APPROVED DISEASE-MODIFYING THERAPIES FOR MS

SELF-INJECTED MEDICATIONS

NAME	TYPE OF MEDICATION	HOW ADMINISTERED AND SIDE EFFECTS
Avonex® (interferon beta-1a)	immune system modulator with antiviral properties	30 micrograms taken via weekly intramuscular injection; side effects include flu-like symptoms and headache, as well as blood count and liver test abnormalities; side effects are manageable and usually temporary
Betaseron® (interferon beta-1b)	immune system modulator with antiviral properties	250 micrograms taken via subcutaneous injection every other day; side effects include flu-like symptoms, headache, and injection-site reactions, as well as blood count and liver test abnormalities; side effects are manageable and usually temporary
Copaxone® (glatiramer acetate)	synthetic chain of four amino acids found in myelin; it is an immune system modulator that blocks attacks on myelin	20 (daily) or 40 (three times weekly) milligrams taken via subcutaneous injection; side effects include injection-site reaction as well as an occasional systemic reaction, usually lasting only a few minutes with no long-term effects
Extavia® (interferon beta-1b)	immune system modulator with antiviral properties	250 micrograms taken via subcutaneous injection every other day; side effects include flu-like symptoms, headache, and injection-site reactions, as well as blood count and liver test abnormalities; side effects are manageable and usually temporary
Generic Glatiramer Acetate Injection (glatiramer acetate)	synthetic chain of four amino acids found in myelin; it is an immune system modulator that blocks attacks on myelin	20 (daily) or 40 (three times weekly) milligrams taken via subcutaneous injection; side effects include injection-site reaction as well as an occasional systemic reaction, usually lasting only a few minutes with no long-term effects
Glatopa® (glatiramer acetate)	synthetic chain of four amino acids found in myelin; it is an immune system modulator that blocks attacks on myelin	20 (daily) or 40 (three times weekly) milligrams taken via subcutaneous injection; side effects include injection-site reaction as well as an occasional systemic reaction, usually lasting only a few minutes with no long-term effects
Plegridy® (interferon beta-1a)	immune system modulator with antiviral properties	125 micrograms taken via subcutaneous injection once every two weeks; side effects include flu-like symptoms, headache, and injection-site reactions, as well as blood count and liver test abnormalities; side effects are manageable and usually temporary
Rebif® (interferon beta-1a)	immune system modulator with antiviral properties	44 micrograms taken via subcutaneous injection three times weekly; side effects include flu-like symptoms, headache, and injection-site reactions, as well as blood count and liver test abnormalities; side effects are manageable and usually temporary

ORAL MEDICATIONS

NAME	TYPE OF MEDICATION	HOW ADMINISTERED AND SIDE EFFECTS
Aubagio® (teriflunomide)	immunomodulator affecting the production of T and B cells; may also inhibit nerve degeneration	7 or 14 milligram tablet taken orally, once per day; side effects include headache, elevated liver enzymes, thinning hair, diarrhea, nausea, neutropenia (a condition causing a reduction of certain white blood cells), and paresthesia (tingling, burning, and numbness); adverse events include severe liver injury and birth defects if pregnant
Gilenya® (fingolimod)	S1P-receptor modulator, which blocks potentially damaging T cells from leaving lymph nodes	0.5 milligram capsule taken orally once per day; side effects include headache, flu, cough, diarrhea, back pain, and abnormal liver tests; adverse events include transient heart-rate reduction and AV block, swelling behind the eye, and possibly PML*, a viral brain infection
Mavenclad® (cladribine)	Selectively targets and depletes the immune system's B cells and T cells, followed by a 'reconstitution, ' as new B cells and T cells are produced	Two annual courses are given orally for a maximum of 20 days over two years; no treatment is needed for Years 3 and 4. The most common adverse reactions include upper respiratory tract infections, headache, and decreased lymphocyte counts. Potential adverse events include lymphopenia, a condition that causes abnormally low counts of white blood cells, and herpes zoster infection. Mavenclad has an increased risk of malignancy (cancer) and fetal harm.
Mayzent® (siponimod)	Its primary actions are at the S1P1 and the S1P5 receptors, blocking the movement of lymph cells from lymph nodes; it has a relatively short half-life compared to similar medications, meaning that it does not stay in the body as long	After starting at a low dose, the recommended maintenance dosage is 2 mg taken orally once daily starting on Day 6. Headache, high blood pressure, and changes in liver function tests were the most common adverse reactions. Serious adverse events include a decrease in white blood cells, heart rate, and rhythm abnormalities, as well as hypertension, swelling of the macula of the eye, varicella zoster reactivation, and convulsions. Women who could become pregnant should use contraception to avoid potential risk of fetal harm.
Tecfidera® (dimethyl fumarate)	immunomodulator with anti-inflammatory properties; may have neuroprotective effects, potentially protecting the nerves and myelin covering	240-milligram tablet taken twice daily; side effects include flushing, gastrointestinal events, reduced white blood cell count, and elevated liver enzymes; adverse events include respiratory infection, chronic itching, rash, gastric-lining inflammation, and possibly PML*, a viral brain infection

**Progressive multifocal leukoencephalopathy (PML), a potentially fatal, viral infection of the brain, can develop in some individuals taking Tysabri. Risk factors include the presence of anti-JCV antibodies, taking Tysabri for two years or more, and prior immunosuppressant treatment. Currently, PML has occurred in a few patients taking Gilenya, Tecfidera, or Ocrevus; some of these cases are still under investigation.*

INFUSED MEDICATIONS

NAME	TYPE OF MEDICATION	HOW ADMINISTERED AND SIDE EFFECTS
Lemtrada® (alemtuzumab)	humanized monoclonal antibody that rapidly depletes or suppresses immune system cells (T and B cells), which can damage the myelin and nerves of the CNS	Five-day course of 12 mgs daily via intravenous (IV) infusion and followed one year later by a second three-day course; side effects include rash, itching, headache, fever, nasopharyngitis, nausea, diarrhea and vomiting, insomnia, numbness, dizziness, pain, and flushing; adverse events include infusion reactions, infection, autoimmune diseases, potentially severe bleeding disorder (ITP), and malignancies
Novantrone® (mitoxantrone)	antineoplastic agent; immune system modulator and suppressor	IV infusion once every three months (for two to three years); side effects include nausea, thinning hair, loss of menstrual periods, bladder infections, and mouth sores; seldom prescribed for MS due to the potential for heart damage and leukemia
Ocrevus™ (ocrelizumab)	humanized monoclonal antibody designed to selectively target CD20-positive B cells, a type of immune cell important to the MS-disease process.	600-milligram dose given via IV every six months; initial dose given in two 300-milligram doses; side effects include potentially serious infusion reactions, infections (respiratory and skin infections most common); adverse events include cancer and possibly PML*, a viral brain infection
Tysabri® (natalizumab)	humanized monoclonal antibody; inhibits adhesion molecules; thought to prevent damaging immune cells from crossing the blood-brain barrier	300 mg dose given via IV infusion every four weeks; side effects include headache, fatigue, depression, joint pain, abdominal discomfort, and infection; serious adverse events include infection (including pneumonia), and the potential for PML*, a viral brain infection

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