

Effetti biologici da esposizione occupazionale a campi magnetostatici utilizzati in *imaging* a risonanza magnetica nucleare: una rassegna

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KEY WORDS

Static magnetic fields; non ionizing radiations; magnetic resonance imaging; health personnel

SUMMARY

«**Health effects of occupational exposure to static magnetic fields used in magnetic resonance imaging: a review**». **Introduction:** *Magnetic resonance imaging is an established diagnostic tool involving exposure to static magnetic fields (SMF) of patients and health personnel (radiology technicians, radiologists, anaesthetists, surgeons, maintenance staff). Occupational exposure to SMF will be governed by the rules of European Union Directive 2004/40/EC covering health and safety requirements regarding the exposure of workers to risks from electromagnetic radiations, which must be incorporated into national law by each member state by 30 April 2008. It applies to all employment sectors and addresses short-term adverse health effects on workers, but excludes possible long-term effects. This study aims to critically review the recent literature on the topic so as to propose guidelines on the need to provide information and training of workers and appropriate health surveillance.* **Materials and methods:** *To identify the studies published after the review by the World Health Organization (WHO) in the series Environmental Health Criteria, a search was carried out on Medline. The strategy defined for searching studies was based on the following MeSH terms, which comprehensively addressed the problem: (i) Magnetic Resonance Imaging, (ii) Electromagnetic Fields, (iii) Electromagnetic Fields/adverse effects, (iv) Occupational Health. These terms were used to create appropriate search links to identify the studies according to the following criteria: (i) English language, (ii) inclusion of review, case-control and cohort study, controlled trials, (iii) abstract availability (iv) human effects, mechanism of action, pathophysiology or in vitro studies, (v) studies published after 1 January 2004 not considered in the WHO review. Twenty-eight studies were available as full-text.* **Results:** *Although studies carried out at cellular level are valuable in investigating mechanisms of interaction, they did not show any specific effect as a consequence of exposure to SMF. Experimental studies carried out on volunteers showed that short-term exposure to SMF induces a variety of acute effects: (i) vertigo, nausea and a metallic taste in the mouth occur during body or head movement with SMF in T range and may result in a possible negative influence on the performance of workers during critical procedures, (ii) changes in blood pressure and heart rate within the range of physiological variability occur for exposures to SMF up to 8 T, (iii) induction of ectopic heart beats and increased likelihood of reversible arrhythmia (possibly leading to ventricular fibrillation) may occur in susceptible workers) (iv) a decrease of working memory and eye-hand coordination are dose-dependent for exposures to 1.5-3 T SMF and may affect*

*the performance of workers executing intricate procedures. The limitations of the available studies, however, do not allow any firm conclusions to be drawn about the effects of SMF on the described endpoints. **Conclusion:** According to Directive 2004/40/EC, the employer must ensure that workers exposed to risks from electromagnetic fields receive all necessary information about the potential risks and that appropriate health surveillance is carried out to prevent any adverse health effects. According to the reported data it will not be easy to provide information and training and the appropriate health surveillance for the exposed workers. In fact, information and training activities might be influenced by the uncertainties resulting from the available evidence, since ability will be needed to find a balance between few certainties and several doubts, while the same uncertainties might reflect on the preventive and periodical examinations aiming at preventing short-term adverse health effects.*