This article is separated into 12 sections, each of which can be individually downloaded. It is a 'work in progress' incorporating new information whenever time permits.

Section 11

Positive health effects

1. Introduction; electricity consumption; measuring meaningful exposure; static electric field from high voltage direct current transmission; precautionary recommendations; EMFs interacting with the environment or other substances; geomagnetic field (GMF) changes; a French study in 2009; residential exposure; mitigating biological effects; campaigning organisations
2. Occupational exposure; occupational research
3. Cancer; leukaemia; Sources of magnetic field exposure and cancer risk; brain cancer; breast cancer; neuroblastoma; other cancer; immune system effects; tamoxifen, doxorubicin and other drug effects; similarities to other chemical effects
4. Cellular changes and potential mechanisms; DNA breaks and changes; EEG changes; other cellular changes; potential mechanisms for interaction between exogenous EMFs and biological processes; free radical effects; effects on other cellular processes; airborne pollutant effects; other potential synergistic effects
5. MRI; contrast enhancement; individual experiences of reactions; MRI vs CT; cardiac scan; the European Physical Agents Directive; research
6. Electronic surveillance systems in shops, airports, libraries, etc.
7. Light at Night and Melatonin; circadian rhythm disruption; clock genes; plant, animal and insect effects
8. General reproductive effects; miscarriage and other effects of female exposure; powerfrequency exposure and male sperm; protective treatments
9. Other effects; ageing; amyotrophic lateral sclerosis (ALS); animal effects; anxiety; asthma; autism; bacteria; behaviour changes; birth defects; effects on blood; bone changes; brain damage; cardiovascular effects; dementia; developmental effects; depression and suicide; EEG changes; energy metabolism; eye effects; gastric effects; genetic defects; hearing effects; heart; insulin and electric fields; interference problems; kidney effects; learning and memory effects; lung, spleen and liver; medical implants; mental health problems; nervous system; neurobehavioural effects; neurodegenerative effects
10. Other effects; obesity; olfactory effects; other neurological and psychological effects; pain perception; Parkinson’s disease; protective effects of EMFs; skin; sleep; spleen; synergistic effects; teeth; thyroid; weight change; some experimental problems; government advisory bodies

11. Positive health effects; apoptosis; cancer treatment; cell survival and differentiation

12. References – 881 references

Apoptosis

Mansourian's (2016) meta-analysis provided conclusive data that ELF-MFs can increase apoptosis in cancer and normal cells. Furthermore, there is a possibly individual intensity and time range with maximum created effect according to window effect.

Cancer treatment

PEMF-based anticancer strategies may represent a new therapeutic approach to treat breast cancer without affecting normal tissues in a manner that is non-invasive and can be potentially combined with existing anti-cancer treatments (Crocetti 2013).

Destefanis (2015) found that exposure of different human cancer cell lines to a 50 Hz magnetic field might reduce cell proliferation, possibly mediated by the modulation of mitochondrial activity.

Cell survival and differentiation

Various studies (Bai 2013, HJ Kim 2013, Urnukhsaikhan 2016) have concluded that exposure of human bone marrow-derived mesenchymal stem cells to a pulsed 60 Hz magnetic field might enhance cell survival and induce neuronal differentiation. This result might be beneficial for future work on cell transplantation therapy for neurological diseases. Seong (2014) indicated that a specific transcriptional factor, early growth response protein (Egr1), mediates ELF-EMF-induced neuronal differentiations, and demonstrates the promise of ELF-EMF based cell replacement therapies for neurodegenerative diseases.

Choi (2014) reported that electromagnetic fields enhance neural differentiation in human bone marrow-derived mesenchymal stem cells incorporated with magnetic iron oxide nanoparticles and would be an effective method for differentiating neural cells.

Jung (2014) identified proteins which provided clues to the mechanism of ELF-MFs stimulation on nerve growth factor induced PC12 cells that occur during neuronal differentiation and may contribute to the development of novel treatments for neurodegenerative diseases.