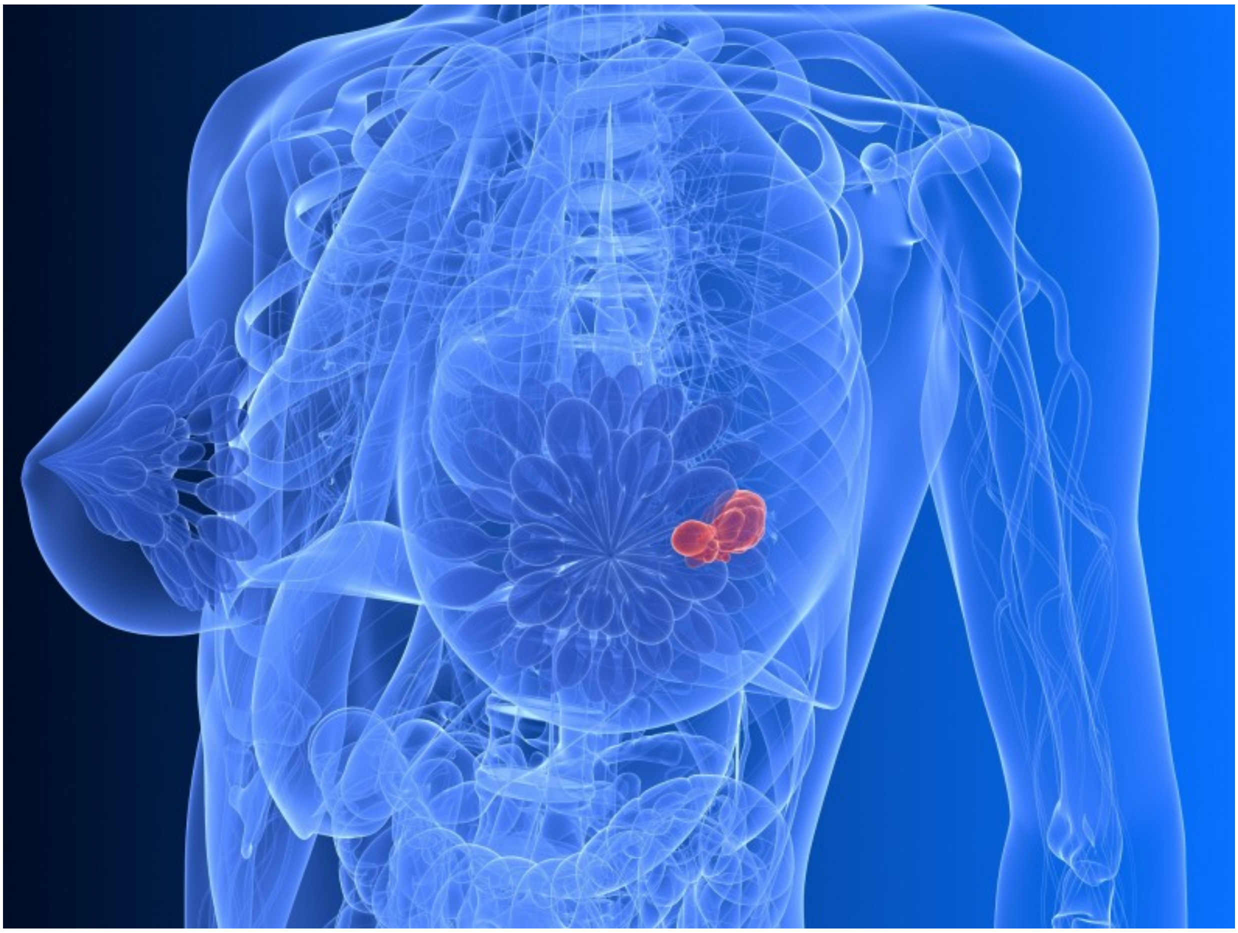
Breast Cancer



Since many anticancer therapies are very general in their action of killing cancer cells and have dramatic side effects, different, effective, yet less toxic, approaches to treating cancers are necessary.

I previously reported on a study that looked at the use of pulsed electric fields on breast cancer in mice. Electric fields have both an electric and magnetic aspect to them. Very short pulse length pulsed electric fields, which don't create heating to destroy tissue, were used. The frequency was 4 hertz. Two weeks after treatment, the growth of treated tumors was inhibited by 79%. MRI was used to assess the physical changes in the tumors. Various growth factors, including the development of new blood vessels, were strongly suppressed. As a control, normal skin was treated the same way as the tumors and showed no permanent changes. So, breast cancer tumors react differently to PEMFs, with a desirable cancer suppressive reaction, than normal tissue does. These results suggest that electromagnetic fields may be able to inhibit human breast cancer development and suppress tumor blood vessel growth, and may therefore serve as a new approach to the treatment for breast cancer.

New Breast Cancer Study

In a new study, the authors studied the potential for ultra-low intensity and frequency

PEMFs to kill breast cancer cells. They wanted to see if the PEMFs in question could show: 1) toxicity to breast cancer cells and; 2) and they were not harmful to healthy cells. Breast cancer cells and normal cells were exposed to PEMFs and cell death indices were measured to determine which PEMFs best kill breast cancer cells. The PEMF parameters tested were: 1) frequencies ranging from 20 to 50 Hz; 2) intensities ranging from 2 mT (20 Gauss) to 5 mT (50 Gauss) and; 3) exposure times ranging from 30-90 minutes per day for up to three days. These were to determine the optimum parameters for selective cancer cell killing. At the end of the study they found a discrete optimal window of vulnerability of breast cancer cells to PEMFs of 20 Hz frequency, 3 mT (30 Gauss) magnetic field intensity and exposure duration of 60 minutes per day. PEMFs applied at a repetition rate of 50 Hz did not produce any noticeable effects on cell viability. The amount of cell damage seen in response to PEMFs increased with time and was even more significant after three days of consecutive daily exposures. By contrast, the optimal PEMF usage found to be the most damaging to breast cancer cells was not damaging to normal cells, and were in fact slightly enhancing to normal cell function. However, based on the evidence from this study, other exposure times (that is, 90 minutes) and intensities 2 mT and 5 mT) were still very strongly effective for killing breast cancer cells, even though not optimal. That means that 20 Gauss and 50 Gauss PEMFs were also quite effective and both 60 minutes and 90 minute exposures were also effective.

A clear window of vulnerability of cancer cells to PEMFs exists; *more is not necessarily better*. That weaker fields, or less exposure to them, are less lethal, upon first impression, might seem somewhat intuitive. However, the fact that stronger, or longer, exposure to fields is less efficient at killing, implies some specificity of biological action, rather than a straightforward dose-dependent accumulation of generalized damage over susceptible cells. The most directly measurable effect of PEMFs on breast cancer cells in this study is that of induced cancer cell death (the medical term is apoptosis). Nonetheless, never mind cell death, even the capacity of PEMFs to slow the growth of a cancer cell also would be a positive clinical outcome and of relevance in advancing PEMF-based anti-cancer therapies.

Mechanisms in Play

The question becomes what is the mechanism of action of PEMFs in the killing of cancer cells. A commonly reported result of PEMF exposure is elevation of intracellular calcium level. In the context of the current study, 3 mT PEMFs at a frequency of 20 Hz for 60 minutes per day would create the “correct” combination of calcium signals that would most effectively result in cell death. Indeed, it has been shown in other studies that augmenting intracellular calcium compromises cancer cell survival.

Non-malignant cells are unaffected, or even fortified, by the PEMFs used in this study. Therefore, based on this research, using PEMF-based technologies, the greatest damage is done in breast cancer cells, supporting the possibility that it may be ultimately feasible to selectively remove cancer cells from an organism without damaging normal tissues. The apparent lack of response of normal cells to PEMFs might suggest that their internal calcium control mechanisms are capable of balancing, or even exploiting, small increases in intracellular calcium concentrations. Breast cancer cells appear to not be able to withstand even modest changes in intracellular calcium levels. This conclusion is supported by other recently published studies.

While this study was done outside a human body, it lends very strong support to the possibility that breast cancer cells may be impacted in a healthy direction, while sparing surrounding normal cells. While it is not certain from this study whether these results would be best seen in the setting of actual cancer in humans or to prevent the development of cancer is still unknown. Since this research seems to indicate, as does much other research, that PEMFs do not seem to affect healthy cells in any negative way, PEMFs may be a very useful tool in both treating and preventing breast cancer.

Conclusion

Because we don’t have definitive research data to support this concept, I would not normally recommend using PEMF therapies as a sole solution. However, for those individuals who are not candidates for conventional therapies or whose personal preferences prevent them from using conventional therapies, PEMFs may well be a good alternative. I think this may certainly apply itself well to the case of ductal carcinoma in situ [DCIS] of the breast, which is not considered a cancer, but rather a pre-cancer. A large percentage of women with DCIS never actually convert their DCIS process into actual cancer. Since conventional medicine cannot predict who will convert and who won’t, at this point, conventional medical practice treats these as cancers, which results in a significant risk of overtreatment for a lot of women. Again, PEMFs may well be a good alternative in this situation and the progress of the breast changes in DCIS may be monitored over time and if progression is confirmed, then more aggressive therapeutic measures may be applied.

The most important take away from these two studies is that PEMFs might prove useful as a non-invasive, additional treatment to be combined with other common anti-cancer therapies. Based on this data it appears that PEMF-based anticancer strategies may represent a new therapeutic approach to treat breast cancer without affecting normal tissues and is done in a manner that is non-invasive.

Wu S, Wang Y, Guo J, Chen Q, Zhang J, Fang J. Nanosecond pulsed electric fields as a novel drug free therapy for breast cancer: An in vivo study. Cancer Lett. 2013 Oct 4. S0304-3835(13)00701-5.

Low intensity and frequency pulsed electromagnetic fields selectively impair breast cancer cell viability. Crocetti S(1), Beyer C, Schade G, Egli M, Fröhlich J, Franco-Obregón A. PLoS One. 2013 Sep 11;8(9).