Vaccine Therapy for Cancer

How does the immune system work?

The immune system is made up of organs, cells, and proteins. It helps keep our bodies healthy by attacking foreign invaders and fighting against bacteria, viruses, parasites, and fungi that can enter and harm your body. Your immune system may also fight against cells already in your body that may have changed over time due to illness. When foreign cells enter the body (like with an infection), the immune system responds and clears the foreign cells in your body. However, cancer cells are not always seen as foreign by the immune system, so your body does not react to them.

White blood cells, also called leukocytes, look for these foreign invaders and kill them. There are two types of leukocytes:

- **B lymphocytes:** These cells helpfind pathogens and also make antibodies. Antibodies are proteins in the body that fight infections that your body has already been exposed to.
- **T lymphocytes**: These cells kill pathogens.

What are vaccines?

There are vaccines for infectious diseases, like measles and hepatitis. These vaccines use weak or dead forms of viruses, bacteria, or other germs to start an immune response in your body. Cancer vaccines teach the immune system to find, attack, and kill cancer cells.

Cancer vaccines help your immune system see cancer cells as foreign. Your immune system can then attack the cancer cells. Cancer vaccines are one way to use your body’s immune system to fight cancer.

How do cancer vaccines work?

A cancer vaccine contains cancer cells, parts of cells, or pure antigens. The vaccine helps with the immune response against cancer cells that are already in your body. This differs from other vaccines that are used to prevent infection. Cancer vaccines help your immune system notice tumor cells as foreign invaders so that they may be killed.

Tumor cells often have antigens (called tumor-associated antigens, or TAAs). Most TAAs are also found in normal cells. Because the immune system sees these antigens as “normal,” no immune response is started. If the immune system can be taught to see the TAAs as foreign, an immune response can be started against the tumor. Some TAAs have been found in certain types of cancers, but not in normal cells. By targeting these TAAs with cancer vaccines, your immune system can attack cancer cells while leaving normal, healthy cells mostly safe. Cancer vaccines that target cancers of the breast, prostate, liver, kidney, pancreas, lung, skin, and certain types of leukemias and lymphomas are in clinical trials.

Are there any vaccines that prevent cancer?

Some cancers are known to be caused by viruses.

1. An infection with human papilloma virus (HPV) can cause cervical cancer, as well as some head and neck, penile, anal, vulvar, and vaginal cancers.

2. Hepatitis B and C viruses are known to cause liver cancer.

Vaccines that prevent infection from these viruses would help prevent these cancers. While these vaccines may prevent cancer, they are not the same as cancer vaccines. These vaccines are directed against viruses, rather than cancer itself.

Do cancer vaccines work?

There have been many clinical trials testing cancer vaccines. Sipuleucel-T (Provenge®) is a type of immunotherapy. Immunotherapy medications stimulate (rev up) your body's immune system to attack cancer cells. This cancer vaccine has been found to improve overall survival.

Another viral therapy approved for use is called talimogene laherparepvec and it is used to treat melanoma that can't be removed with surgery. The drug is a weakened form of Herpes Simplex Virus Type 1. The medication is placed directly into the melanoma tumor on the skin or in a lymph node. This makes the cancer cells burst and die.

A viral therapy called Bacillus Calmette-Guerin (BCG) is a weakened strain of Mycobacterium bovis. It works against cancer as a biologic response modifier. This means that it can trigger your immune system to attack tumors. BCG is thought to work by starting an immune response and causing inflammation of the bladder wall that kills cancer cells within the bladder.

Clinical Trials

Cancer vaccines are an important and growing area of cancer research. Many trials are being done to test these vaccines. We are still trying to research cancer vaccines so that one day they may be used in the routine care of cancer patients. Research into new ways of treating cancer, such as cancer vaccines, is an important part of the search for a cure.