

# Magnetotherapy

## Magnetic fields

Magnetic fields are produced either around permanent magnets or around a conductor with moving electric charges. It could be classified as:

**Static fields** in which the magnetic field intensity value remains unchanged with time. This type of field is created around permanent magnets or conductors carrying direct current (DC).

In **alternating fields** the intensity value is periodic changes with time. This type of field is found around conductors carrying alternative current (AC).

**An impulse magnetic field** arises around conductors carrying electric impulses.

**Magnetic induction  $B$  is proportional to** the magnetic field strength  $H$  [A/m], the factor of proportionality is the magnetic permeability

## Magnetic fields and living systems

- The living tissues are mainly composed from diamagnetic and paramagnetic substances which have magnetic permeability ( $\mu$ ) slightly differ from the permeability of vacuum. The application of magnetic fields in biological medium is inducing electric voltages and currents.
- Even, the induced voltages by magnetic field are lower than the rest membrane potentials; it can influence the biological media. It is supposed that, this induced voltage affects the membrane receptors and this way changes the biological reactions.
- The interactions of magnetic fields with human tissues are utilised in both diagnostics (MRI) and therapy (Magnetotherapy)

## Magnetotherapy

**Magnetotherapy** is the use of the magnetic field surrounding magnet therapy devices or static magnets to the body for health benefits.

Almost all magnetotherapeutic sources are with variable magnetic field,  $f = 50\text{Hz}$ , and or pulsed filed 2-50 Hz. In especial cases, the illness area is subjected to magnetic field by using the so called magnetic jewelry (like necklaces and earrings), or strips, belts and wraps.

## Main therapeutic effects of magnetic field

**Electric current** in the living cell is induced by application of Magnetic field, which affects the membrane systems of the cell by acting on membrane receptors and ionic changes.

- Metabolic activity of cells increased as a result of increasing the membrane permeability as an effect of Magnetic field.
- Blood cells is weakly paramagnetic, therefore application of a magnetic field up to 1 T produces no effect on the local blood flow. However, at a strong magnetic field (over 1 T) would reduce the flow rate of laminar streaming in a blood vessel. It is also observed that application of Electric field can improve the blood flow in underlying tissues.
- It is found out also tat the application of Magnetic field is reducing the muscle tension, relaxes the blood vessel and increasing endorphin levels.
- At strong -static magnetic field can cause inhibits metabolic processes.
- There is no effect as been recorded of the magnetic field for the tissue oxygenation.
- There is no effect as been recorded of the magnetic field on the pain relief.
- In biological fluids, free radicals and other chemical active substance are formed as an indirect action of the applied magnetic field, which arising the so called of magnetochemical reactions. It affects the antioxidative enzymatic systems, which may have complexes changes in the tissue as:

Vasodilatation  
Relaxation of muscle spasms  
Analgesia  
Anti-inflammatory effect  
Anti-oedematous effect

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