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Magnetic Therapy of Problems Generated by Sports

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Abstract
The purpose of my paper is to find a therapy for the treatment of problems generated by extensive sports. The objective is to find another treatment than the treatment with medical drugs which often have unwanted bad side effects. The result is the suggestion of the magnetic therapy of problems generated by extensive sports, and the explanation of the physical processes underlying this therapy.

Problems Generated by Sports

Very hard and extensive sports can generate waste products in the blood, e.g., lactic acid. This can lead to a decrease of supply of oxygen and nutrition to the cells, and this reduces a breaking decrease of performance. The application of pulsating electromagnetic fields increases the blood flow, which helps to remove the waste and to bring the oxygen particles in the blood more rapidly and more frequently to the muscles where they are required for a good performance. Furthermore, sports may lead to torn down of muscles and injuries. Injuries lead to inflammations and pain.

Magnetic Therapy of Problems Generated by Sports

TI now describe the magnetic therapy of problems generated by sports, and I explain the physical processes underlying this therapy. The basis of the therapy is that extensive sports generate waste products in the blood, which can lead to a decrease of supply of oxygen and nutrition to the cells (see section I). The aim of the magnetic therapy is to remove these problems.

When an external time-oscillating electromagnetic field is applied, then an electromagnetic wave is generated in the tissue. An electromagnetic wave is described by

$$\mathbf{E} = \mathbf{E}_0 \cos(\omega t - \mathbf{k}\,\mathbf{r}), \quad (1)$$

$$\mathbf{B} = \mathbf{B}_0 \cos(\omega t - \mathbf{k}\,\mathbf{r}). \quad (2)$$

Here E is the electric part of the electromagnetic wave, and B is the magnetic induction, with

$$\mathbf{B} = \mathbf{H} + 4\pi\,\mathbf{M}, \quad (3)$$

W the magnetic field **H** and the magnetization **M**. An electromagnetic wave carries energy, and part of this energy is absorbed in the tissue, leading to a certain amount of warming up the tissue. When the blood vessels are warmed up, then their diameters increase and the blood flow increases. As a result the waste particles are generated by extensive sports are removed soon, and the oxygen and nutrition particles which are required to a good sport performance come more rapidly and more frequently to the sites where they are required. Furthermore, the sports-generated injuries are related to inflammations, which produce pain. Inflammations require for healing the oxygen particle which are in the blood, and the increases blood flow brings the oxygen particles more rapidly and more frequently to the sites of inflammations, and this helps to reduce the inflammations and the pain.

Furthermore, in the blood are particles with charge q, mainly Ca^{2+} ions and other ions with positive or negative charge, respectively. The electromagnetic wave exerts Lorentz forces F,

$$\mathbf{F} = q\,(\mathbf{E} + v \times \mathbf{B}). \quad (4)$$

Here v is the velocity of the ions in the blood, and the symbol x in the second part of equation 4 denotes the vector product. When the electromagnetic field is applied in a direction perpendicular to the direction of the blood flow, then the Lorentz forces accelerate them in directions perpendicular to the blood flow and give them more energy. They hit walls of the blood vessels, and in each hit at least part of the energy is absorbed, and this leads to a certain amount of warming up the tissue. When the blood vessels are warmed up, then their diameters increase and the blood flow increases. As a result the waste particles are removed very soon and the oxygen particles

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and the nutrition particles which are required for a good sports performance come more rapidly and more frequently to the sites, where they are required. In addition, the oxygen particles in the blood which are required to heal inflammations come more rapidly and more frequently to the sites of inflammations, and this helps to remove the inflammation and the related pain.

I want to note that Lorentz forces do not appear only when applying time-oscillating external electromagnetic fields, but also when applying static magnetic and or electric fields. Therefore static external fields can be also used to treat problems generated by the sports.

Conclusions

In my paper I have described the electromagnetic therapy of problems generated by very extensive sports. The basis of the therapy is that the extensive spirts generates waste particles in the blood which reduce the blood flow so that the supply with oxygen particles and the nutrition particles required for a good performance is reduced. Furthermore, the oxygen particles in the blood which are required to heal inflammations and the related pains come slowly to the sites of inflammations. By the magnetic therapy the blood flow is increased, so that the oxygen particles come mor rapidly and more frequently to the sites of inflammations. All this helps to remove the problems generated by extensive sports.

This is a very interesting example for magnetic therapy of diseases. Another very interesting example is the pulsed electromagnetic field treatment of cancer [1].

Declarations

Fundings and/pr Conflicts of Interests/Competing Interactions.

My study was not funded. There in no conflict of interest, no competing interactions.

References

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