

ELECTROSENSITIVITY - OVERVIEW

Electrosensitivity is the condition of being physically affected by radio frequency radiation, voltage transients ('dirty electricity', VLF), and/or power lines and ELF.

- **Radio frequency radiation (RFR)** is emitted by mobile phones, phone masts, Wifi, smart meters, Bluetooth, Fitbits, radio and TV masts etc.
- **Voltage transients ('dirty electricity')** and very low frequency can be emitted from induction cooker hobs, battery chargers, CFL and some LED lights etc.
- **Power lines** (extremely low frequency) emit electric and magnetic fields (EMFs), as do transformers, electric motors, hair dryers, shavers and washing machines.

Electrosensitivity is a spectrum condition:

- Everyone is electrosensitive since all cells in the body can react subconsciously to magnetic and electric fields.
- Some people are more consciously RF/EMF sensitive or perceptive than others.
- Some people become hyper-sensitive and are severely disabled by RF/EMF.

Electrosensitivity is also called:

- EMF Intolerance Syndrome
- Environmental Intolerance
- Microwave Sickness
- Radio Wave Sickness

Electrosensitivity covers a wide range of conscious and subconscious reactions, like other environmental allergies or sensitivities, such as to particular foods, pollens or amounts of sunshine.

- The conscious adverse symptoms of Electrosensitivity (ES), like headaches, physical weakness and muscular pains, were first recorded from 1733 by scientists researching the effects of electricity.
- More disabling Electromagnetic Hypersensitivity (EHS) was first recorded in 1746.
- In the 19th and early 20th centuries telegraph lines, electricity supplies and radio caused conscious symptoms among workers. Simultaneously, most people were affected subconsciously by the 'diseases of civilisation'.
- Since then, conscious effects, and subconscious ones like disturbed sleep, cancers, infertility and heart problems, spread more widely, with computers, mobile or cordless phones, Wifi and smart meters.

SOLUTION: removal of man-made RF/EMF exposures causing intolerance

HISTORY: SCIENCE

1733: ES: non-thermal adverse symptoms, EMF
1746: EHS: hypersensitivity specific symptoms, EMF
1893: ES: specific non-thermal adverse symptoms, RFR
1926: RFR non-thermal lethal effects on some mice
1930: Non-thermal effects primary, heating secondary
1932: EHS: hypersensitivity specific symptoms, RFR
1945: Military use of non-thermal RFR in warfare
1953: Cancer, an ES symptom, from non-thermal RFR
1974: RF causes calcium flux; 1981: melatonin reduced
1991: ES shown in provocation tests, screened subjects
1995: RF causes DNA breaks, which can lead to cancer
2000: More brain tumours on side of head near phone
2002: More ES symptoms near mast than further away
2003: Risk of cancer x 3 nearer mast than further away
2014: Genetic variants associated with EHS
2015: Cerebral blood hypoperfusion in people with EHS
2017: 3d fMRI scans show brain damage in EHS people
2018: NTP study confirms mobile phones cause cancer
2019: 'Bystander' RFR effect, like ionising radiation
2019: Subconscious human magnetoreception shown
2021: Scientific Consensus by 32 Experts on real EHS
2022: Ecological study confirms proof of EHS
2023-24: Health studies: EHS symptoms near 5G masts

HISTORY: REGULATORY

1935: 1st RFR guidelines USSR: non-thermal & thermal
1957: US 'conspiracy' imposing Schwan's thermal myth
1968: US law: public must be protected from RF/EMF
1974: Health & Safety at Work Act protects ES workers
1990s: Insurers: RFR high risk only, like cancer asbestos
2001: WHO/IARC classifies ELF EMF a 2B cancer agent
2001: Geneva: mast dismantled, residents compensated
2002: WHO/ICNIRP recognise 'sensitive' ES people
2006: UK employers remove RFR for ES people
2007: UK £15k compensation for EHS discrimination
2009: EU Parl.: biological, not ICNIRP heating, limits
2009: EU Parl.: protect EHS and grant them equality
2010: Equality Act protects people disabled by ES
2011: WHO/IARC classifies RF as a 2B cancer agent
2012: NHS GPs and consultants diagnose physical ES
2012: Courts accept ES and award compensation/fines
2013: H&SC Act: local authority duty to improve health
2017: US city stops phone mast after cancer cluster
2021: US Court: FCC must assess non-thermal effects
2021: Court: ES person is interested party in siting mast
2022: US city bans phone mast after ES symptoms harm
2022: UK court: removal of Wifi/phones for EHS person
2022: US: \$187,300 for RFR injuries to Havana official

Radio Frequency Radiation (3 MHz – 300 GHz) Adverse Biological Effects and Limits NB: Specific frequencies not listed Firstenberg, Some Biological Effects of Radio Waves , 2022; Powerwatch .		$\mu\text{W}/\text{m}^2$
Cosmic Background Level, ~1,800 MHz		~ 0.0000000001
Genetic alterations- E.Coli		0.000000001
Natural Background Level, all frequencies		0.000001
Human sensitivity		~ 0.000001
	Altered EEG	0.00001
	Immune effects - mice	0.0001
International Scientific Limits, Bionitiative, Building Biology, EUROPAEM, IGNIR, Seletun, etc.		≥ 0.1
Adverse Biological Effects	Conditioned 'avoidance' reflex - rats	0.1
	Premature aging - pine needles; smaller growth rings - trees	0.24
	100 yards from home Wifi	4
	Disturbed sleep, abnormal blood pressure, digestive problems, weakness, pain, anxiety	20
	100 yards from a mobile phone, peak power	40
	1 mile from a mobile phone mast	100 - 1,000
	Disturbed metabolism, changes: EEG, heart liver, spleen, testes, brain: rats, rabbits	600
	Irreversible infertility - mice	1,680
	Childhood leukaemia, <12 km from TV mast	2,000
	Impaired motor function, memory and attention; altered sex ratio (fewer boys)	3,000
	Blood-brain barrier impaired by mobile phones	4,000
	Altered calcium flux in brain tissue	6,000
	Tinnitus, buzzing and other auditory effects	20,000
	Leukaemia, skin melanoma and bladder cancer, near TV and FM mast	50,000
	Head and chest exposure from a laptop on a table	80,000
	Metal redistributed in the lungs, brain, heart, liver, kidney, muscles, spleen, bones, skin	100,000
Head and chest exposure from a mobile phone on a table	1,500,000	
mobile phone against the brain; laptop on the lap exposure to genitals	17-20,000,000	
ICNIRP: Arbitrary, unscientific, unprotective, thermal limits, averaged 6 or 30 min.		$\leq 40,000,000$

ELF EMF Biological Effects and Limits (Bevington, 2013, p.48, Table 7, Link)		
Background Level (earth's static MF: 22,000-67,000 nT)	0.0001 V/m	0.0002 nT
Sandbar Sharks: behavioural threshold (Crawford et al, 2024)	0.2 nV/m	
Human subconscious sensitivity	Aurora Disturbance (solar flare)	0.0004 nT rise/fall at 0.0013 nT
	Schumann Resonance	0.05 nT
	*Transmembrane, **retina effects (Attwell, 2003)	*0.6 $\mu\text{V}/\text{m}$, **10mV/m
Human conscious sensitivity	Power lines (some EHS people)	~5 nT rise/fall at ~7 nT
IGNIR 2018 limit, for children, elderly and EHS (*excluding MRI etc.)	1 V/m (average)	*100 nT
Below/*100m from 400 kV overhead power line (Swiss, 2005; RPS, 2014)	~5,000 / *0.24 V/m	*210 nT
Childhood Leukaemia: Relative Risk x 3.8 (Feychting et al, 1993)		≥ 300 nT
ICNIRP 1998 limit, 50 Hz		5,000 V/m
		200,000 nT

ABBREVIATIONS		
ASSESSMENTS	METRICS	THERMAL
EIA environmental impact assessment	m:milli 10 ⁻³ ; μ :micro 10 ⁻⁶ ; n:nano 10 ⁻⁹ ; p:pico10 ⁻¹²	SAR specific absorption rate (heat)
HRA health risk assessment	k: kilo 10 ³ ; M: mega 10 ⁶ ; G: giga 10 ⁹ ; T: tera 10 ¹²	W/kg Watts per kilogram (SAR heat)
CONDITIONS	NON-THERMAL	PHYSICAL AGENTS
CFS chronic fatigue syndrome	Frequencies (F):	CME coronal mass ejection (geomagnetic disturbance)
EHS electromag. hypersensitivity	ELF extremely low frequency	GEC global electrical circuit (atmospheric electricity)
EI environmental intolerance	VLF very low f., VHF very high f.	EF electric field
ES electrosensitivity	UHF ultra high f. (microwave)	MF magnetic field
FI functional impairment	Hz Hertz (one cycle per second)	EMF electromagnetic field
HS Havana (EHS) Syndrome	kHz kiloHertz, MHz megaHertz	RFR radio frequency radiation
MCS multiple chemical sensitivity	GHz gigaHertz, THz teraHertz	
ME myalgic encephalomyelitis	Magnetic fields: mG. milliGauss	PRINCIPLES
MS multiple sclerosis	μT , nT microTesla, nanoTesla	ALARA as low as reasonably achievable
MWS microwave sickness	Electric fields, transients:	HC10 harmful concentration at 10%
DEVICES	V/m Volts per metre	HFP health first principle
ATA analogue telephone adaptor	G-S Graham-Stetzer (transients)	NDP non-discrimination principle
CFL compact fluorescent light		NET no effect threshold
LED light-emitting diode	NON-THERMAL & THERMAL	NOAELno observable adv. effect level
ONT optical network terminal	dBm decibel-milliWatts (each 3: x2)	PP precautionary principle
SM (wireless) smart meter	$\mu\text{W}/\text{m}^2$ microWatt per metre squared (power density)	

CONSCIOUS SPECIFIC SYMPTOMS

- Anxiety
- Asthma
- Cancer
- Confusion
- Cramp
- Depression
- Diarrhoea
- Dizziness
- Fatigue
- Hair loss
- Headache, brain pain
- Heart palpitations
- Indigestion
- Irritability
- Light sensitivity
- Memory loss
- Menstrual changes
- Muscle/nerve pains
- Nausea
- Noise sensitivity
- Nosebleeds
- Restless legs
- Sinusitis
- Skin rashes
- Sleep disturbance
- Smell sensitivity
- Thirst, Tics, Tinnitus
- Visual effects

SUBCONSCIOUS SYSTEMIC EFFECTS

- Brain wave disturbance, especially Alpha
- Cancer: bioelectrical dysregulation, DNA breaks
 - e.g. brain, breast, prostate, skin, thyroid
- Cell cycle disturbance, mitochondrial dysfunction
- Cell membrane depolarisation, ion channel effects
- Fertility reduced, changes in offspring, more females
- Heart: changes to rate, variability, cerebral perfusion
- Immune system changes: chronic inflammation
- Nervous (peripheral and central) system effects:
 - Demyelination, axonal and microglia
 - Hippocampus: enzymes, proteins
 - Hormonal: cortisol, testosterone
- Skin: mast cell degranulation, allergic sensitivity

CAUSES

- Bluetooth, TETRA, Wifi
- CFLs, LEDs, transients
- Cordless DECT phones
- Mobile phones, masts
- Powerlines, transformers
- Smart meters, Fitbits

MECHANISMS

- Cilia. Hairs. Cryptochromes
- Demyelination. DNA signalling
- Genetic variants. Glial/synapses
- Magnetite. NALCN. Pineal gland
- Radical pair mech. Retina. SCN
- Voltage-gated channels

PATHWAYS (like some Ultrasound effects)

- Antioxidant glutathione. Metabolism
- GABA. Hormones: melatonin, thyroid
- Metal implants, dental amalgam, fluoride
- Oxidative stress (like ionising radiation)
- Protein expression: ERK, Hsp70, p53 etc.
- Signalling: Ca, CaSR, NMDA, T cells, TGF

FUNCTIONAL IMPAIRMENT AND EHS SYMPTOMS

- Electrical Hypersensitivity (EHS), established since 1746, is an environmental systemic spectrum syndrome.
- EHS is caused by the person's exposure to RFR/EMF.
- EHS disables people with a range of symptoms which vary as the condition and its causes change in severity.
- Symptoms are disabling, causing functional impairment under the Health & Safety 1974 and Equality 2010 Acts.

EHS SYNDROME: CLINICAL DIAGNOSIS

- Clinical history: cause/effect from exposure/symptoms.
- The absence of symptoms when the RFR/EMF source is removed (positive reverse provocation testing).
- Multiple biomarkers, but only a few may be elevated or suppressed, depending on the RF/EMF toxicity; GC-MS.
- Brain blood perfusion and 3d fMRI scans, where the potential benefits outweigh health risks of an MRI scan.

PREVALENCE IN UK 67m POPULATION

- 0.65%, 435,500 people: work restricted because of EHS
- 1.2%, 800,000 people: severe electrical hypersensitivity
- 3.6%, 2.4m people: moderate electrical sensitivity
- 100% subconsciously sensitive, 80% chronic inflammation

TREATMENT: AVOIDANCE OF RFR/EMF

- Avoid RFR: e.g. masts, mobiles, smart meters, Wifi
- Keep: 10m from mobiles in use, 100m from Wifi
- Live: 500m from masts, 600m from powerlines
- Protect sleep: e.g. military nets, shielded rooms.

NON-IONISING (RFR/EMF) and IONISING RADIATION

Both cause oxidative stress and cancer; sensitivity varies. 24 hours of mobile phone harms DNA like 1,600 X-rays. Both: primary non-thermal effects, thermal secondary. Both: hormetic (change low/high dose), no threshold.

RESEARCH INTO ES AND EHS

ES research started in 1730 at the Royal Society, London. Centres for research into ES and EHS include: ARTAC Paris, Breakspear Herts, EMC Dallas USA, DARPA Caltech USA, HUSM Lleida, CES Moscow, UC San Diego USA, Toronto WCH, JMU Virginia USA.

NATURAL RFR/EMF EFFECTS

All life in the Earth's biosphere is electrically sensitive to natural geomagnetic and global electrical circuit changes at levels far below most man-made electrosmog.

ICD-10 CODES

- ICD-10: W90.0 (RFR); W90.8 (ELF); Z58.4 (radiation).
- EHS, known since 1746, still lacks its own ICD-10 code.

**SCIENTIFIC MAINSTREAM CONSENSUS
NON-THERMAL & THERMAL EVIDENCE**

- All scientific weight of evidence; not an arbitrary claim
 - Established long-term (and short-term) effects
 - Established non-thermal (and thermal) adverse effects
 - All ES symptoms recognised as harm, e.g. cancer, EHS
 - EMF/RFR harm to wildlife and biosphere recognised
 - 32 International Independent Experts, 2021: EHS is a 'neuropathological disorder', not psychological.
- [Scientific Consensus International Report on EHS, 2021](#)

**INTERNATIONAL PROTECTIVE
SCIENTIFIC GUIDELINES**

- Bioinitiative 2012,
- Building Biology (sleeping areas) 2015,
- EUROPAEM 2016,
- IGNIR 2018,
- Seletun 2010

**IMPARTIAL MAINSTREAM ORGANISATIONS
USING ESTABLISHED SCIENTIFIC EVIDENCE**

These independent groups include experts on real ES and accept the NTP and WHO/IARC cancer classifications.

- Bioinitiative Group <https://bioinitiative.org>
- EHT: Environmental Health Trust, USA <https://ehtrust.org>
- EMF Scientist: International EMF Scientist Appeal [link](#)
- EPA: Environmental Protection Agency, USA
- ES-UK: Electrosensitivity UK <https://www.es-uk.info>
- EUROPAEM: European Acad. for Environ. Medicine [link](#)
- IARC: International Agency for Research on Cancer [link](#)
- ICBE-EMF: International Commission on the Biological Effects of Electromagn. Fields (ICBE-EMF) icbe-emf.org
- ICEMS: Internat. Commission on EM Safety www.icems.eu
- IEMFA: International EMFs Alliance <https://www.iemfa.org>
- IGNIR: Internat. Guidelines on Non-I. Rad. <https://ignir.org>
- NTP: National Toxicology Program, USA [link](#)
- PHIRE: Physicians' Health Init Rad. & Envir. phiremedical.org

1st MYTH: UNSCIENTIFIC THERMAL-ONLY CLAIM

- Ongoing 'conspiracy' from 1957 to impose Schwan's unscientific short-term heating-only myth of 1953
- Arbitrary: no evidence 1°C rise causes e.g. cancer, EHS
- Unprotective against ES symptoms e.g. cancer, EHS
- Unprotective of wildlife and the earth's biosphere
- 'Cherry-picking' by biased industry cartel 'fronts'

2nd MYTH: INVALIDLY PRETENDING EHS IS EPH

WHO Backgrounder 296 (2005) confuses two different conditions, (a) physiological EHS, known since 1746, and (b) psychological EPh (Electrophobia, IEI-EMF), a nocebo effect known since 1903. EPh's prior conditioning cannot apply to EHS children, unaware adults and in warfare. (But ICNIRP recognises non-thermal ES adverse effects,2002)

ARBITRARY, UNPROTECTIVE THERMAL GUIDELINES

FCC 1998, ICNIRP 2020

**'FRONT', FRINGE AND SINGLE-VIEWPOINT GROUPS,
UNPROVEN DENIALS, 'JUNK' SCIENCE & MYTHS,
'CONSPIRACY' & MISINFORMATION**

Many are secret 'captured agencies' with no experts on EHS and ignore the NTP and WHO/IARC cancer classifications.

- DHSC: Depart. for Health & Social Care (follows ICNIRP)
- UKHSA: UK Health Security Agency (advises Ofcom/DCMS)
- COMARE: Com.on Med.Aspects of Radiat. & the Envir.
- EAHS: EMF and Health Subgroup (2022-); AGNIR (1990-2017) Pub. Health Engl. (PHE)'s Advis.Gp on NI Rad.
- FCC: Federal Communications Commission, USA
- GLORE: Global Coord. of Res. & Health Pol. on RF EMFs
- SCHEER: Sci. Comm. on Health Env & Em Risk (Eur.Com.)
- ITU: Internat. Telecommunications Union (UN agency)
- WHO: World Health Organiz.(UN agency): - EMF Project
- ICNIRP: Int.Com.on Non-Ion.Rad.Prot.(WHO agency)
- WHO† is subject to Int. Atomic Energy Agency (IAEA)
- IAEA is subject to Int. Comm. on Radiol. Prot. (ICRP)
- WHO/ICNIRP recognises ES risk: to 2004, from 2018

† WHO does not hold jurisdiction over national health work.

		International Radio Frequency Radiation Guidelines & Reference Levels (3 MHz-300GHz)					
Electric Field	Background level	Non-thermal and Thermal effects			Thermal effects only		
		Long-Term and Short-Term			Not Long-Term [WHO 2003: duration needed]		
[Red = Thermal Metric]	Safe for humans	Protective for most humans			Unprotective for humans, especially sensitives		
		Includes some wildlife			Excludes wildlife		
	Johansson et al. 1997	USSR 1935	Bioinitiative 2012	EUROPAEM, IGNIR 2016, 2018	USA Schwan 1953	USA, ICNIRP 1982, 1998	ICNIRP, WHO 2020**
V/m	~ 0.00002	6	0.03 - 0.05	≤ 0.002 - 0.2 *	194	61	≤123
µW/m ²	~ 0.000001	100,000	3 to 6	0.1 to 100	100,000,000	10,000,000	≤40,000,000
dBm	< - 90	+ 20	- 26 to - 23	≤ - 40 to - 10	+ 50	+ 40	≤ + 46
W/kg	(SAR) < 0.00002	Seletun (2010): 0.0003			1980,1984: 0.08 whole body; 1.6/2.0 head; 4.0 limbs		

Further information: www.es-uk.info Electrosensitivity UK. Registered Charity No.: 1103018. * Wifi: 0.02 V/m (20 mV/m) = 0.03% ICNIRP. **Excludes Implants. M. Bevington, 2nd April 2024