

The Immune System, Inflammation and Cancer

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The Immune System Explained

The immune system is a wonderful system of cells and signaling cytokines that fight infections and keep us healthy. We come in contact with billions of microorganisms every day. These include bacteria, viruses, fungi, and parasites. To protect us, we have an immune system. The immune system is a fascinating collection of infection fighting white blood cells and their partners the complement system and cytokines.

The complement system contains small proteins which circulate throughout the blood system. Their job is to recognize foreign substances (antigens), bind to them, and then activate the rest of the system. They stick to the bad cells and mark them so that the other immune cells can recognize the infectious cells. Another role of the complement system is to kill bacteria.

The next group is phagocytes. These cells can eat bacteria a process called phagocytosis. The phagocytes include granulocytes, macrophages which are converted monocytes, and dendritic cells. This system of cells is the first line of defense against infections.

Lymphocytes make up the next set. There are different types of lymphocytes and each has a specific function. T-helper cells are the main regulators of the immune system. When they come in contact with an antigen presenting cell such as a macrophage that has just eaten a bacteria, the helper cell is activated and it then helps turn on the rest of the immune system. Another type of T-cell is a killer T-cell. These cells circulate in the body looking for infections or infected normal cells, or even cancer cells. Their job is quite simple, when they find a bad cell, they kill it. B-lymphocytes help the immune system kill bacteria by producing immunoglobulins. Immunoglobulins act as tags that mark bacteria for removal by the phagocytes. These are produced every time you get an infection or an immunization. When the same bug invades your body, the B-lymphocytes remember and then produce more immunoglobulins via the plasma cells to help kill the infection.

Finally, there are substances called cytokines. These substances are used for a variety of purposes. They help the cells signal to each other, they can act as growth factors, they recruit immune cells, they activate immune cells, they turn off immune cells, and some even act as hormones. The cytokines are very important to keep the system running and they need to be in a balance. There are cytokines to turn on the system and to turn off the system. When there is an imbalance, the end result is either an immune deficiency or an overactive immune system. The overactive immune system is what is involved in chronic inflammation and this is a bad thing because of the diseases chronic inflammation causes. In fact, chronic inflammation has been implicated in heart disease, stroke, dementia, and cancer.

Inflammation and Cancer

We have known about inflammation and cancer since 1863 when Rudolph Virchow discovered white blood cells in tumor tissues. Today, the connection between

chronic inflammation and cancer is commonly accepted. Some common examples of cancers resulting from chronic inflammation include ulcerative colitis and Crohn's disease leading to bowel cancers. Barrett's esophagus results in cancer of the esophagus. Celiac disease can lead to small bowel lymphomas. Hashimoto's thyroiditis can lead to lymphoma of the thyroid.

Inflammation stimulates tumor development at all stages; initiation, progression, and metastasis. Tumor initiation is the process when a normal cell becomes malignant. Tumor progression is the process by which the cancer cell grows, and metastasis is the process by which the cancer cell spreads to distant sites either through the lymphatics to the lymph nodes or through the blood to distant organs.

The role inflammation plays in tumor cell initiation is clear but the mechanism is not worked out yet. It is thought to be a two part process. The inflammatory cells are responsible for secreting reactive oxygen species (ROS) and reactive nitrogen species (RNS). These normally are used to kill bacteria or virus-infected normal cells. In a chronic state, these ROS and RNS can damage the DNA of normal cells causing mutations. A mutation in an oncogene can be the initial process that eventually leads to a cancer. The second step is the inflammatory cells secrete cytokines that increase cell growth, so not only are the cells stimulated to grow but they are doing so in an environment full of ROS and RNS setting up a perfect situation to produce mutated oncogenes.

The manner in which chronic inflammation encourages tumor cell progression is not well described. It is thought that the inflammatory cytokines produce many effects especially growth promotion and degradation of the tissues surrounding the tumor (stromal matrix) which helps tumor cells spread and migrate.

Finally, the milieu of cytokines also encourages metastasis. Some of them serve as growth factors for blood vessel formation. This is called angiogenesis and it is necessary for tumor cells to metastasize. Additionally, as the blood vessels are being formed around the tumor cell, additional cytokines have protease activity which break down the stromal matrix and allow the cancer cells to migrate in to the blood vessel and then metastasize.

When the immune system is in good working order, we remain in the best of health protected from infections and also cancers. A healthy immune is our best defense, but what foods are best for your immune system? Here is a list, and as always, it is best to get these nutrients directly from foods rather than a pill.

Nine of the Best Immune Boosting Nutrients

1. Vitamin C: Increases the production of white blood cells, antibodies, and the production of interferon. Only 200 mg/day is necessary. Mega doses end up in the toilet. It is best to get your vitamin C from citrus fruits, green peppers, strawberries, tomatoes, broccoli, and sweet and white potatoes.
2. Vitamin E: Improves natural killer cell and B cell function. It can be found in seeds, oils and grains.
3. Carotenoids: Vitamin A and beta-carotene increase infection fighting cells and are powerful anti-oxidants. They have also been found to have anti-cancer activity and can be found in green leafy vegetables, intensely colored vegetables, fish, fish, eggs, and dairy products.

4. Bioflavonoids: Are anti-inflammatory and anti-viral. They improve cell walls and are essential to absorb vitamin C. Bioflavonoids can be found alongside vitamin C in citrus fruits.
5. Zinc: Improves production of white blood cells especially T cells. Zinc has been shown in clinical studies to shorten the duration of common cold. You can find zinc in peanuts, peas, lentils, and lima beans.
6. Garlic: Boosts white blood cells, natural killer cells, and production of antibodies. It also has direct anti-bacterial effects. Try to add garlic whenever possible to your diet.
7. Selenium: Increases natural killer cells and cancer fighting cells. There is some promising evidence of its cancer prevention abilities.
8. Omega-3 fatty acids: Is a very beneficial fat. It is anti-inflammatory, associated with good heart health, boosts immune system especially the phagocytes, and has anti-cancer effects.
9. Mushrooms: Known for centuries to have immune boosting qualities in the Orient. Maitake, Reishi, and Shiitake strengthen the immune system and fight diseases like cancer.