



CENTER FOR IMMUNE RESEARCH

Backgrounder: Interferon and Its Role in Immune Health

The immune system has many different types of cells acting together to protect the body against viruses, bacteria, and other “foreign invaders.” Part of this protection includes the production of interferon, a protein that plays a special role in triggering the body’s immune response. The following describes what interferon is and why it is so important to a healthy immune system.

What Is Interferon

The immune system consists of a complex network of cells, tissues, and organs all working in tandem to ward off infection and keep us healthy. This includes interferon, one of the proteins called cytokines, which are diverse and potent chemical messengers that can trigger the immune system to attack invading pathogens. Interferon signals neighboring cells into action and also interferes with how foreign cells grow and multiply.

Interferon is also considered essential for optimal health because it can boost the immune system’s ability to recognize foreign invaders. It is because of this special role that interferon is used in drug form as an anti-viral agent to treat many different diseases. Moreover, researchers have shown that interferon, given by nasal spray in daily doses, can prevent infection and illness. However, pharmaceutical forms of interferon cause side effects such as nosebleeds, fatigue, headache and aches, and may not be useful in treating established colds.

In humans, there are three classes of interferon, alpha, beta and gamma. Interferon alpha and beta are produced by many cell types, including the infection-fighting T-cells and B-cells in the blood, and are an important component of the anti-viral response. In contrast, interferon gamma is involved in the regulation of the immune and inflammatory responses and is produced by activated T-cells.

The History of Interferon

Since more than half of the communicable diseases affecting human beings are caused by viruses, scientists in the 1950’s began searching for clues into how the body protects itself against viruses, leading to the discovery of interferon. During studies on virus replication, two groups of researchers in different parts of the world separately discovered interferon. The first discovery occurred in Japan in 1954 when researchers at

Tokyo University were studying viruses in rabbits and found that a natural protein made the rabbits resistant to subsequent viral infection. Then, in 1957, Scottish virologist Alick Isaacs and Swiss scientist Jean Lindenmann found that when chick embryos were injected with influenza virus, the protein produced by the cells destroyed the virus and also inhibited the growth of any other viruses in the embryos. Isaacs and Lindenmann named the protein interferon because of its ability to interfere with virus replication.

Further research showed that interferon was produced within hours of a viral invasion (antibodies take several days to form) and that most living things, including plants, can make the protective protein. Interferon was seen as the cell's first line of defense against viral infections, but because the body produces interferon in small amounts and the protein was thought to be species-specific – meaning only human interferon will work in human beings – research on the use of interferon in drug form inched forward at a snail's pace.

Then, in the late 1960's, Ion Gresser, an American researcher working in Paris, and the Finnish virologist Kari Cantell developed a way to make interferon in useful amounts from human blood cells. Monoclonal antibodies, first produced in 1975, made large-scale purification of interferon possible, and the mid-1980s saw the advent of genetically engineered interferon. During the same period, scientists learned that there are three classes of interferon and that these interferons are not species-specific but can produce a response in other species.

While these developments were occurring, Japanese researchers were focusing on interferon-inducing activities in Chinese herbal medicines. This led extensive research on ways to boost the body's ability to produce interferon through the interaction of botanicals. After screening, testing and evaluating over 200 different herbs, the research successfully isolated four botanicals that, in combination, naturally increase the body's production of its own interferon.

As a result of this extensive research, interferon is being used today in drug form to treat viral diseases like rabies, hepatitis, and herpes infections. At the same time, new research now makes it possible for healthy adults to boost their immune system through a dietary supplement that naturally increases the production of interferon in the body.

How Interferon is Used To Treat Diseases and Boost Immunity

In drug form, several different types of interferon are now approved for use in humans, and are usually administered as an intramuscular injection. Interferon alpha is used as a cancer therapy and a treatment for Hepatitis C, the AIDS-related Kaposi's sarcoma and genital warts. Interferon beta is used in the treatment and to control the neurological disorder multiple sclerosis.

In therapeutic doses, interferon can be hard to tolerate because of its side effects, which include fatigue, headache and aches, and less frequently, low thyroid activity, low platelet count and depression. It is because of these side effects that researchers have not pursued the use of interferon alpha for the common cold and flu, even though studies find that interferon, given in daily doses by nasal spray, can prevent infection and illness. However, new research now makes it possible for healthy adults to boost their immune system through a dietary supplement that naturally increases the production of interferon in the body.

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