

The future of medicine is Bio-electronics here are just a few articles



An electronic cure for cancer?

[R. Colin Johnson](#)

[EE Times](#)

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PORTLAND, Ore. — Curing cancer is usually the domain of medical doctors, but now biomedical engineers at Virginia Tech and the University of California at Berkeley have invented a promising electronic therapy. Using short electrical pulses that target only cancer cells, together with real-time monitoring via electrical impedance tomography, the procedure has already been shown to cure cancer in lab rats. Currently the group is treating mice, and human trials were started in 2008.

"We have invented a new, inexpensive, minimally invasive technique that makes use of irreversible electroporation, essentially killing cancer cells with short electrical pulses, while leaving neighboring healthy cells unharmed," said bioengineering professor Rafael Davalos of Virginia Tech's School of Biomedical Engineering and Science. "We are also using electrical impedance tomography to monitor progress and make sure all the cancer cells get treated."

Work has progressed from cell cultures to rats to mice, with human trials on prostate cancer started in 2008. If human trials for prostate cancer keep being successful, then curing other types of cancer will be tried in other cancers.

Since the mid-1960s engineers have been using electroporation to take electronic control of the pores in a living cell's outer membrane. For instance, genetic engineers routinely use electroporation to load DNA sequences into cells. By using 2,500-V electrical pulses that are 100-microseconds long, pores can be opened in any [cell membrane](#), allowing liquids to flow in and out. Other cancer researchers use electroporation to temporarily make tumor cells more permeable to cancer-killing drugs than the surrounding healthy tissue, but Davalos and UC-Berkeley collaborator Boris Rubinsky use extended sessions with the electrical pulses to essentially electrocute the cancer cells, permanently opening pores that kill the cell as its contents drain out.

"We use needle electrodes to surround the cancerous area, then we use external electrodes to monitor our progress with electrical impedance tomography, because when the pores stick open on a cell, it lowers the bulk resistance of that tissue, which we can image with sub-millimeter cell-scale resolution," said Davalos.

By treating an area while watching their progress using electrical impedance tomography, then moving the needles and repeating as necessary, the engineers have been able to treat different types of cancerous tissue in laboratory animals. The treatment takes about one minute per affected area.

"With our treatment the pulses are so short that the cells don't heat up," said Davalos.

Likewise, cryoablation freezes cancer cells, instead of heating them. Unfortunately, killing the cancer cells with cold sometimes damages nearby healthy cells, just as heat can.

"Our procedure doesn't affect neighboring cells," said Davalos. "Our treatment is also tissue independent—all cells just behave in this way. All we have to be able to do is get the needles to the targeted area, and in just one treatment

you are rid of the cancer."

A key problem with all cancer treatments, according to the researchers, is that oncologists cannot tell if the cancer cells are dead until a week or more after the treatment. Consequently, if oncologists are not aggressive enough during the treatment, they can miss some cancer cells. Conversely, if they are too aggressive, the treatment can damage surrounding healthy tissue and blood vessels. Using irreversible electroporation, success can be monitored in real-time with electrical impedance tomography, leading the researchers to claim their technique is more effective because it can be more accurately applied.

"With other procedures, you don't get immediate feedback on whether the area has had enough treatment yet. With ours, you can see how successful the treatment is as you go along," said Davalos.

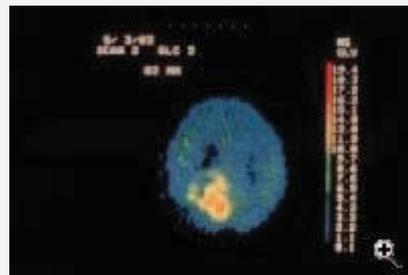
Biztech

Killing Cancer Cells Using Electrical Field

Thursday, August 30, 2007 - Asaf Peer

A group of scientists headed by Yoram Palti from the Technion Institute in Israel, succeeded in killing dividing cells without harming non-dividing ones using electrical charges. It turns out that an electrical field in a small enough voltage doesn't damage living cells. The scientists used this fact to treat a cancerous organ with an altering current (AC) electrical field. Using the AC electrical field, normal cells remain unharmed while the dividing cancerous cells are destroyed.

Living cells consist of ions, charged molecules, membranes and organelles, which are responsive to electrical fields and currents and sometimes even generate electrical activity. When a non-uniform electric field is generated near living cells, polar molecules will move towards the higher field intensity. When an altering current is generated the molecules stay in place, their reaction being only vibration. However, in dividing cells the altering field causes the molecules to move towards the furrow, which is the narrow place between the two daughter cells. Using this principle the scientists had a way to tell apart normal cells from dividing cells, which are normally cancerous cells.



Brain tumor as seen using PET scan (Credit: NIH)

The procedure achieved good results when tested on tissue cultures and animal tumors. When tried on several cancerous tissue cultures the treatment was found effective. While the control culture roughly doubled itself every 24 hours, the exposed cultures' proliferation rate was slowed down. After its efficiency was proved on culture, the treatment was tried on a living animal. Rats with Intracranial Glioblastoma, a type of brain cancer, were used to test the treatment. A group of rats were treated with an electric field while another one was kept as control. The rats treated with the electric field showed a tumor half the size

of the control on average after a treatment of six days. The successful results led to clinical tests.

The treatment then was successfully tested on human Glioblastoma multiforme (GBM), a deadly form of brain tumor. Ten patients, all with recurrent GBM were treated using the method. The patients treated showed continued living more than twice longer than other patients suffering from GBM, and at least in one case ten months after the treatment the tumor wasn't detected using MRI. Other clinical tests with the new method are currently underway.

The treatment is supposed to have very few side-effects and since it is done using external electrodes it is non invasive. The risks include seizures or cardiac arrhythmias, but since the frequency used is larger than 10kHz no such side-effects are expected to happen. Current cancer treatments that target dividing cells, such as chemotherapy or radiotherapy have the problem of killing frequently dividing normal cells like bone marrow cells. Because the bone protects the bone marrow from electrical charges, the AC electric charge will have a significantly lower affect (100 fold less!) on the bone marrow than in other treatments where the cells are not protected by the bone. Using electrical fields seems to be a promising way to cure cancer, being both effective and free of side-effects.

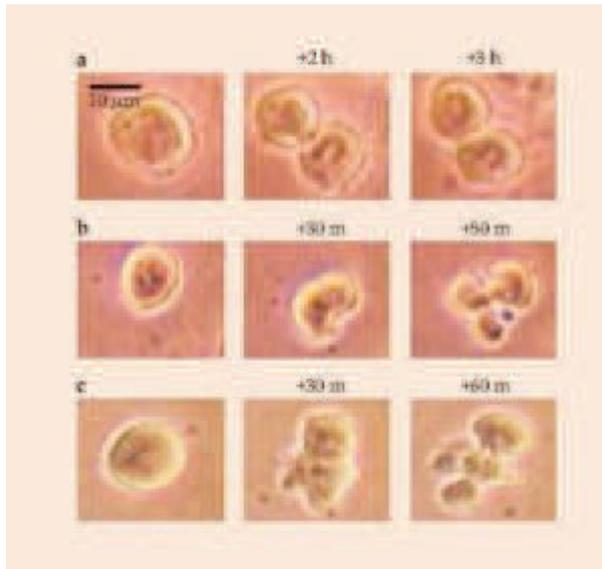
In 2006, [TFOT](#) covered a [similar research](#) conducted by Luca Cucullo and Damir Janigro from the Cleveland Clinic Lerner College of Medicine in Ohio. In their study, tumor cells resistant to chemotherapeutic drugs were subjected to very low intensity electrical stimulation. As a result, these cells acquired sensitivity to the anti-cancer drug doxorubicin. The hope now is that combination of electrical stimulation and chemotherapy will result in better treatment for cancer patients.

Science News ScienceDaily

Electric Fields Have Potential As A Cancer Treatment

ScienceDaily (Aug. 6, 2007) — Low-intensity electric fields can disrupt the division of cancer cells and slow the growth of brain tumors, suggest laboratory experiments and a small human trial, raising hopes that electric fields will become a new weapon for stalling the progression of cancer.

The research, performed by an international team led by Yoram Palti of the Technion-Israel Institute of Technology in Haifa, is explained in the August issue of *Physics Today*.



Alternating electric fields affect tumor cells by (a) slowing their division time from under one hour to more than three hours. The fields also (b,c) disintegrate cells in the later stages of cell division. (Credit: Physics Today, adapted from Kirson et al., *Cancer Res.* 64, 3288, 2004)

In the studies, the research team uses alternating electric fields that jiggle electrically charged particles in cells back and forth hundreds of thousands of times per second. The electric fields have an intensity of only one or two volts per centimeter. Such low-intensity alternating electric fields were once believed to do nothing significant other than heat cells. However, in several years' worth of experiments, the researchers have shown that the fields disrupt cell division in tumor cells placed on a glass dish (in vitro).

After intensively studying this effect in vitro and in laboratory animals, the researchers started a small human clinical trial to test its cancer-fighting ability. The technique was applied to ten human patients with recurrent glioblastoma multiforme (GBM), a form of brain cancer with a very low survival rate. All the patients had their earlier tumors treated by other methods, but the cancer had started to recur in all cases.

Fitting the patients with electrodes that applied 200 kHz electric fields to the scalp at regular intervals for up to 18 hours per day, the researchers observed that the brain tumors progressed to advanced stages much slower than usual (taking a median time of 26 weeks), and sometimes even regressed. The patients also lived considerably longer, with a median survival time of 62 weeks.

While no control group existed, the results compared favorably to historical data for recurrent GBM, in which the time for tumor progression is approximately 10 weeks and the typical survival time is 30 weeks. In addition, 3 of the 10 patients were still alive two years after the electrode therapy started. These results were announced in a recent issue of *The Proceedings of the National Academy of Sciences* (Kirson et al., *PNAS* 104, 10152-10157, June 12, 2007).

The Physics Today article explains these results in terms of the physical mechanisms that enable the electric fields to affect dividing cancer cells. In vitro, the electric fields were seen to have two effects on the tumor cells.

First, they slowed down cell division. Cells that ordinarily took less than an hour to divide were still not completely divided after three hours of exposure to an electrical field of 200 kHz. Another group consisting of Luca Cucullo, Damir Janigro and their colleagues at the Cleveland Clinic, slowed cell division by applying electric fields with a much lower frequency just 50 Hz. In addition, this protocol demonstrated the ability to decrease the intrinsic drug resistance of the cells.

What causes cell division to slow down" In the 200-kHz case, the electric fields hamper the formation and function of a key cell structure known as the mitotic spindle. The spindle is composed of cell components known as microtubules. The microtubules in turn contain components that have a high electric dipole moment, in which there is a large separation of opposite electric charges. Therefore, parts of the mitotic spindle are greatly influenced, and apparently disrupted, by an electric field.

The second effect of the 200 kHz fields is that they sometimes disintegrated the daughter cells just before they split off from their partners. The dividing cells sometimes destruct because a high-electric-field region develops between the two daughter cells. This leads to a large slope, or gradient, in the electric field from each daughter cell to this region. This gradient may rip organelles (cell structures) and macromolecules (such as proteins) from the scaffolding of the cells.

The alternating electric fields are believed to have similar effects in the human glioblastomas. In contrast, the electric-field treatment poses little danger to normal brain tissue, because healthy brain cells do not divide. The electric fields were only observed to have disruptive effects on dividing cells. Based on the success of their initial human study, the researchers are working on another human clinical trial, this time with a control group receiving chemotherapy. The future of medicine is in Bio-electronics.

International Journal of the Medical Science of Homeopathy June 2009

Medical experts currently recognize more than 100 types of cancer. They name them according to the organ this particular type of cancer attacks – for example cancer which attacks colon would be called colon cancer, cancer which attacks breast tissue would be called breast cancer, cancer which attacks lungs would be called lung cancer and so on.

Cancer types are divided into categories based on which area of the body they attack. The main categories of cancer are carcinoma, sarcoma, leukemia, central nervous system cancer, lymphoma and myeloma. Carcinoma cancer forms in the skin or in any internal organs. Sarcoma cancer forms in bones, fat, cartilage, blood vessels, muscles, connective tissue and supportive tissue. Leukemia cancer forms in bone marrow and in blood forming tissue. Central nervous system cancer forms in the brain and spinal cord tissues. Lymphoma and myeloma cancer begins in the [immune system](#) tissues. Symptoms of cancer include persistent fatigue, unplanned weight loss, fever, skin irritation, itchiness and pain.

Natural Cancer Treatment

Natural or Energetic [cancer treatment](#) methods are not scarce, but few are familiar with them. People who have been fighting cancer off for a while would have either tried or at least heard of various [alternative cancer treatment](#) methods. In general, those who would like to battle cancer with methods other than chemotherapy have several options. Alternative Cancer website will focus on providing as much information about these alternative cancer treatment methods as possible to help you make informed decision and win your fight against this devastating disease.

Some of alternative cancer treatment methods include:

Acid and alkaline balance is a treatment which is a combination of acid neutralizing minerals and magnesium. Through proper application of acid neutralizing minerals such as calcium and magnesium the body of cancer patient is supplied with necessary additives to correct the acid and alkaline balance. In addition minerals like potassium, rubidium and cesium neutralize the acid nature of the cancer cells which can't survive in high PH ranges.

Adjunctive therapies are a conjunction therapy which is used with selenium, detoxification, specific vitamins and supplements, water therapy and [nutrition](#) balancing.

Amygdaline or Laetrile is a natural substance which is concentrated for [cancer therapy](#). Amygdalin is an extraction from the apricot seeds and is available in both tablets and in injectable form. This therapy is used for seriously ill people with proteolytic enzymes, fresh fruit diet, vegetables, whole grains, etc. doctors first give injections and after some time tablets are given.

Antineoplastons are amino acid compounds, also known as peptides. These are found in the blood and urine of any healthy people, but they are deficient in cancer patients. There are many patients who believe and claim that this method has helped put cancer cells under control.

Cancel/cantron (entelle) has demonstrated 70 – 80 % success rate in elimination of cancer in mice. It helps in lowering the overall potency of cancer cells forcing it to “starve” and die off.

Ellagic acid is a new discovered extract which is derived from fruits like red berries and pomegranates. Tests conducted at the institute of South Carolina show that it can effectively prevent cancer by inhibiting the growth of cancer cells. It acts by suppressing cancer causing chemicals and makes them inactive.

Electronic therapies were used by Rife, Beck, Clark, Nelson and others to treat cancer. Electrotherapy is also known as electrochemical tumor therapy and electro cancer therapy. It was developed in Europe and it uses galvanic electrical stimulation to cure tumors and skin cancers. It is also used in conjunction with therapies of different kinds. Electrotherapy utilizes local anesthesia with positively charged platinum which is inserted with a gold or silver needle into the places around the tumor. The voltage of 1V to 15V is applied, depending on the size of the tumor. Electricity induces electrolysis in tissues and the PH balance depolarizes cancer cell membranes which destroys tumors gently. Generated heat stroke proteins around the patient's cancer cells induce cell specific immunity as it triggers natural killer cells. The most tested and proven system is the EPPFX of Prof. Nelson.

Magnetic or bio resonance is a new technique. Every cell has natural frequency of resonance and cancer cells are different from normal cells. Radio waves are set to resonate with the cancer cell frequency which destroys them, in the same way a loud sound breaks fine glass. It has been used in Europe for 23 years.

Enzymatic therapy is available in two options – food enzymes and proteolytic enzymes. Some scientists believe that cancer cells are covered with protein lining, which prevent body's natural defense mechanisms from reaching them. If this protein lining is destroyed by enzymatic therapy, body defenses can easily reach the cancer cells and destroy them.

Many alternative cancer centers around the world use food therapies that protect body with production of enzymes that prevent tumors from forming. The flax seed oil diet helps in increasing metabolism, improving immune system, reduces cholesterol levels and help suppress the growth of cancer cells. Low sugar diets also seem to help in suppressing cancer cells.

Gerson therapy consists of detoxification and diet. Detoxification utilizes coffee enemas whereas caffeine is absorbed in the lower bowel and reaches liver to stimulate the growth of natural immune factors. The dosage in such cases has to be carefully controlled. Over stimulation of liver can lead to malfunction and fatigue. Gerson therapy also involves drinking of 12 or more glasses of fresh vegetables, fruits and potassium with iodine supplements. As its name suggests, this alternative cancer therapy was developed by Dr. Gerson.

Glycoalkaloids are primarily used for alternative treatment of skin cancer but have also been proven effective in treatment of melanomas. Studies conducted by Lane labs concluded that Glycoalkaloids are also beneficial in treatment of cell carcinomas.

Green tea has long been known for its cancer preventive qualities but some believe that it cannot prevent uncontrolled growth of cancer cells once present in the body. Green tea still remains the least expensive method of cancer control for many. The most active anti cancer ingredient found in green tea is called EGCG. It's a compound known for its free radical killing properties.

Haelan is an anti cancer nutrition agent made from soybean extracts. It cuts blood supply from cancerous cells, reduces tumors through enzymes and boost immune system. It also helps in relieving the side effects of mainstream [cancer therapies](#).

The brief overview of alternative cancer treatment methods is not exhaustive and we will strive to provide as much detailed information about it as available. Herbal extracts like artemesia, essiac tea, graviola, hoxsey, pau d arco, radium weed, red clover, saw palmetto and tian xian have also been found beneficial.

THE ARIZONA REPUBLIC

Banner touts electrical cancer treatment

Hospital is 1st to offer method commercially

by Brian Anthony Hernandez - Aug. 5, 2009 12:00 AM
The Arizona Republic

Millisecond bursts of electricity flowed pass Maria Bartz's skin behind her rib cage and straight to her sick liver.

Bartz lay motionless as probes emitting as much as 3,000 volts and as little as 1,500 volts - a similar amount used to kill insects in electric fly swatters - poked through the right side of her body.

"The probes look like small shish kabobs," said Kevin Hirsch, medical director of Interventional Radiology at Banner Good Samaritan Medical Center.

Radiologists at the center recently added a new weapon to their arsenal of tools they use to combat liver cancer: irreversible electroporation.

Unlike traditional invasive surgical procedures, chemotherapies or radiation treatments, the new method keeps organs intact and spares nerves, blood vessels and other healthy areas of the body.

Last month, with Bartz as their patient, physicians at Banner Health became the first facility in the U.S. to commercially use the ultrasound-guided technique to treat liver cancer.

Radiologist Charley Raker used a minimally invasive tool called a NanoKnife to open tumor cell membranes in Bartz, who was diagnosed with liver cancer in May.

Instead of burning or freezing the tumor, as is done with other methods, the NanoKnife released electric pulses to kill her tumor, which dissolved, leaving healthy liver tissue to grow and repopulate the area.

"I didn't feel any pain after the treatment," said Bartz, 66, of Chandler.

Traditional treatments such as chemotherapy can cause severe pain and create a barrage of complications for patients. The procedure left Bartz, who had heart surgery last year, with no pain and only four pen tip-sized wounds, which now are barely visible.

"For patients who can't tolerate more aggressive procedures, we can still treat them and rid them of cancer," Raker said. "Surgery involves a large incision - this procedure does not. It's not to say we're better than surgery. . . . We offer an alternative (to surgery and chemotherapy).

"There's a good place for IRE within the existing treatments."

Bartz, the first patient outside of clinical trial to use the treatment, will return to the center for ultrasounds and CAT scans so radiologists can determine the status of her liver. Patients who received IRE during the trial period had little or no sign of their tumors after 30 days.

The NanoKnife takes 10 minutes to kill a tumor, whereas treatment time for traditional burning and freezing techniques could last as long as 15 minutes for small tumors and 40 minutes for larger ones. From start to finish, IRE lasts less than an hour; other methods can take as long as 1 1/2 hours depending on whether anesthesia is used.

Bartz left the hospital a day after the procedure. Eventually, most liver patients will go home on the same day of their treatments.

IRE uses a computer-controlled capacitor, a big machine that creates electrical charges and currents. The machine is hooked into tiny probes radiologists insert through a patient's skin. The probes circle the tumor; imaging guidance ensures this happens.

The U.S. Food and Drug Administration approved the NanoKnife for surgical ablation of soft tissue such as the liver.

"People will be doing this in the prostate," Raker said. "People will be doing this in the brain. It gives them confidence when they're fighting cancer."

NanoKnife's manufacturer, AngioDynamics, is seeking approval for prostate- and pancreatic-cancer procedures.

"People are always asking, 'What's the next big thing?' in medicine" Raker said. "This is it. And we have it."



electrical treatment of cancer

by [jaguar57](#) on Mon Sep 14, 2009

I don't know why some of the best treatment modalities get lost in the media shuffle. In 1959 there was an article in Science Magazine of lab tests on mice which had 60% of the tumors completely die from application of just 3 milliamps of direct current for 4.8 hours daily. And there have been other

tests since then showing just as much effectiveness. And yet no Americans know about it, probably due to the stranglehold on the media by big money interests. But the communist country of China knows this kind of info and makes use of it. There are a number of hospitals there that use electrical treatment of tumors probably because of the low cost. There's also a clinic in Germany that uses it. I wouldn't doubt that Cuba does too.

Also few Americans know how much of a connection there is in the body between microbes (bacteria, viruses) and cancer. Dr Dowling of the North Carolina Institute of Technology has a really great page with all the scientific info of how bacteria (usually from dental cavitations) restrict the bodys own immune system to fight the proliferation of cancer cells. And theres much info on how viruses can damage cells DNA to allow them to become cancerous. And guess what? Small amounts of electric current (AC or DC) applied to the skin over arteries can enter the bloodstream and deactivate or kill all the microbes there, freeing the body to be able to fight the cancer. It's such a super simple method that's so effective that it becomes unbelievable in this overly technological age. But the humble wise ones have no problem accepting it and using it.

I have witnessed how both these methods work in cancer patients and would be glad to help others help themselves with this. You can email me at

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