New hope for Cancer Patients

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We all have a friend, a family member or a colleague who is battling the worst kind of enemy there is,…Cancer! Cancer has become the most feared word in our lives - a word that spells doom and depression. An illness that has taken innumerable lives and separated its victims from their families and friends. Doctors and scientists are doing their utmost to find a way to defeat their common foe, and emerge victorious.

Although, new innovations in cancer research and treatments are continuously coming to the forefront, but most of these experimental treatments take a long time to mature and test through various clinical trials, and they still require a lot of changes in the end. However, there are certain new experimental cancer treatments which are being investigated as to their efficacy.

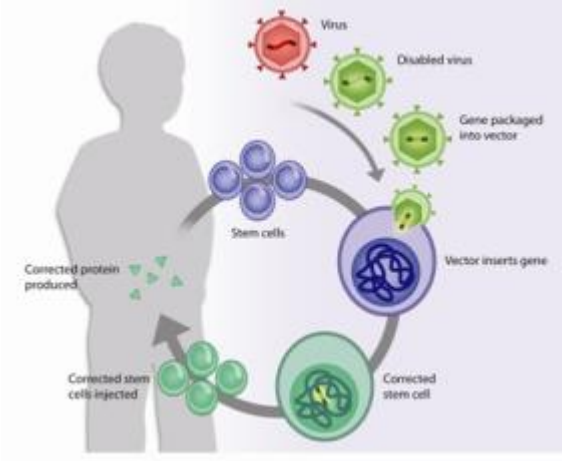
Hyperthermia therapy is a type of cancer therapy that uses heat to damage cellular proteins of tumor cells, thus causing their apoptosis and phagocytosis. If it turns out to be feasible, this will destroy various malignant growths, thus hampering their capacity to infect other healthy cells. Presently, this treatment needs to be developed further in order to determine the degree of heating which will be required to destroy cancer cells.

Radiation therapy utilizes different forms of radiation in an effort to cause cancerous tumors to go into remission.

Non-invasive cancer treatments are minimally invasive, have a short recovery time and are indicated for cancer patients whose health cannot withstand the trauma of surgery or other invasive treatments. These treatments also have fewer side effects, when compared to radiotherapy or chemotherapies. One such treatment comprises of inserting metallic nanoparticles like gold etc. into the tumor. These nanoparticles would then be heated up using magnetic fields or radio waves, thus destroying neighboring malignant cells.

Another noninvasive treatment type is High-Intensity Focused Ultrasound (HIFU) which destroys malignant cells in the brain, breast, bones, pancreas, liver, rectum, testes, prostate and kidneys by using intense sound waves. As HIFU is non-invasive, and does not use radiation, so, is associated with lesser side effects.

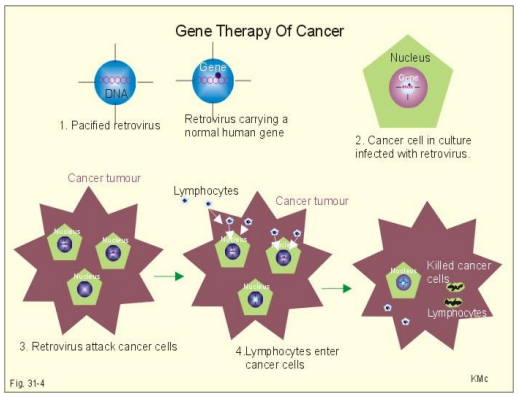
Gene therapy comprises of introduction of tumor suppressor genes into fast dividing cells, which is expected to delay or stop a tumor from advancing. Adenoviruses are an oft employed vector as they act as a vehicle to deliver targeted therapy in the form of proteins or recombinant DNA. These viruses code for proteins in both dividing and non-dividing cells without disturbing the genetic material of the host cell.



Gene therapy for cancer treatment

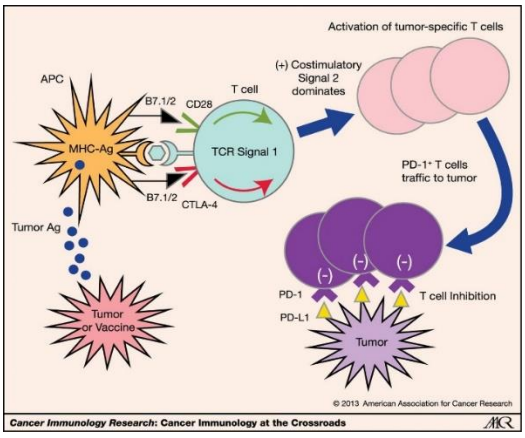
Source: *Littlefighterscancertrust.wordpress.com*

Genetically-modified poliovirus therapy makes use of genetically-modified poliovirus with part of a rhinovirus responsible for causing colds. This deletes the disease-causing part of the poliovirus. The genetically-modified virus is then injected into a patient's tumorous growth, which then poisons and kills the cancerous cells, and also activates the body's immune system. The immune system in individuals, which is automated to fight against infections caused by viruses, after identification of these cells as being infected by viruses attacks them.



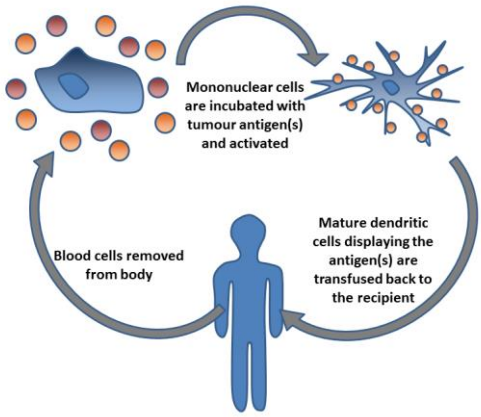
Source: *Paulev Zubeita, 2nd edition, New Human Physiology*

Immunotherapy uses the body's natural defense mechanisms to kill cancerous cells. This therapy is usually less noxious and more effective than other methods of treatment. This involves the use of Checkpoint Inhibitors (CPIs) which serve to bring about destruction of tumor cells by removing the immune checkpoint molecules, like Programmed cell death protein -1 (PD-1), Cytotoxic T lymphocyte antigen 4 (CTLA-4), etc., thereby enhancing the anti-tumor response of T cells. Combinations of PD-1 and CTLA-4 blockade are also being studied.



Source: *2013 American Association for cancer research*

Adoptive cell transfer therapy is a type of immunotherapy which comprises taking cells of the immune system (generally white blood cells) from a patient's body, these are then engineered in a way so that they are capable of fighting against certain types of malignant cells. These are then re-infused into the patient. These cancer treatments which are under experiment have to be precisely done for each patient, which makes it very expensive. Scientists are trying their utmost to make this treatment a more feasible possibility for patients.



Adoptive cell transfer therapy

Source: *By Simon Caulton - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=29706339*

Drug therapy for cancer makes use of man-made or natural drugs to encourage recovery. The newer drugs which are under trial include Dichloroacetate (DCA) which has been found to decrease tumor size in animal studies. DCA is believed to re-energize repressed mitochondria in some kinds of tumor cells which are starved of oxygen, and thus brings about their death. Quercetin is also under trial for its anti-cancer effects as it acts as an antioxidant and helps apoptosis of cancerous cells. Quercetin is present in a number of vegetables, fruits, leaves and grains.

Bacterial therapies with certain bacteria like Clostridium Novyi-NT have been observed in clinical trials to consume the insides of oxygen-starved tumors, then perish as they spread to the outer sides of the tumor which are supplied with oxygen. The reason for this is that C. novyi can survive, grow, and increase in number in a hypoxic environment like the inner parts of a tumor, but not in an

oxygenated one. Because of this, they are not harmful for the individual. This lessens the number of cancerous cells, thus making it easier to treat. Since the bacteria cannot devour oxygen rich portions of the tumor, this treatment needs to be followed by some other forms of treatment to eliminate oxygen rich cancer cells. A reduction in tumor size thus occurs and helps to avoid complications like infections and hypoxia.

A lot of research is being done on cancer treatments in the hope of finding an effective way of combating this disease with minimal side-effects. Scientists today hope to pave the way for better and healthier generations. You all, as future doctors and scientists are our hope for relief from this dire predicament faced by many!

Adapted from: Top 10 most promising experimental cancer treatments. (*www.bestmedical degrees.com/experimental-cancer-treatments*)