MAGNETIC FIELD EFFECTS ON BIOLOGICAL FUNCTIONS

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There are considerable and growing studies on the effects of magnetic field exposure on biological systems, but they have provided diverse, and often contradictory, findings. Many of the experimental reports have been based on studies with small numbers of exposed and control subjects.

Molecular Level

Enzyme kinetics(static magnetic fields up to 20.8T)

58% of the experimental studies showed no effects.

33% of the tests showed increases in the reaction rate.

8% of the tests showed decreases in the reaction rate.

Molecular orientation(diamagnetic anisotropy)

A large number of biological macromolecules (B>10T) and molecular assemblies (B<1T) exhibit orientation in magnetic fields. However, at present, there are no data suggesting that the magneto-orientation of macromolecules exerts profound effects on biological functions.

Cell Level

The results of studies conducted in the 1960s suggested that exposure to static fields might lead to physiological, morphological, and growth abnormalities at the cellular level.

A large number of more recent studies have failed to produce effects on cell growth.

Tissues and Organs

The existence of deleterious effects of static magnetic fields on tissue and organ functions must, at present, be considered as questionable.

Visual System

The most clearly established biological effect of magnetic fields is the induction of visual light flashes by time-varying magnetic fields. This phenomenon, known as magnetophosphenes, was first described by d'Arsonval in 1896.

Nervous System

Theoretical examinations of the field strength necessary for a reduction in action-potential conduction velocities argue that fields required to produce a 10% reduction in conductivity must be 24T or more. Experimental observations that demonstrated large changes in conduction velocity are probably changes associated with experimental conditions other than magnetic field effects.

Circulatory System

High static magnetic fields cause abnormalities in the electrocardiograms(ECG) of the heart. The ECG signal in the T-wave region shows a substantial augmentation in the presence of magnetic fields and this phenomenon is completely and immediately reversible on termination of the exposure. The increased amplitude of the T-wave in magnetic fields is related to induced electromotive force potentials due to the flow of blood through the fields.

Genetics, Reproduction, and Development

No genetic defect has been observed.

Does the magnetic field control the sex of offspring?