

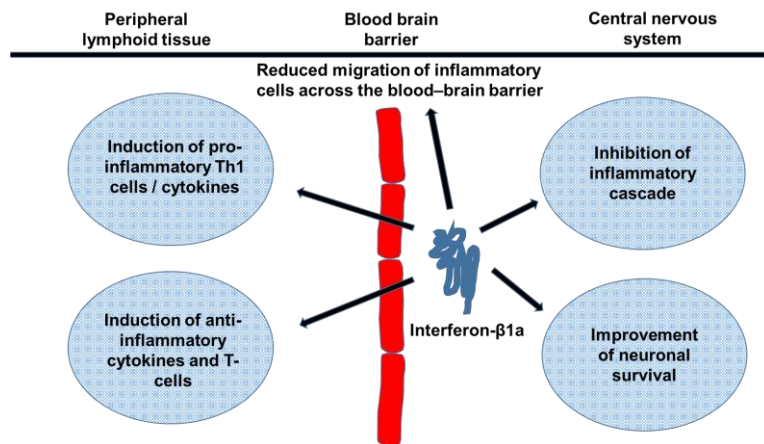
## Interferon-β1a – Fact Sheet

### Molecule

Interferon-β1a (IFN-β1a, Avonex®) is a cytokine in the interferon family. It is a 166 amino acid glycoprotein with a single N-linked carbohydrate chain on Asn80 residue. The molecular weight is 20 kDa. Commercial IFN-β1a preparations show core-fucosylated glyco-forms differing in sialylation and glycol-antennary degree.

### Mode of Action

IFNs comprise a family of secreted α-helical cytokines induced in response to extracellular biomolecules through stimulation of toll-like receptors. IFN-β1a is acting on a variety of processes and molecules within the immune system. For example, it balances the expression of anti-inflammatory and pro-inflammatory cytokines. Other activities of IFN-β1a include inhibition of T-cell activation. The beneficial effect on Multiple Sclerosis results from a variety of immunomodulatory and anti-proliferative actions. In the central nervous system, IFN-β1a balances expression of pro- and anti-inflammatory agents, reduces number of inflammatory cells which cross the blood brain barrier, and increases production of nerve growth factor thus improving neuronal survival.



### Indication

Avonex® is indicated for treatment of relapsing forms of Multiple Sclerosis to slow accumulation of physical disability and to decrease frequency of clinical exacerbations in patients with first clinical episode and Magnetic Resonance Imaging consistent with Multiple Sclerosis.

### Patent Situation

True composition of matter patents expired for Avonex® in 2013. These patents were regarded to have limited utility to keep competitors off the market. Whether other patents for the drug's use in treating diseases, valid until September 2026, may block potential competitors remains to be observed.

### Market and Competitive Field

Avonex®, developed by Biogen, was approved in US in 1996, and in Europe in 1997. It is the leading Multiple Sclerosis therapy in the US, with around 40% of the market in US and 30% in Europe. The competitor Rebif® from Merck (co-marketed by Pfizer in US) was approved in Europe in 1998 and in US in 2002. In 2017, sales for Avonex® were 1.85 billion Euro and for Rebif® 1.6 billion Euro. Different biosimilars are already developed in emerging markets.

	Interferon-β1a
	Avonex®, Rebif®
	Blastoferon®, CinnoVex®, Relibeta™
<b>Clone selection/ comparability</b>	
Affinity to recombinant target – kinetics (Biacore)	IFNAR 1,2
Cell-based bioassay	
<b>(Pre)clinical application</b>	
Pharmacokinetics (ECL or ELISA)	
Immunogenicity (Biacore/ ELISA/ bioassay)	
<b>Batch release EU</b>	

Vela Portfolio