

Four of the seven currently available disease-modifying MS drugs are often referred to as “the interferons” - Avonex, Rebif, Betaseron, and Extavia. The first two listed are interferon beta-1a and the last two are interferon beta-1b.

What is an interferon?

Occurring naturally in the body, interferons are glycoproteins which are secreted by immune cells in response to viral infections. It is believed that they provide protection to other cells against the viral infection. In effect, they run “interference” against infection.

Interferons as Medication

In addition to having antiviral properties, interferons have immunomodulatory and anti-neoplastic (cancer fighting) properties. Synthetic interferons are manufactured commercially using recombinant DNA technology. There are two classifications of interferons. Type 1 includes interferon alpha (leukocyte interferon) and interferon beta (fibroblast interferon). Type 2 includes interferon gamma (immune interferon). There is a third classification which is not widely recognized.

Interferon alphas have been used to treat viral infections such as acute and chronic hepatitis C, chronic hepatitis B, and even genital warts. They are also used in the treatment of lymphomas and other types of cancer. Interferon betas have been approved in the treatment of multiple sclerosis. Interferon gamma is used to treat chronic granulomatous disease. (This is not intended to be a complete list of the numerous diseases which interferons have been used to treat.)

Beta Interferons and Multiple Sclerosis

As mentioned above, interferon beta-1a and interferon beta-1b are FDA approved for the treatment of multiple sclerosis. The theory behind the development of interferons as treatment for multiple sclerosis is based on the belief that the disease may be due to latent virus infections of the brain in persons whose immune system is impaired in some way. In testing, interferon

alpha had no effect on MS and interferon gamma made MS worse. Interferon beta was found effective. The reason for this difference is not known.

When researching the question - *What is the difference between the beta interferons?* - I tried hard to locate a scientific explanation of the difference between beta-1a and beta-1b. I could not find exactly what it is. Perhaps the difference lies in a slight variation of the structure of the amino acids.

But in my search, I did find the following in the [monograph for Interferon beta-1b published on Medscape](#) (emphasis mine):

“There currently are 2 types of interferon beta (recombinant) commercially available in the US, interferon beta-1a and interferon beta-1b. **Important differences in beneficial effects** (clinical, MRI measures of response) **between these different types of interferon beta in the management of MS have not been reported and the existence of such differences is as yet unknown.** Clinical interpretation of head-to-head comparative studies involving various interferon beta preparations is limited by methodologic problems (e.g., short duration, open-label studies, nonstandardized dosages and/or routes of administration). Some of these studies were principally designed to provide evidence to the FDA that one particular preparation of interferon beta has sufficient therapeutic superiority to justify overturning the Orphan Drug Act protection of another preparation. **The optimal preparation, dosage, and route of administration of interferon beta for the management of MS has not been determined.** In addition, the comparative efficacy of interferon beta preparations and other disease-modifying agents (e.g., glatiramer acetate, mitoxantrone) has not been evaluated in well-designed, controlled studies.”

Thus, it is difficult and inappropriate to try to compare the effectiveness of one interferon formulation with another. Any head-to-head studies were really designed simply to gain FDA approval when a similar product was already on the market. However, it is known that non-responder and responders to interferon beta differ in their genes. A biomarker panel may soon become a valuable tool for assessing and predicting a drug's clinical benefit for a specific patient.

Please talk with your doctor and ask about his/her recommendations for YOU, specifically, if you are taking or considering using a beta interferon to treat your MS. It is not uncommon that a neurologist may suggest trying a different interferon medication even after one has not worked for you.

Interferon Beta-1a

This interferon beta formulation is available in two formats, manufactured by different companies. Avonex <http://www.avonex.com> , made by Biogen Idec, is given by injection into a muscle once per week. It received FDA approval in 1996. Rebif, made by EMD Serono/Merck and Pfizer, <http://www.rebif.com> is given by injection just under the skin three days per week. It received FDA approval in 2002.

Interferon Beta-1b

This interferon beta is available in one formulation, but manufactured by two companies. Betaseron, made by Bayer Healthcare, <http://www.betaseron.com> is given by injection just under the skin every other day. It received FDA approval in 1993. Extavia, made by Novartis, <http://www.extavia.com> is given by injection just under the skin every other day. It received FDA approval in 2009.

Common Side-Effects

Common side effects of all the interferons include fever, chills, headache, malaise, muscle aches and pains, and fatigue. These symptoms vary from mild to severe and occur in up to half of patients. The literature says that symptoms tend to diminish with repeated injections. Patients often pre-treat with analgesics (such as Tylenol) and antihistamines (such as Benadryl) before each injection to manage these symptoms. Tissue damage at the injection site can occur but is more common with Betaseron and Extavia. High levels of interferons can cause kidney, liver, bone marrow and heart toxicity. Regular blood testing is recommended.

SOURCES:

[“Viral Interference and Interferon”](#) from Medical Microbiology. 4th edition. Baron S, editor. Galveston (TX): University of Texas Medical Branch at Galveston; 1996.

[“Interferon”](#) from Microbiology and Immunology Online. University of South Carolina School of Medicine.

Monographs for [Interferon Beta-1a \(subQ\)](#), [Interferon Beta-1b \(subQ\)](#),
[Interferon Beta-1a \(IM\)](#) found on Medscape

["Interferons"](#) on MedicineNet.com