

Rapid Communication

Magnetic Therapies of Pancreas Diseases

Fahnle M*

Retired, Schönblickstraße 95, 71272 Renningen, Germany, Former Member of the Max Planck Institute for Intelligent Systems, Stuttgart, Germany

***Corresponding author:** Manfred Fahnle, Retired, Schönblickstraße 95, 71272 Renningen, Germany, Former Member of the Max Planck Institute for Intelligent Systems, Stuttgart, Germany

Received: October 27, 2022; **Accepted:** November 23, 2022; **Published:** November 30, 2022

Abstract

In my paper I describe magnetic therapies of pancreas diseases, and I explain the physical processes underlying these therapies.

Keywords: Pancreas; Magnetic therapy; Underlying physical processes

Study Design

The study design is to describe the magnetic therapy of pancreas diseases, and to explain the physical processes underlying this therapy.

Methods: Pancreas Diseases, Causes, Symptoms, Possible Treatments

There are two types of pancreas diseases. The first type is an infection, pancreatitis, the second type is pancreas cancer. The latter one is a very bad disease [1] with many deaths after short time, because there is a resistance against chemotherapy. Causes are smoking, interior cell mutation, diabetes, pancreas family history, obesity. Symptoms are pain in the abdomen which radiates into the back, loss of appetite and loss of weight, or unintended weight loss, light colored stool, dark-colored urine, itchy skin, new diagnosis of diabetes or existing diabetes becoming more difficult to treat, yellowing of skins and of the whites of eyes. Blood clots, fatigue. Possible causes are smoking, diabetes, family history of pancreas cancer, family history of genetic syndromes that increase the risk for cancer, obesity, old age and chronic inflammation of the pancreas (pancreatitis).

A possible treatment is a surgery which removes the cancer part of the pancreas. This is a mayor surgery, very complicated, with risks of complications. Another therapy is chemotherapy, which – however – also has bad side effects and which affects not just the cancer cells but also other non-cancer cells. Chemotherapy is often combine with the use of chemical drugs, which – however – may have unwanted bad side effects [2]. A new type of therapy is a magnetic therapy [1], based on hyperthermia treatment of the cancer cells.

Results: Magnetic Therapy of Pancreas Diseases

I now describe the magnetic therapy of the pancreas diseases, pancreas cancer and pancreatitis. I start with the pancreas cancer- Thereby magnetic nanoparticles, e.g., iron-oxide nanoparticles (magnetite) are introduced directly to the cancer region. The nanoparticles are covered by proteins, leading to a nanoparticle-protein complex which makes the particles biocompatible. Magnetite in some concentration is also a natural part of the human blood. When an external time-oscillating electromagnetic field is applied, then there are two effects. First, the nanoparticles travel through a magnetic hysteresis loop. Thereby energy is delivered from the nanoparticles to

the cancer regime (hyperthermia), and by heating up this regime the cancer cells are destroyed. Magnetite Nanoparticles are very good for hyperthermia, because they have a large saturation magnetization. Second, the time-oscillating electromagnetic fields have also a direct action of the tissue. This therapy is safe, easy to apply, and in this sense it is superior to the treatment by a combination of chemotherapy with medical drugs. Furthermore, it affects only the cancer cells because they are introduced only there, whereas a chemotherapy affects all other non-cancer cells.

Pulsed electromagnetic field treatment of cancer. It has been shown in [3] that by the application of a pulsed electromagnetic field the cancer cells can be destroyed. Because the pulsed electromagnetic field can be focused very well to the cancer regime, only cancer cells are destroyed, whereas the non-cancer cells are not affected, in contrast to the chemotherapy which affects all cells in the body.

Magnetic therapy of pancreatitis. Pancreatitis is an inflammation disease. Inflammations can be cured by oxygen particles, and oxygen particles are in the human blood. When applying a time-oscillating external electromagnetic field, then an electromagnetic wave is generated in the tissue. An electromagnetic wave is described by

$$E = E_0 \cos(\omega t - kr) \quad (1)$$

$$B = B_0 \cos(\omega t - kr) \quad (2)$$

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

$$B = H + 4\pi M \quad (3)$$

with the magnetic field H and the magnetization M . An electromagnetic wave carries energy, and part of this energy is absorbed in the tissue, producing a certain amount of warming up the tissue. When the blood vessels are warmed up, then their diameters increase, leading to an increased blood flow. As a result the oxygen particles in the blood come more rapidly and more frequently to the sites of inflammations, and this helps to cure the inflammations and reduce the pancreatitis.

Furthermore, the blood contains particles with charge q , respectively,

mainly Ca^{2+} ions, and also various other ions with positive and negative charges, respectively. The electromagnetic field exerts Lorentz forces F on the ions,

$$F = q(E + v \times B) \quad (4)$$

Where v is the velocity of the ion in the blood, and where the symbol \times in equation 4 denotes the vector product. When the electromagnetic field is applied in a direction perpendicular to the blood flow, then the ions are accelerated in a direction perpendicular to the blood flow. They hit the walls of the blood vessels, and in each hit they transfer energy to the blood vessels. This generates a certain warming up of the tissue. When the blood vessels are warmed up, then their diameters increase, leading to an increase of the blood flow. As a result, the oxygen particles in the blood come more rapidly and more frequently to the sites of inflammations, and this helps to cure the inflammations and the pancreatitis.

I want to note that Lorentz forces do not appear only when applying a time oscillating electromagnetic field, but also when applying static or electric and magnetic fields.

Discussion

In the present paper I described causes, symptoms and possible treatments of pancreas diseases like pancreas cancer and pancreatitis.

There are various types of treatments, which - however- are sometimes mayor therapies with possible side effects. A new therapy is the magnetic therapy of pancreas diseases, which is safe, easy to apply, and which does not have side effects. I described the magnetic therapy of pancreas cancer, and the magnetic therapy of pancreatitis, and I explained the physical processes underlying these therapies.

This is an interesting application of magnetic and electromagnetic fields to cure diseases. Magnetic therapies are also applied to cure various other diseases; the pulsed electromagnetic field therapy of cancer is described in [3].

Funding

Funding by Max Planck Company, DE, grant number 123.

References

1. J Palzer et al. International Journal of Nanomedicine. 2021; 16: 2905.
2. J Huang et al. Medicine. 2021; 100: 26673.
3. M Nadala et al. Cancer Med. 2016; 5: 3128.