965. doi: 10.1111/jcmm.12088.
8. Pall ML. 2014 Electromagnetic field activation of voltage-gated calcium channels: role in therapeutic effects. *Electromagn Biol Med.* 2014 Apr 8 doi: 10.3109/15368378.2014.906447.

9. Pall ML. 2015a How to approach the challenge of minimizing non-thermal health effects of microwave radiation from electrical devices. *International Journal of Innovative Research in Engineering & Management (IJIREM)* ISSN: 2350-0557, Volume-2, Issue -5, September 2015; 71-76.
10. Pall, M. L. 2015 Scientific evidence contradicts findings and assumptions of Canadian Safety Panel 6: microwaves act through voltage-gated calcium channel activation to induce biological impacts at non-thermal levels, supporting a paradigm shift for microwave/lower frequency electromagnetic field action. *Rev. Environ. Health* 3, 99-116. doi: 10.1515/reveh-2015-0001.
11. Pall ML. 2016 Electromagnetic fields act similarly in plants as in animals: Probable activation of calcium channels via their voltage sensor. *Curr Chem Biol* 10: 74-82.
12. Pall ML. 2016 Microwave frequency electromagnetic fields (PEMs) produce widespread neuropsychiatric effects including depression. *J Chem Neuroanat* 75(Pt B):43-51. doi: 10.1016/j.jchemneu.2015.08.001.
13. Batista Napotnik T, Reberšek M, Vernier PT, Mali B, Miklavčič D. 2016 Effects of high voltage nanosecond electric pulses on eukaryotic cells (in vitro): A systematic review. *Bioelectrochemistry*. 2016 Aug;110:1-12. doi: 10.1016/j.bioelechem.2016.02.011.
14. Asghari A, Khaki AA, Rajabzadeh A, Khaki A. 2016 A review on Electromagnetic fields (PEMs) and the reproductive system. *Electron Physician*. 2016 Jul 25;8(7):2655-2662. doi: 10.19082/2655.

VIII. Pulsacyjne pola elektromagnetyczne są w większości przypadków znacznie bardziej aktywne biologicznie niż niepulsacyjne. Jest to ważne, ponieważ wszystkie bezprzewodowe urządzenia komunikacyjne komunikują się za pomocą pulsacji i ponieważ im bardziej "inteligentne" są te urządzenia, tym bardziej pulsują, ponieważ pulsy przekazują informacje. Co powinno być oczywiste to to, że nie można badać takich ról pulsacyjnych, jeśli nie było żadnych skutków biologicznych wytwarzanych przez takie PEM. Badania pulsacji same mówią nam, że istnieje wiele takich efektów PEM.

1. Osipov YuA, 1965 [Labor hygiene and the effect of radiofrequency electromagnetic fields on workers]. Leningrad Meditsina Publishing House, 220 pp.
2. Pollack H, Healer J. 1967 Review of Information on Hazards to Personnel from High-Frequency Electromagnetic Radiation. Institute for Defense Analyses; Research and Engineering Support Division. IDA/HQ 67-6211, Series B, May 1967.
3. Creighton MO, Larsen LE, Stewart-DeHaan PJ, Jacobi JH, Sanwal M, Baskerville JC, Bassen HE, Brown DO, Trevithick JR. 1987 In vitro studies of microwave-induced cataract. II. Comparison of damage observed for continuous wave and pulsed microwaves. *Exp Eye Res* 45:357-373.
4. Grigor'ev IuG. 1996 [Role of modulation in biological effects of electromagnetic radiation]. *Radiats Biol Radioecol* 36:659-670.
5. Belyaev I. 2005 Non-thermal biological effects of microwaves. *Microwave Rev* 11:13-29.
6. Belyaev I. 2005 Non-thermal biological effects of microwaves: current knowledge, further perspective and urgent needs. *Electromagn Biol Med* 24(3):375-403.
7. Markov MS. 2007 Pulsed electromagnetic field therapy: History, state of the art and future. *The Environmentalist* 27:465-475.
8. Van Boxem K, Huntoon M, Van Zundert J, Patijn J, van Kleef M, Joosten EA. 2014 Pulsed radiofrequency: a review of the basic science as applied to the pathophysiology of radicular pain: a call for clinical translation. *Reg Anesth Pain Med*. 2014 Mar-Apr;39(2):149-59.
9. Belyaev, I. 2015. Biophysical mechanisms for nonthermal microwave effects. In: *Electromagnetic Fields in Biology and Medicine*, Marko S. Markov, ed, CRC Press, New York, pp 49-67.
10. Pall, M. L. 2015 Scientific evidence contradicts findings and assumptions of Canadian Safety Panel 6: microwaves act through voltage-gated calcium channel activation to induce biological impacts at non-thermal levels, supporting a paradigm shift for microwave/lower frequency electromagnetic field action. *Rev. Environ. Health* 3, 99-116. doi: 10.1515/reveh-2015-0001.
11. Panagopoulos DJ, Johansson O, Carlo GL. 2015 Real versus simulated mobile phone exposures in experimental studies. *BioMed. Res. Int.* 2015, article ID 607053, 8 pages. doi: 10.1155/2015/607053.
12. Batista Napotnik T, Reberšek M, Vernier PT, Mali B, Miklavčič D. 2016 Effects of high voltage nanosecond electric pulses on eukaryotic cells (in vitro): A systematic review. *Bioelectrochemistry*. 2016 Aug;110:1-12. doi: 10.1016/j.bioelechem.2016.02.011.

IX. Powodowanie raka przez ekspozycję na PEM:

1. Dwyer, M. J., Leeper, D. B. 1978 A Current Literature Report on the Carcinogenic Properties of Ionizing and Nonionizing Radiation. DHEW Publication (NIOSH) 78-134, March 1978.
2. Marino AA, Morris DH. 1985 Chronic electromagnetic stressors in the environment. A risk factor in human cancer. *J environ sci health C3*:189-219.
3. Adey WR. 1988 Cell membranes: the electromagnetic environment and cancer promotion. *Neurochem Res*.13:671-677.
4. Adey WR. 1990 Joint actions of environmental nonionizing electromagnetic fields and chemical pollution in cancer promotion. *Environ Health Perspect* 86:297-305.
5. Frey AH. 1993 Electromagnetic field interactions with biological systems. *FASEB J* 7:272- 281.
6. Goldsmith JR. 1995 Epidemiological evidence of radiofrequency radiation (microwave) effects on health in military, broadcasting and occupational settings. *Int J Occup Environ Health* 1:47-57.
7. Goldsmith JR. 1997 Epidemiologic evidence relevant to radar (microwave) effects. *Env Health Perspect* 105(Suppl 6):1579-1587.
8. Kundi M, Kild K, Hardell L, Mattsson M. 2004 Mobile telephones and cancer – a review of the epidemiological evidence. *J Toxicol Env Health, Part B* 7:351-384.
9. Kundi M. 2004 Mobile phone use and cancer. *Occup Env Med* 61:560-570.
10. Behari J, Paulraj R. 2007 Biomarkers of induced electromagnetic field and cancer. *Indian J Exp Biol* 45:77-85.
11. Hardell L, Carlberg M, Soderqvist F, Hansson Mild K. 2008 Meta-analysis of long-term mobile phone use and the association with brain tumors. *Int J Oncol* 32:1097-1103.
12. Khurana VG, Teo C, Kundi M, Hardell L, Carlberg M. 2009 Cell phones and brain tumors: a review including the long-term epidemiologic data. *Surg Neurol* 72:205-214.
13. Desai NR, Kesari KK, Agarwal A. 2009 Pathophysiology of cell phone radiation: oxidative stress and carcinogenesis with focus on the male reproductive system. *Reproduct Biol Endocrinol* 7:114.
14. Davanipour Z, Sobel E. 2009 Long-term exposure to magnetic fields and the risks of Alzheimer's disease and breast cancer: Further biological research. *Pathophysiology* 16:149-156.
15. Yakymenko I, Sidorik E. 2010 Risks of carcinogenesis from electromagnetic radiation and mobile telephony devices. *Exp Oncol* 32:729-736.
16. Carpenter DO. 2010 Electromagnetic fields and cancer: the cost of doing nothing. *Rev Environ Health* 25:75-80.
17. Giuliani L, Soffriti M (Eds). 2010 NON-THERMAL EFFECTS AND MECHANISMS OF INTERACTION BETWEEN ELECTROMAGNETIC FIELDS AND LIVING MATTER, RAMAZZINI INSTITUTE EUR. *J. ONCOL. LIBRARY* Volume 5, National Institute for the Study and Control of Cancer and Environmental Diseases “Bernardino Ramazzini” Bologna, Italy 2010, 400 page monograph.
18. Khurana, V. G., Hardell, L., Everaert, J., Bortkiewicz, A., Carlberg, M., Ahonen, M. 2010 Epidemiological evidence for a health risk from mobile phone base stations. *Int. J. Occup. Environ. Health* 16, 263-267.
19. Carpenter DO. 2010 Electromagnetic fields and cancer: the cost of doing nothing. *Rev Environ Health* 25:75-80.
20. Yakymenko, I., Sidorik, E., Kyrylenko, S., Chekhun, V. 2011. Long-term exposure to microwave radiation provokes cancer growth: evidences from radars and mobile communication systems. *Exp. Oncol.* 33(2), 62-70.
21. Bioinitiative Working Group, David Carpenter and Cindy Sage (eds). 2012 Bioinitiative 2012: A rationale for biologically-based exposure standards for electromagnetic radiation. <http://www.bioinitiative.org/participants/why-we-care/>
22. Ledoigt G, Belpomme D. 2013 Cancer induction molecular pathways and HF-PEM irradiation. *Adv Biol Chem* 3:177-186.
23. Hardell L, Carlberg M. 2013 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. *Rev Environ Health* 28:97-106. doi: 10.1515/reveh-2013-0006.
24. Hardell L, Carlberg M, Hansson Mild K. 2013 Use of mobile phones and cordless phones is associated with increased risk for glioma and acoustic neuroma. *Pathophysiology* 2013;20(2):85- 110.
25. Davis DL, Kesari S, Soskolne CL, Miller AB, Stein Y. 2013 Swedish review strengthens grounds for concluding that radiation from cellular and cordless phones is a probable human carcinogen. *Pathophysiology* 20:123-129.
26. Morgan LL, Miller AB, Sasco A, Davis DL. 2015 Mobile phone radiation causes brain tumors and should be classified as a probable human carcinogen (2A). *Int J Oncol* 46(5): 1865-1871.

27. Mahdavi M, Yekta R, Tackallou SH. 2015 Positive correlation between ELF and RF electromagnetic fields on cancer risk. *J Paramed Sci* 6(3), ISSN 2008-4978.
28. Carlberg M, Hardell L. 2017 Evaluation of Mobile Phone and Cordless Phone Use and Glioma Risk Using the Bradford Hill Viewpoints from 1965 on Association or Causation. *BioMed Res Int* 2017, Article ID 9218486, <https://doi.org/10.1155/2017/9218486>
29. Bortkiewicz A, Gadzicka E, Szymczak W. 2017 Mobile phone use and risk for intracranial tumors and salivary gland tumors - A meta-analysis. *Int J Occup Med Environ Health* 30:27-43.
30. Bielsa-Fernández P, Rodríguez-Martín B. 2017 [Association between radiation from mobile phones and tumour risk in adults]. *Gac Sanit.* 2017 Apr 12. pii: S0213-9111(17)30083-3. doi: 10.1016/j.gaceta.2016.10.014. [Epub ahead of print]
31. Alegría-Loyola MA, Galnares-Olalde JA, Mercado M. 2017 [Tumors of the central nervous system]. *Rev Med Inst Mex Seguro Soc* 55:330-334.
32. Prasad M, Kathuria P, Nair P, Kumar A, Prasad K. 2017 Mobile phone use and risk of brain tumours: a systematic review of association between study quality, source of funding, and research outcomes. *Neurol Sci.* 2017 Feb 17. doi: 10.1007/s10072-017-2850-8. [Epub ahead of print].
33. Miller A. 2017 References on cell phone radiation and cancer. <https://ehtrust.org/references-cell-phone-radio-frequency-radiation-cancer/> (Accessed Sept. 9, 2017)
34. Hardell L. 2017 World Health Organization, radiofrequency radiation and health – a hard nut to crack (Review). *Int J Oncol* 51:405-413.
35. Pall ML. 2018 How cancer can be caused by microwave frequency electromagnetic field (PEM) exposures: PEM activation of voltage-gated calcium channels (VGCCs) can cause cancer including tumor promotion, tissue invasion and metastasis via 15 mechanisms. Chapter 7 in: *Mobile Communications and Public Health*, Marko Markov, Ed., CRC Press, pp 167-188.

W każdym z tych przeglądów, zwykle przytacza się od 5 do ponad 100 cytatów z literatury źródłowej. Wynika z tego, że istnieje nie tylko 11 lub więcej przeglądów dokumentujących każdy z tych skutków, ale jest też dostępna obszerna literatura źródłowa dokumentująca również skutki nietermiczne. Wynika z tego, że ICNIRP, FCC i międzynarodowe wytyczne dotyczące bezpieczeństwa, które w całości opierają się wyłącznie na skutkach termicznych, są niewystarczające, a ponadto pojawiły się petycje i inne oświadczenia międzynarodowych grup naukowców wyrażające duże zaniepokojenie tym, że wytyczne ICNIRP, FCC i międzynarodowe wytyczne dotyczące bezpieczeństwa są całkowicie nienaukowe i nie można na nich polegać w celu ochrony naszego bezpieczeństwa. (...)



Autor: Martin Pall - profesor Biochemii oraz Nauk Medycznych Uniwersytetu Stanu Waszyngton. Syndrom ciągłego zmęczenia zachęcił go do badań nad jego przyczyną. Autor wielu publikacji na Pubmedzie o wrażliwości elektromagnetycznej (EHS) oraz wrażliwości chemicznej (MCS). Otrzymał 8 nagród ze względu na pracę odnośnie medycyny środowiskowej oraz mechanizmów MCS. W 2013 r. opublikował przełomową pracę o działaniu PEM na kanały wapniowe komórek, zacytowaną 232 razy przez inne badania.

Zdjęcie z okładki: prezentacja z wykładu dr. Magdy Havas, <https://www.youtube.com/watch?v=V1GRP73Gw24>