Overview of the epidemiologic studies on the health effects of ELF magnetic and electric fields published in the second trimester of 2018

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1. Reviews

Association between parental occupational exposure to extremely low frequency magnetic fields and childhood nervous system tumors risk: A meta-analysis.
Su L, Zhao C, Jin Y, Lei Y, Lu L, Chen G.
Sci Total Environ. 2018 Nov 15;642:1406-1414.

Previous epidemiological studies suggested association between parental occupational exposure to extremely low frequency magnetic fields (ELF-MF) and risk of childhood nervous system tumors, but the results were inconsistent. The authors conducted a meta-analysis of case-control and cohort studies to re-evaluate this association. Relevant studies were identified by searching PubMed and Web of Science databases as well as by manual searching. Summary odds ratio (OR) with 95% confidence interval (CI) were pooled with a fixed-effects or random-effects model.

A total of 22 eligible articles (21 case-control studies and 1 cohort study) were included for the quantitative analysis. The results showed that parental occupational ELF-MF exposure was significantly associated with an increased risk of childhood nervous system tumors (OR = 1.11, 95% CI = 1.02-1.21), and this association remained in studies on central nervous system (CNS) tumors (OR = 1.13, 95% CI = 1.02-1.27) but not neuroblastoma (OR = 1.02, 95% CI = 0.92-1.14). Furthermore, maternal (OR = 1.14, 95% CI = 1.05-1.23) but not paternal (OR = 1.05, 95% CI = 0.98-1.13) occupational ELF-MF exposure significantly increased risk of childhood nervous system tumors. Increased risk of childhood CNS tumors was significant associated with maternal (OR = 1.16, 95% CI = 1.06-1.26) but not paternal (OR = 1.15, 95% CI = 0.98-1.34) occupational ELF-MF exposure.

Conclusions: These results provide limited evidence for the association between maternal occupational exposure to ELF-MF and increased risk of childhood CNS tumors, which should be explained with cautions. Future studies are needed to further evaluate the association of paternal occupational ELF-MF exposure with risk of childhood CNS tumors.

2. Residential exposure

No publications

3. Exposure assessment

Occupational exposure to electromagnetic fields from medical sources.
Stam R, Yamaguchi-Sekino S.
Ind Health. 2018 Apr 7;56(2):96-105.

High exposures to electromagnetic fields (EMF) can occur near certain medical devices in the hospital environment. A systematic assessment of medical occupational EMF exposure could help to clarify where more attention to occupational safety may be needed. This paper seeks to identify sources of high exposure for hospital workers and compare the published exposure data to occupational limits in the European Union. A systematic search for peer-reviewed publications was conducted via PubMed and Scopus databases. Relevant grey literature was collected via a web search. For each publication, the highest measured magnetic flux density or internal electric field strength per device and main frequency component was extracted. For low frequency fields, high action levels may be exceeded for magnetic stimulation, MRI gradient fields and movement in MRI static fields. For radiofrequency fields, the action levels may be exceeded near devices for diathermy, electrosurgery and hyperthermia and in the radiofrequency field inside MRI scanners.

Conclusions: The exposure limit values for internal electric field may be exceeded for MRI and magnetic stimulation. For MRI and magnetic stimulation, practical measures can limit worker exposure. For diathermy, electrosurgery and hyperthermia, additional calculations are necessary to determine if SAR limits may be exceeded in some scenarios.

Occupational exposure to electromagnetic fields. The situation in Greece.
Gourzoulidis GA, Tsaprouni P, Skamnakis N, Tzoumanika C, Kalampaliki E, Karastergios E, Gialofas A, Achtipis A, Kappas C, Karabetsos E.
Phys Med. 2018 May;49:83-89.

The management of the occupational exposure to electromagnetic fields (EMF) was under intense negotiations at European level over the last twenty years; the Directive 2013/35/EU is the new legislative tool. The presented study deals with the practical aspects of the Directive's implementation. The appropriate, extensive measurements and the overall EMF exposure assessments (i.e. exposure mapping, identification of hot spots, proposition of solutions) were conducted in specific workplaces, including power production, railway, broadcasting, clinical Magnetic Resonance Imaging (MRI) systems, industrial and research sites, as well as common office workplaces.

The vast majority of the performed EMF assessments did not reveal occupational overexposures; moreover in most of the cases, even the general public exposure limits (in the above occupational areas) were not exceeded. The very few localized overexposures detected, were manageable on the basis of the technical and organizational OHS principles. On the contrary, the maintenance procedures of the

EMF emitting equipment, as recorded in this survey, presented overexposures revealing a challenging field.

Conclusions: This study lays a firm basis for the clarification of the occupational EMF environment, where potential exposures might be high. The proper risk assessment demands precise exposure identification and deep understanding of the EMF nature and hazards. Misconceptions range from the common exposure overestimation to the rarer case of the maintenance hazards underestimation, while attention is needed concerning the proper application of the complex limiting system of the Directive.

4. Leukemia studies

Living on a farm, contact with farm animals and pets, and childhood acute lymphoblastic leukemia: pooled and meta-analyses from the Childhood Leukemia International Consortium.

Orsi L, Magnani C, Petridou ET, Dockerty JD, Metayer C, Milne E, Bailey HD, Dessypris N, Kang AY, Wesseling C, Infante-Rivard C, Wünsch-Filho V, Mora AM, Spector LG, Clavel J.

Cancer Med. 2018 Jun;7(6):2665-2681.

The associations between childhood acute lymphoblastic leukemia (ALL) and several factors related to early stimulation of the immune system, that is, farm residence and regular contacts with farm animals (livestock, poultry) or pets in early childhood, were investigated using data from 13 case-control studies participating in the Childhood Leukemia International Consortium. The sample included 7847 ALL cases and 11,667 controls aged 1-14 years. In all studies, the data were obtained from case and control parents using standardized questionnaires. Pooled odds ratios (ORs) and 95% confidence intervals (CIs) were estimated by unconditional logistic regression adjusted for age, sex, study, maternal education, and maternal age. Contact with livestock in the first year of life was inversely associated with ALL (OR = 0.65, 95% CI: 0.50, 0.85). Inverse associations were also observed for contact with dogs (OR = 0.92, 95% CI: 0.86, 0.99) and cats (OR = 0.87, 95% CI: 0.80, 0.94) in the first year of life.

Conclusions: There was no evidence of a significant association with farm residence in the first year of life. The findings of these large pooled and meta-analyses add additional evidence to the hypothesis that regular contact with animals in early childhood is inversely associated with childhood ALL occurrence which is consistent with Greaves' delayed infection hypothesis.

Exposure to permethrin and cancer risk: a systematic review.

Boffetta P, Desai V.

Crit Rev Toxicol. 2018 Jul;48(6):433-442.

No systematic reviews are available on data from humans on cancer risk from exposure to permethrin, a widely used insecticide for which some animal studies have reported positive findings based on mechanisms that may not be relevant to humans. The authors identified potentially relevant articles through a search of electronic databases which included all studies of pesticide exposure and human

cancer. A total of 18 articles were selected, including six identified from the list of references of other articles. Most articles were based on analyzes of the Agriculture Health Study (AHS); they provided no evidence of an increased risk of cancers of colon, rectum, pancreas, lung, melanoma, female breast, prostate, urinary bladder, as well as non-Hodgkin lymphoma (including its main subtypes), and leukemia. An increased risk of multiple myeloma was reported among AHS members with the highest tertile of estimated permethrin exposure (odds ratio 5.01; 95% confidence interval 2.41-10.42; p for trend <0.01). A subsequent analysis with a larger number of cases found a less pronounced association between permethrin exposure and risk of multiple myeloma; no exposed cases were reported in a separate study. Two case-control studies of childhood leukemia reported an association with biological markers of permethrin metabolites; in another study self-reported exposure to permethrin was associated with risk in children below 1 year of age, but not in older children.

Conclusions: Permethrin exposure does not seem to entail a risk of cancer in humans. Results on multiple myeloma and childhood leukemia are weak and inconsistent, and require replication in independent populations.