APPROVED LONG-TERM TREATMENTS FOR MS

UPDATED NOVEMBER 2024

Self-Injected Medications

NAME AND TYPE OF DRUG	SIDE EFFECTS	HOW ADMINISTERED	ADDITIONAL NOTES
Avonex® (Interferon beta-1a) immune system modulator with antiviral properties	Flu-like symptoms and headache, blood count and liver test abnormalities	30 micrograms taken via weekly intermuscular injection	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Side effects are usually temporary and manageable. Blood tests can monitor liver enzymes, blood-cell counts, and neutralizing antibodies.
Betaseron® (Interferon beta-1b) immune system modulator with antiviral properties	Flu-like symptoms, injection-site skin reaction, blood count and liver test abnormalities	250 micrograms taken via subcutaneous injection every other day	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Side effects are usually temporary and manageable. Blood tests can monitor liver enzymes, blood-cell counts, and neutralizing antibodies.
Copaxone® (glatiramer acetate) Synthetic chain of four amino acids found in myelin (immune system modulator that blocks attacks on myelin)	Injection-site skin reaction as well as an occasional systemic reaction - occurring at least once in approximately 10 percent of those tested	20 (daily) or 40 (three times weekly) milligrams taken via subcutaneous injection	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Systemic reactions occur about five to 15 minutes following an injection and may include anxiety, flushing, chest tightness, dizziness, palpitations, and/or shortness of breath. Usually lasting for only a few minutes, these symptoms do not require specific treatment and have no long-term negative effects.
Extavia® (Interferon beta-1b) immune system modulator with antiviral properties	Flu-like symptoms, injection-site skin reaction, blood count and liver test abnormalities	250 micrograms taken via subcutaneous injection every other day	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Side effects are usually temporary and manageable. Blood tests can monitor liver enzymes, blood-cell counts, and neutralizing antibodies.

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Generic glatiramer acetate injection (glatiramer acetate) Mylan's generic version of Copaxone is a synthetic chain of four amino acids found in myelin	Using study results from trials with Copaxone, side effects include injection-site skin reaction as well as an occasional systemic reaction	20 (daily) or 40 (three times weekly) milligrams taken via subcutaneous injection	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Using study results from trials with Copaxone, systemic reactions occur about five to 15 minutes following an injection and may include anxiety, flushing, chest tightness, dizziness, palpitations, and/or shortness of breath.
Glatopa® (glatiramer acetate) As a generic version of Copaxone, Glatopa is a synthetic chain of four amino acids found in myelin	Using study results from trials with Copaxone, side effects include injection-site skin reaction as well as an occasional systemic reaction	20 (daily) or 40 (three times weekly) milligrams taken via subcutaneous injection	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Using study results from trials with Copaxone, systemic reactions occur about five to 15 minutes following an injection and may include anxiety, flushing, chest tightness, dizziness, palpitations, and/or shortness of breath.
Kesimpta® (ofatumumab) Binds to and depletes B-cells shown to be associated with disease activity in MS	Upper respiratory tract infection (URTI), including sore throat, runny nose, and headache, as well as headache unrelated to a URTI	20-mg dose given monthly via self-administered subcutaneous injection	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary- progressive disease, in adults. Serious but less-common side effects include: infections; hepatitis B virus (HBV) reactivation; PML*; a weakened immune system; and injection-related reactions.
Plegridy® (Interferon beta-1a) immune system modulator with antiviral properties	Flu-like symptoms, injection-site skin reaction, blood count and liver test abnormalities	125 micrograms taken via subcutaneous injection once every two weeks	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Side effects are usually temporary and manageable. Blood tests can monitor liver enzymes, blood-cell counts, and neutralizing antibodies.
Rebif® (Interferon beta-1a) immune system modulator with antiviral properties	Flu-like symptoms, injection-site skin reaction, blood count and liver test abnormalities	44 micrograms taken via subcutaneous injection three times weekly	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Side effects are usually temporary and manageable. Blood tests can monitor liver enzymes, blood-cell counts, and neutralizing antibodies.

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Infused Medications

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Briumvi® (ublituximab-xiiy) Monoclonal antibody that targets CD20, a protein found on the surface of B cells, and induces B-cell depletion within 24 hours. B cells are white blood cells shown to play a role in MS.	The most common adverse events were infusion-related reactions and infections (most related to respiratory tract); other side effects included headache, cold symptoms, fever, and nausea.	After initial dose via intravenous (IV) infusion of 150 mg, followed by 450 mg two weeks later, 450 mg is given via IV infusion 24 weeks after the first infusion and every 24 weeks thereafter	For relapsing forms of MS in adults – including clinically isolated syndrome, relapsing-remitting MS, and active secondary-progressive MS. Serious and life-threatening infections were seen in 5% of study participants. Individuals with active Hepatitis B Virus (HBV) should not be given Briumvi. Although cases of PML have been reported with other anti-CD20 antibodies, no cases of PML occurred during the studies. Briumvi may harm the fetus if given to a pregnant woman.
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 central nervous system (CNS).	Common side effects include rash, itching, headache, pyrexia (increase in temperature), nasopharyngitis (inflammation of the nose and throat), nausea, diarrhea and vomiting, insomnia, numbness/tingling, dizziness, pain, flushing, and infection.	Lemtrada is given for a course of five days via intravenous (IV) infusion and followed one year later by a second three-day course.	For relapsing forms of multiple sclerosis (MS), including relapsing-remitting disease and active secondary-progressive disease, in adults. Lemtrada is not recommended for use in patients with clinically isolated syndrome (CIS). Adverse events from Lemtrada can include infusion reactions to the medication, an increased risk of infection, emergent autoimmune diseases, a potentially severe bleeding disorder called immune thrombocytopenic purpura (ITP), and an increased risk of malignancies including thyroid cancer, melanoma and lymphoproliferative disorders. For early detection and management of these risks, Lemtrada is only available through a restricted distribution program, the Lemtrada REMS (Risk Evaluation and Mitigation Strategy).

Infused Medications

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Novantrone® (mitoxantrone) Antineoplastic agent (immune system modulator and suppressor)	Side effects include nausea, thinning hair, loss of menstrual periods, bladder infections, and mouth sores	IV infusion once every three months (for two to three years maximum)	For secondary-progressive MS and relapsing forms of MS, and worsening relapsing-remitting MS. Novantrone carries the risk of cardiotoxicity and leukemia; it may not be given beyond three years and is seldom prescribed for individuals with MS.
Ocrevus® (ocrelizumab) is a humanized monoclonal antibody designed to selectively target CD20-positive B cells. These are a specific type of immune cell that is an important contributor to the MS-disease process.	Potentially serious infusion reactions and an increase in infections; upper respiratory tract infection was the most commonly seen in studies with RMS and PPMS; lower respiratory tract and skin infections were also seen in studies with PPMS	A 600-milligram dose is given via IV every six months. For the initial dose, two 300-milligram doses are given, separated by two weeks.	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Also approved for primary-progressive MS in adults. Ocrevus should not be used in patients with hepatitis B infection or a history of life-threatening infusion-related reactions to Ocrevus. Other rare adverse events, including cancer and progressive multifocal leukoencephalopathy (PML*), could potentially occur, but these risks are still being investigated.
Ocrevus Zunovo™ (ocrelizumab and hyaluronidase-ocsq) is an injectable version of the original IV Ocrevus, given subcutaneously by a medical professional. Approved by the FDA in 2024, Ocrevus Zunovo™ is the same medication as the original IV Ocrevus and is associated with the same benefits and side effects, with the exception of the potential for injection-related reactions rather than infusion-related reactions.			
Tysabri® (natalizumab) Humanized monoclonal antibody (inhibits adhesion molecules; thought to prevent damaging immune cells from crossing the blood-brain barrier)	Headache, fatigue,depression, joint pain, abdominal discomfort, and infection	IV infusion every four weeks	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Risk of infection was the most common serious adverse event during studies. The TOUCH Prescribing Program monitors patients for signs of PML*, a potentially fatal viral infection of the brain. Risk factors include: the presence of JC virus antibodies; previous treatment with immunosuppressive drugs; and taking Tysabri for more than two years.

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Oral Medications

NAME AND TYPE OF DRUG	SIDE EFFECTS	HOW ADMINISTERED	ADDITIONAL NOTES
Aubagio® (teriflunomide) Immunomodulator (affecting the production of T and B cells; may also inhibit nerve degeneration)	Headache, elevations in liver enzymes, hair thinning, diarrhea, nausea, neutropenia (a condition that reduces the number of certain white blood cells), and paresthesia (tingling, burning, or numbing sensation)	7- or 14-milligram tablet taken orally, once per day	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. More severe adverse events include the risk of severe liver injury and the risk of birth defects if used during pregnancy. A TB test and blood tests for liver function must be performed within six months prior to starting Aubagio, and liver function must be checked regularly.
Bafiertam® (monomethyl fumarate) Immunomodulator with anti-inflammatory properties; may have neuroprotective effects, potentially protecting the nerves and myelin covering	Flushing and stomach problems are common, especially at the start of therapy, and may decrease over time; redness, itching, rash, or diarrhea may also occur	Starting dose is one 95-mg oral capsule taken twice daily for the first 7 days, followed by a maintenance dose of two 95-mg capsules (190 mg total) taken twice daily	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Bafiertam is a "bioequivalent alternative" to Biogen's Tecfidera® (dimethyl fumarate), which means that the active ingredient and site of action do not differ significantly. Warnings, side effects, and adverse events are similar to those listed for Tecfidera. Allergic reactions, PML (progressive multifocal leukoencephalopathy), serious infections, and liver injury, are among the potential adverse events.
Gilenya® (fingolimod, FTY720) S1P-receptor modulator (blocks potentially damaging T cells from leaving lymph nodes)	Headache, flu, diarrhea, back pain, abnormal liver tests and cough	0.5-milligram capsule taken orally once per day	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults and children 10 years of age and older. Adverse events include: a reduction in heart rate (dose-related and transient); infrequent transient AV conduction block of the heart; a mild increase in blood pressure; macular edema (swelling behind the eye); reversible elevation of liver enzymes; and a slight increase in lung infections (primarily bronchitis). Other infections, and potentially PML*, could also occur
In late 2019, the FDA approved **three generic versions of Gilenya®** (noted above) for the treatment of relapsing forms of multiple sclerosis (MS); however, these are not yet commercially available.			

Oral Medications

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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	The most common adverse reactions include upper respiratory tract infections, headache, and decreased lymphocyte counts	Two annual courses are given orally for a maximum of 20 days over two years. No treatment is needed for Years 3 and 4	For relapsing forms of multiple sclerosis (MS), including relapsing-remitting disease and active secondary-progressive disease, in adults. Mavenclad is not recommended for use in patients with clinically isolated syndrome. 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.	Headache, high blood pressure, and changes in liver function tests were the most common adverse reactions	After starting at a low dose, the recommended maintenance dosage is 2 mg taken orally once daily starting on Day 6	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. 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.
Ponvory® (ponesimod) Selective sphingosine-1-phosphate receptor (S1P) modulator that is believed to work by keeping immune cells called lymphocytes out of the blood by trapping them in the lymph nodes	Common side effects include upper respiratory tract infections, elevated liver enzymes, and high blood pressure	Using a 14-day starter pack, the dose starts low and gradually increases to 20 mg taken orally, once per day	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Adverse effects can include more serious infections and a slowed heart rate (bradycardia or bradyarrhythmia). Those with certain heart conditions, or women who are planning to be or are currently pregnant, should not take Ponvory.

*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.

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Tecfidera® (dimethyl fumarate) Immunomodulator with anti-inflammatory properties; may have neuroprotective effects, potentially protecting the nerves and myelin covering	Flushing and gastrointestinal events; reduced white-blood cell (lymphocyte) counts; elevated liver enzymes in small percentage of patients	240-milligram tablet taken twice daily	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Adverse events include upper respiratory infection, pruritus (chronic itching), erythema (skin redness or rash), gastroenteritis (intestinal lining inflammation) and gastritis (stomach lining inflammation). Reduced white-blood cell (lymphocyte) counts were seen during the first year of treatment. Elevated liver enzymes were seen more often with Tecfidera; PML* could potentially occur.
In August 2020, the FDA approved **Mylan's generic version of Biogen's Tecfidera®** for relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Given at the same dose, the warnings, side effects, and adverse events are similar to those listed for Tecfidera.			
Vumerity® (diroximel fumarate) Immunomodulator with anti-inflammatory properties; may have neuro-protective effects, potentially protecting the nerves and myelin covering	Flushing and stomach problems are common, especially at the start of therapy, and may decrease over time; redness, itching, rash, or diarrhea may also occur.	231-milligram capsule taken twice daily	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. Vumerity is in the same class of MS therapy as Tecfidera® (noted above), but is believed to cause fewer gastrointestinal (GI) side effects. Warnings, side effects, and adverse events are similar to those listed for Tecfidera. The exact mechanism of action by which Vumerity exerts therapeutic effect in MS is not completely understood. However, upon entering the body, the medication is rapidly converted into the molecule monomethyl fumarate, which is the same active component found in Tecfidera.

Oral Medications

NAME AND TYPE OF DRUG	SIDE EFFECTS	HOW ADMINISTERED	ADDITIONAL NOTES
Zeposia® (ozanimod) Sphingosine-1-phosphate (S1P) receptor modulator that binds with high affinity to S1P receptors 1 and 5; thought to work by blocking potentially damaging immune-system cells (lymphocytes) from leaving lymph nodes	Upper respiratory infection; elevated liver enzymes; orthostatic hypotension, which is a sudden drop in blood pressure when changing position; urinary tract infection; back pain; and high blood pressure	Oral medication given once daily as a 0.92 mg pill	For relapsing forms of MS, including clinically isolated syndrome, relapsing-remitting disease, and active secondary-progressive disease, in adults. This medication is started at a lower dose and gradually increased until the full dose is reached, reducing the risk of a transient decrease in heart rate and atrioventricular conduction delays, which may occur if introduced too quickly. Warnings include an increased risk of infections, heart-rhythm issues, liver injury, fetal risk if pregnant while taking Zeposia, a decline in pulmonary (respiratory) function, and macular edema (swelling behind the eye).