List of scientific studies on electrohypersensitivity (last update: 10/2026)

- Genetics and Electromagnetic Hypersensitivity (EHS). Open Access Government. Bevington M., 2026. Link (open access).

- Skin Fibroblasts from Individuals Self-Diagnosed as Electrosensitive Reveal Two Distinct Subsets with Delayed Nucleoshuttling of the ATM Protein in Common. International Journal of Molecular Sciences. Sonzogni L. et al., 2025. Link (open access).

- Wireless radiation and health: making the case for proteomics research of individual sensitivity (opinion article). Frontiers in Public Health. Leszczynski D., 2025. Link (open access).

  "The way forward in EHS research is to discover biomarkers of EHS, molecules that are affected by wireless radiation exposure, by research using high-throughput screening techniques of proteomics, transcriptomics, and metabolomics. For the start, proteomics might be the most promising of these methods."

- Sensory Processing Sensitivity, and Not Gender, Drives Electromagnetic Hypersensitivity and Nature Connection. Ecopsychology. Watten R.G., Volden F. & Visnes Trå H., 2024. Link.

  "In the current gender-matched cross-sectional study (n = 450; 225 men and 225 women) we assessed gender differences in environmental sensitivity assessed as SPS (sensory processing sensitivity), EHS, and CNS. Women had higher general EHS prevalence than men (13.3% vs. 5.3%), higher mean values on perceived sensitivity for 5 out of 9 categories of electromagnetic equipment (computers, electrical appliances, fluorescent lighting, mobile phones, and television) and they had higher scores on the three EHS Scales EHS General, EHS Scale, and EHS Index, in addition to higher SPS and CNS scores. The gender differences vanished when adjusting for SPS in the multivariate analyses of variance (MANOVA) analyses, suggesting that the differences in these scales were associated with SPS. The statistical equation modeling (SEM) results showed a significant positive direct effect of SPS on CNS, and a significant indirect effect mediated by EHS. The present study provides the first empirical evidence that highly sensitive individuals are capable of perceiving electromagnetic radiation. The results indicate that perceived EHS and CNS are driven by SPS and not by gender."

- A mechanistic understanding of human magnetoreception validates the phenomenon of electromagnetic hypersensitivity (EHS). International Journal of Radiation Biology. Henshaw D.L. & Philips A., 2024. Link (open access).

  "We examined primary magnetic field/EMF sensing and subsequent coupling to the nervous system and the brain. Magnetite particles in our brains and other tissues can transduce MFs/EMFs, including at microwave frequencies. The radical pair mechanism (RPM) is accepted as the main basis of the magnetic compass in birds and other species, acting via cryptochrome protein molecules in the eye. In some cases, extraordinary sensitivity is observed, several thousand times below that of the geomagnetic field. Bird compass disorientation by radio frequency (RF) EMFs is known.

Interdisciplinary research has established that all forms of life can respond to MFs. Research shows that human cryptochromes exhibit magnetosensitivity. Most existing provocation studies have failed to confirm EHS as an environmental illness. We attribute this to a fundamental lack of understanding of the mechanisms and processes involved, which have resulted in the design of inappropriate and inadequate tests. We conclude that future research into EHS needs a quantum mechanistic approach on the basis of existing biological knowledge of the magnetosensitivity of living organisms."

- Letter to the Editor, Environment International 'Available evidence shows adverse symptoms from acute non-thermal RF-EMF exposure'. Comment on: Bosch-Capblanch X et al., The effects of radiofrequency electromagnetic fields exposure on human self-reported symptoms: A systematic review of human experimental studies, Envir Int. vol. 187, May 2024, 108612. Environment International. Bevington M., 2024. Link (open access).

  "(...) this review also omitted in its discussion a comparison with established sensitivity to geomagnetic disturbances across significant populations (Sarimov et al., 2023), including, for instance, a correlation of geomagnetic activity and migraines (Kuritzky et al., 1987). These and similar examples show the wide range of human sensitivity to EMF exposures (Martel et al., 2023), its consistency with the Microwave Syndrome or Electro-Hypersensitivity (Carpenter, 2015), and its physiological basis in part by reception through magnetite and the radical pair mechanism acting on cryptochromes (Sherrard et al., 2018)."

- Hypersensitivity to man-made electromagnetic fields (EHS) correlates with immune responsivity to oxidative stress: a case report. Communicative & Integrative Biology. Thoradit T. et al., 2024. Link (open access).

- Why electrohypersensitivity (EHS) is a biologically expected reaction to harmful radiation. Umwelt · medizin · gesellschaft 37, 2-2024. Hensinger P. & Budzinski B., 2024. Link.

- Combined Neurological Syndrome in Electrohypersensitivity and Multiple Chemical Sensitivity: A Clinical Study of 2018 Cases. Journal of Clinical Medicine. Belpomme D. & Irigaray P., 2023. Link (open access).

- Prevalence of Migraine Disease in Electrohypersensitive Patients. Journal of Clinical Medicine. Greco F. et al., 2023. Link.

  "The vast majority of electrohypersensitive (EHS) patients present headaches on contact with an electromagnetic source. Clinical features suggest that the headaches of these patients could be a variant of the migraine disease and could be treated as such."

- Prevalence and correlation of multiple chemical sensitivity and electromagnetic hypersensitivity with age, sex, and depression in the Japanese population: a retrospective study. BMC Public Health. Lu X. et al., 2023. Link.

  "Although MCS and EHS are strongly correlated, they exhibit distinct characteristics and symptoms, indicating that they can be regarded as separate conditions."

  "Population-based surveys have estimated the prevalence of EHS to be 2.7% in Sweden, 7.2%

in Finland [16], 3.2% in California [17], 3.5% in Austria [18], 4% in the UK [11], and 13.3% in Taiwan [19]. Further, 3.0–4.6% of Japanese individuals in the general population may have EHS [13]."

- Metabolomics analysis of plasma samples of patients with fibromyalgia and electromagnetic sensitivity using GC–MS technique. Nature Scientific Reports. C. Piras et al., 2022. Link.

  "The analysis allowed to identify a metabolomic profile able of distinguishing IEI-EMF patients [Idiopathic environmental intolerance attributed to electromagnetic fields] and healthy subjects. IEI-EMF patients were therefore characterized by the alteration of 19 metabolites involved in different metabolic pathways such as energy metabolism, muscle, and pathways related to oxidative stress defense and chronic pain. The results obtained in this study complete the metabolomic "picture" previously investigated on the same cohort of IEI-EMF patients with 1H-NMR spectroscopy, placing a further piece for better understanding the pathophysiological mechanisms in patients with IEI-EMF."

- The lack of international and national health policies to protect persons with self-declared electromagnetic hypersensitivity. Reviews on Environmental Health. Leszczynski D., 2022. Link, PDF.

- Why electrohypersensitivity and related symptoms are caused by non-ionizing man-made electromagnetic fields: An overview and medical assessment. Environmental Research. Belpomme D. & Irigaray P., 2022. Link, PDF (open access).

  "Electrohypersensitivity is a neurological disorder with inflammation, oxidative stress, blood brain barrier opening and neurotransmitter abnormalities. Electrohypersensitivity must be defined by the decrease of brain electromagnetic fields tolerance threshold."
  "Much of the controversy over the cause of electrohypersensitivity (EHS) lies in the absence of recognized clinical and biological criteria for a widely accepted diagnosis. However, there are presently sufficient data for EHS to be acknowledged as a distinctly well-defined and objectively characterized neurologic pathological disorder."

- Electromagnetic hypersensitivity close to mobile phone base stations – a case study in Stockholm, Sweden. Reviews on Environmental Health. Hardell L. & Koppel T., 2022. Link.

- Associations Between a Polymorphism in the Rat 5-HT1A Receptor Gene Promoter Region (rs198585630) and Cognitive Alterations Induced by Microwave Exposure. Frontiers in Public Health, Sec. Radiation and Health. Li H. et al., 2022. Link.

  "The nervous system is a sensitive target of electromagnetic radiation (EMR). Chronic microwave exposure can induce cognitive deficits, and 5-HT system is involved in this effect. Genetic polymorphisms lead to individual differences. In this study, we evaluated whether the single-nucleotide polymorphism (SNP) rs198585630 of 5-HT1A receptor is associated with cognitive alterations in rats after microwave exposure with a frequency of 2.856 GHz and an average power density of 30 mW/cm2.
  (...) Rats carrying rs198585630 C allele exhibited increased mRNA and protein expression of 5-HT1A receptor and were more susceptible to 30 mW/cm2 microwave exposure, showing cognitive deficits and inhibition of brain electrical activity. These findings suggest SNP

rs198585630 of the 5-HT1A receptor is an important target for further research exploring the mechanisms of hypersensitivity to microwave exposure."

- The ecology of electricity and electroreception. Biological Reviews. England SJ & Robert D., 2021. Link, PDF.

  "A detailed introduction to the ecology and physiology of electroreception – the biological detection of ecologically relevant electric fields – is provided."

- The Critical Importance of Molecular Biomarkers and Imaging in the Study of Electrohypersensitivity. A Scientific Consensus International Report. International Journal of Molecular Sciences. Belpomme D, Carlo GL, Irigaray P, Carpenter DO, Hardell L, Kundi M, Belyaev I, Havas M, Adlkofer F, Heuser G, Miller AB, Caccamo D, De Luca C, von Klitzing L, Pall ML, Bandara P, Stein Y, Sage C, Soffritti M, Davis D, Moskowitz JM, et al., 2021. Link, PDF.

- Commentary: Proof of EHS beyond all reasonable doubt. Reviews on Environmental Health. Bevington M., 2021. Link.

  "In 2008 the first genetic variant associated with EMF sensitivity was discovered, the XRCC1 Ex9+16A allele, a DNA repair polymorphism, linked with childhood leukaemia near substations and powerlines [2]. In 2014 it was reported that people with EHS were 9.7 times more likely to have GSTM1 + GSTT1 null genotypes [3], indicating a susceptibility to oxidative stress. This genetic variation can also increase the risk of multiple sclerosis, some cancers, Alzheimer's and asthma, each sometimes associated with EHS. Such genetic variants seem more common at higher than lower latitudes and in women than men, with others associated with higher levels of mercury. EHS symptoms are also associated with some demyelinating neurodegenerative conditions."

- Review of the scientific evidence on the individual sensitivity to electromagnetic fields (EHS). Reviews on Environmental Health. Leszczynski D., 2021. Link, PDF.

- Redefining electrosensitivity: A new literature-supported model. Electromagnetic Biology and Medicine. Redmayne M. & Reddel S., 2021. Link.

- Metabolomics and psychological features in fibromyalgia and electromagnetic sensitivity, Nature Scientific Reports, C. Piras et al., 2020. Link.

  "Multivariate statistical analysis (…) allowed the identification of a distinct metabolic profile between IEI-EMF [Idiopathic environmental intolerance attributed to electromagnetic fields] and healthy subjects. IEI-EMF were characterized by higher levels of glycine and pyroglutamate, and lower levels of 2-hydroxyisocaproate, choline, glutamine, and isoleucine compared to healthy subjects. These metabolites are involved in several metabolic pathways mainly related to oxidative stress defense, pain mechanisms, and muscle metabolism. The results here obtained highlight possible physiopathological mechanisms in IEI-EMF patients to be better defined."

- Electromagnetic Hypersensitivity (EHS, Microwave Syndrome) - Review of Mechanisms. Environmental Research. Stein Y. & Udasin E., 2020. Link.

- Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It, International Journal of Molecular Sciences, Belpomme D. & Irigaray P., 2020. Link/PDF.

- The Prevalence of People With Restricted Access to Work in Man-Made Electromagnetic Environments, Journal of Environment and Health Science, M. Bevington, 2019. Link.

- Individual variation in temporal relationships between exposure to radiofrequency electromagnetic fields and non-specific physical symptoms: A new approach in studying 'electrosensitivity', Environment International, R. Bogers, 2018. Link.

  "We found statistically significant correlations between perceived and actual exposure to wireless internet (WiFi - rate of change and number of peaks above threshold) and base stations for mobile telecommunications (GSM + UMTS downlink, rate of change) and NSPS scores in four of the seven participants. In two persons a higher EMF exposure was associated with higher symptom scores."

- Oxidative stress in electrohypersensitivity self-reporting patients: Results of a prospective in vivo investigation with comprehensive molecular analysis, International Journal of Molecular Medicine. Irigaray, Caccamo & Belpomme, 2018. PDF.

- Biophysical mechanism of sensing atmospheric discharges by living organisms, Science of the Total Environment, Balmori A., 2017. Link.

  See also the book: 'You are the Weatherman: Meteopathy and electrosensitivity. The scientific explanation for our vulnerability to weather changes'. Balmori A., 2020.

  Updated version: Human Antennas. Balmori A., 2026.

  (In Spanish: 'Meteoropatía y electrosensibilidad: Una explicación clara y rigurosa de los motivos de nuestra vulnerabilidad a los cambios de tiempo y a las radiaciones electromagnéticas')

- Increasing levels of saliva alpha amylase in electrohypersensitive (EHS) patients, Int J Radiat Biol., Andrianome S. et al., 2017. Link.

- Functional brain MRI in patients complaining of electrohypersensitivity after long term exposure to electromagnetic fields, Reviews on Environmental Health, Heuser & Heuser, 2017. PDF.

- Electromagnetic hypersensitivity: Nation-wide survey among general practitioners, occupational physicians & hygienists in the Netherlands, Int J Hyg Environ Health, Slottje P. et al., 2016. Link.

- Electromagnetic field reduction restores health of electro-sensitive people, Schooneveld et al., 2016. PDF.
- The Hidden Marginalization of Persons With Environmental Sensitivities, Ecopsychology, Gibson P.R., 2016. PDF.
- Development and evaluation of an electromagnetic hypersensitivity questionnaire for Japanese people. Bioelectromagnetics. Hojo S. et al., 2016. Link.
- Reliable disease biomarkers characterizing and identifying electrohypersensitivity and multiple chemical sensitivity as two etiopathogenic aspects of a unique pathological disorder, Rev Environ Health, Belpomme D. et al., 2015. PDF.
- The microwave syndrome or electro-hypersensitivity: historical background, Rev Environ Health, Carpenter D., 2015. PDF.
- Electrohypersensitivity: a functional impairment due to an inaccessible environment, Rev Environ Health, Johansson O., 2015. PDF.
- Electromagnetic hypersensitivity – an increasing challenge to the medical profession, Rev Environ Health, Hedendahl L., 2015. PDF.
- The implications of non-linear biological oscillations on human electrophysiology for electrohypersensitivity (EHS) and multiple chemical sensitivity (MCS), Rev Environ Health, Sage C., 2015. Link.
- Metabolic and Genetic Screening of Electromagnetic Hypersensitive Subjects as a Feasible Tool for Diagnostics and Intervention, Mediators of Inflammation, De Luca C., 2014. PDF.
- Could Myelin Damage From Radiofrequency Electromagnetic Field Exposure Help Explain the Functional Impairment Electrohypersensitivity? A Review of the Evidence, Journal of Toxicology and Environmental Health, Redmayne M. & Johansson O., 2014. PDF.
- Mobile Phones, Electromagnetic Hypersensitivity, and the Precautionary Principle, Bioelectromagnetics, Tuengler A. et al., 2013. PDF.
- Electromagnetic hypersensitive Finns: Symptoms, perceived sources and treatments, a questionnaire study, Pathophysiology, Hagström M. et al., 2013. Link, PDF.
- Electromagnetic hypersensitivity: evidence for a novel neurological syndrome, International Journal of Neuroscience, McCarty D.E., 2011. PDF.
- Electromagnetic hypersensitivity: Fact or fiction? (Review), Science of the Total Environment, Genuis S.J. & Lipp C.T., 2011. Link, PDF.
- Elektrosensibilität: Ein Patient mit verbrennungsartigen Hautveränderungen, Umwelt-medizin-gesellschaft, Aschermann C., 2011. PDF.

- Association of Tinnitus and Electromagnetic Hypersensitivity: Hints for a Shared Pathophysiology?, PLoS One, Landgrebe M. et al., 2009. Link (open access).

- Chemical and electromagnetic exposures as disability barriers: environmental sensitivity, Disability & Society, Gibson P.R., 2009. PDF.

- Increased concentrations of certain persistent organic pollutants in subjects with self-reported electromagnetic hypersensitivity - a pilot study, Electromagnetic Biology and Medicine, Hardell L. et al., 2008. Link, PDF.

- Cognitive and neurobiological alterations in electromagnetic hypersensitive patients: results of a case-control study, Psychological Medicine, Landgrebe L. et al., 2008. PDF.

  "Conclusions. These results demonstrate significant cognitive and neurobiological alterations pointing to a higher genuine individual vulnerability of electromagnetic hypersensitive patients."

- Altered cortical excitability in subjectively electrosensitive patients: results of a pilot study, Journal of Psychosomatic Research, M. Landgrebe et al., 2007. Link.

  "To elucidate a potential role of dysfunctional cortical regulations in mediating hypersensitivity to electromagnetic fields, cortical excitability parameters were measured by transcranial magnetic stimulation. (...) Electrosensitive patients showed reduced intracortical facilitation as compared to both control groups (...). This pilot study gives additional evidence that altered central nervous system function may account for symptom manifestation in subjectively electrosensitive patients as has been postulated for several chronic multisymptom illnesses sharing a similar clustering of symptoms."

- Electrohypersensitivity (EHS) in the Netherlands - A Questionnaire survey, Schooneveld H. & Kuiper J., Dutch Electrohypersensitivity (EHS) Foundation, 2007. PDF.

- Electrohypersensitivity: state-of-the-art of a functional impairment, Electromagn. Biol Med., Johansson O., 2006. Link, PDF.

  "In Sweden, electrohypersensitivity (EHS) is an officially fully recognized functional impairment (i.e., it is not regarded as a disease). Survey studies show that somewhere between 230,000–290,000 Swedish men and women report a variety of symptoms when being in contact with electromagnetic field (EMF) sources. The aim of our studies has been to investigate possible alterations, in the cellular and neuronal systems of these persons' skin. (...) In summary, it is evident from our preliminary data that various alterations are present in the electrohypersensitive persons' skin."

- Letter to the editor: will we all become electrosensitive?, Electromagnetic Biology and Medicine, Hallberg & Oberfeld, 2006. Link/PDF.

- Symptoms of ill health ascribed to electromagnetic field exposure – a questionnaire survey, International Journal of Hygiene and Environmental Health, M. Roosli et al., 2004. Link.

"A mean of 2.7 different symptoms were reported. Sleep disorders (58%), headaches (41%), nervousness or distress (19%), fatigue (18%), and concentration difficulties (16%) were most common complaints."

- Holter ECG monitoring in patients with perceived electrical hypersensitivity, International Journal of Psychophysiology, M. Sandstrom et al., 2003. Link.

  "The major finding of the present study is that patients with perceived EHS had disturbed patterns of circadian rhythms of heart rate variability."

- Prevalence of self-reported hypersensitivity to electric or magnetic fields in a population-based questionnaire survey, Scand. J Work Environ Health, Hillert L. et al., 2002. Link/PDF.

- Electromagnetic Perception and Individual Features of Human Beings, Critical Reviews in Biomedical Engineering, N. N. Lebedeva et al., 2001. Link.

  "We found that the electromagnetic perception of human beings correlated with their individual features, such as EEG parameters, the critical frequency of flash merging, and the electric current sensitivity. Human subjects who had a high-quality perception of electromagnetic waves showed an optimal balance of cerebral processes, an excellent functional state of the central nervous system, and a good decision criterion."

- A theoretical model based upon mast cells and histamine to explain the recently proclaimed sensitivity to electric and/or magnetic fields in humans, Medical Hypotheses, Gangi S. & Johansson o., 2000. PDF.

- "Electrosensitivity", "electrosupersensibility" and "screen dermatitis": preliminary observations from on-going studies, Johansson O. & Liu P.Y., 1995. In: Simunic D. Proceedings of the COST 244: Biomedical Effects of Electromagnetic Fields - Workshop on Electromagnetic Hypersensitivity. Brussels/Graz. EU/EC (DG XIII).

- Electromagnetic Field Sensitivity Case study evaluation, Journal of Bioelectricity, Rea W.J. et al., 1991. PDF.

  "We conclude that this study gives strong evidence that electromagnetic field sensitivity exists, and can be elicited under environmentally controlled conditions."