<table>
<thead>
<tr>
<th>NAME AND TYPE OF DRUG</th>
<th>SIDE EFFECTS</th>
<th>HOW ADMINISTERED</th>
<th>ADDITIONAL NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Avonex®</strong> (Interferon beta-1a) immune system modulator with antiviral properties</td>
<td>Flu-like symptoms and headache, blood count and liver test abnormalities</td>
<td>30 micrograms taken via weekly intramuscular injection</td>
<td>Side effects may be prevented and/or managed effectively through various treatment strategies; side effect problems are usually temporary. Blood tests may be given periodically to monitor liver enzymes, blood-cell counts, and neutralizing antibodies.</td>
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<tr>
<td><strong>Betaseron®</strong> (Interferon beta-1b) immune system modulator with antiviral properties</td>
<td>Flu-like symptoms, injection-site skin reaction, blood count and liver test abnormalities</td>
<td>250 micrograms taken via subcutaneous injection every other day</td>
<td>Side effects may be prevented and/or managed effectively through various treatment strategies; side effect problems are usually temporary. Blood tests may be given periodically to monitor liver enzymes, blood-cell counts, and neutralizing antibodies.</td>
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<tr>
<td><strong>Copaxone®</strong> (glatiramer acetate) Synthetic chain of four amino acids found in myelin (immune system modulator that blocks attacks on myelin)</td>
<td>Injection-site skin reaction as well as an occasional systemic reaction - occurring at least once in approximately 10 percent of those tested</td>
<td>20 (daily) or 40 (three times weekly) milligrams taken via subcutaneous injection</td>
<td>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. Copaxone was originally approved at a dose of 40 milligrams daily, but in January 2014, a new dose of 40 milligrams three times weekly was approved by the FDA. The original 20-milligram daily dose remains available, so patients and their doctors may now choose their preferred dosing regimen.</td>
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<tr>
<td><strong>Extavia®</strong> (Interferon beta-1b) immune system modulator with antiviral properties</td>
<td>Flu-like symptoms, injection-site skin reaction, blood count and liver test abnormalities</td>
<td>250 micrograms taken via subcutaneous injection every other day</td>
<td>Side effects may be prevented and/or managed effectively through various treatment strategies; side effect problems are usually temporary. Blood tests may be given periodically to monitor liver enzymes, blood-cell counts, and neutralizing antibodies.</td>
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<td><strong>Generic glatiramer acetate injection</strong> (glatiramer acetate) Mylan's generic version of Copaxone, side effects include injection-site skin reaction as well as an occasional systemic reaction</td>
<td>Using study results from trials with Copaxone, system ic 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.</td>
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<td><strong>Glatopa®</strong> (glatiramer acetate) As a generic version of Copaxone, Glatopa is a synthetic chain of four amino acids found in myelin</td>
<td>Using study results from trials with Copaxone, side effects include injection-site skin reaction as well as an occasional systemic reaction</td>
<td>20 (daily) or 40 (three times weekly) milligrams taken via subcutaneous injection</td>
<td>Using study results from trials with Copaxone, system ic 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.</td>
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<td><strong>Kesimpta®</strong> (ofatumumab) Binds to and depletes B-cells shown to be associated with disease activity in MS</td>
<td>Upper respiratory tract infection (URTI), including sore throat, runny nose, and headache, as well as headache unrelated to a URTI</td>
<td>20-mg dose given monthly via self-administered subcutaneous injection</td>
<td>Serious but less-common side effects include: infections; hepatitis B virus (HBV) reactivation; PML; a weakened immune system; and injection-related reactions</td>
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<td><strong>Plegridy®</strong> (Interferon beta-1a) immune system modulator with antiviral properties</td>
<td>Flu-like symptoms, injection-site skin reaction, blood count and liver test abnormalities</td>
<td>125 micrograms taken via subcutaneous injection every two weeks</td>
<td>Side effects may be prevented and/or managed effectively through various treatment strategies; side effect problems are usually temporary. Blood tests may be given periodically to monitor liver enzymes, blood-cell counts, and neutralizing antibodies.</td>
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<tr>
<td><strong>Rebif®</strong> (Interferon beta-1a) immune system modulator with antiviral properties</td>
<td>Flu-like symptoms, injection-site skin reaction, blood count and liver test abnormalities</td>
<td>44 micrograms taken via subcutaneous injection three times weekly</td>
<td>Side effects may be prevented and/or managed effectively through various treatment strategies; side effect problems are usually temporary. Blood tests may be given periodically to monitor liver enzymes, blood-cell counts, and neutralizing antibodies.</td>
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<td><strong>Lemtrada®</strong>  (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).</td>
<td>Common side effects include rash, itching, headache, pyrexia (increase in temperature), nasopharyngitis (inflammation of the nose and throat), nausea, diarrhoea and vomiting, insomnia, numbness/tingling, dizziness, pain, flushing, and infection.</td>
<td>Lemtrada is given for a course of five days via intravenous (IV) infusion and followed one year later by a second three-day course.</td>
<td>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).</td>
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<tr>
<td><strong>Novantrone®</strong>  (mitoxantrone) Antineoplastic agent (immune system modulator and suppressor)</td>
<td>Side effects include nausea, thinning hair, loss of menstrual periods, bladder infections, and mouth sores; additionally, urine and whites of the eyes may turn a bluish color temporarily</td>
<td>IV infusion once every three months (for two to three years maximum)</td>
<td>Novantrone carries the risk of cardiotoxicity (heart damage) and leukemia; it may not be given beyond two or three years. People undergoing treatment must have regular testing for cardiotoxicity, white blood cell counts, and liver function. Because of the potential risks, Novantrone is seldom prescribed for individuals with MS. Anyone taking Novantrone now or given Novantrone previously needs to have annual evaluations of his or her heart function, even if no longer receiving this medication.</td>
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<tr>
<td><strong>Ocrevus™</strong>  (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.</td>
<td>Side effects can include infusion reactions, which can be serious, as well as an increase in infections. Upper respiratory tract infection was the most common infection seen in studies with RMS and PPMS; skin infection and lower respiratory tract infection were also common infections seen in studies with PPMS.</td>
<td>IV infusion every six months. For the initial dose, two 300-milligram doses are given, separated by two weeks.</td>
<td>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.</td>
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<tr>
<td><strong>Tysabri®</strong>  (natalizumab) Humanized monoclonal antibody (inhibits adhesion molecules; thought to prevent damaging immune cells from crossing the blood-brain barrier)</td>
<td>Headache, fatigue, depression, joint pain, abdominal discomfort, and infection</td>
<td>IV infusion every four weeks</td>
<td>Risk of infection (including pneumonia) was the most common serious adverse event during the studies (occurring in a small percentage of patients). The TOUCH Prescribing Program monitors patients for signs of PML, a potentially fatal viral infection of the brain. Risk factors for PML include: the presence of JC virus antibodies, previous treatment with immunosuppressive drugs, and taking Tysabri for more than two years.</td>
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## Oral Medications

### NAME AND TYPE OF DRUG
- **Aubagio®**
  - **(teriflunomide)** Immunomodulator
  - (affecting the production of T and B cells; may also inhibit nerve degeneration)

### SIDE EFFECTS
- 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)

### HOW ADMINISTERED
- 7- or 14-milligram tablet taken orally, once per day

### ADDITIONAL NOTES
- 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. If liver damage is detected, or if someone becomes pregnant while taking this drug, accelerated elimination of the drug is prescribed.

### NAME AND TYPE OF DRUG
- **Bafiertam™**
  - **(monomethyl fumarate)** Immunomodulator with anti-inflammatory properties; may have neuroprotective effects, potentially protecting the nerves and myelin covering

### SIDE EFFECTS
- 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

### HOW ADMINISTERED
- 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

### ADDITIONAL NOTES
- 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.

### NAME AND TYPE OF DRUG
- **Gilenya®**
  - **(fingolimod, FTY720)** S1P-receptor modulator (blocks potentially damaging T cells from leaving lymph nodes)

### SIDE EFFECTS
- Headache, flu, diarrhea, back pain, abnormal liver tests and cough

### HOW ADMINISTERED
- 0.5-milligram capsule taken orally once per day

### ADDITIONAL NOTES
- 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 PMI, could also occur.

- A six-hour observation period is required immediately after the first dose, to monitor for cardiovascular changes.

### NAME AND TYPE OF DRUG
- **Mavenclad®**
  - **(cladribine)** Immunomodulator

### SIDE EFFECTS
- Flushing and gastrointestinal events; reduced white-blood cell (lymphocyte) counts; elevated liver enzymes in small percentage of patients

### HOW ADMINISTERED
- 240-milligram tablet taken twice daily

### ADDITIONAL NOTES
- Approved to treat adults with relapsing-remitting MS and active secondary-progressive MS. 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.

### NAME AND TYPE OF DRUG
- **Mayzent®**
  - **(siponimod)** Immunomodulator

### SIDE EFFECTS
- Headache, high blood pressure, and changes in liver function tests were the most common adverse reactions

### HOW ADMINISTERED
- After starting at a low dose, the recommended maintenance dosage is 2 mg taken orally once daily starting on Day 6

### ADDITIONAL NOTES
- Approved to treat individuals with clinically isolated syndrome, relapsing-remitting MS, and active secondary-progressive MS. 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.

### NAME AND TYPE OF DRUG
- **Tecfidera®**
  - **(dimethyl fumarate)** Immunomodulator with anti-inflammatory properties; may have neuroprotective effects, potentially protecting the nerves and myelin covering

### SIDE EFFECTS
- Flushing and gastrointestinal events; reduced white-blood cell (lymphocyte) counts

### HOW ADMINISTERED
- Two annual courses are given orally for a maximum of 20 days over two years. No treatment is needed for Years 3 and 4

### ADDITIONAL NOTES
- Approved to treat adults with relapsing-remitting MS and active secondary-progressive MS. 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.

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.

### NAME AND TYPE OF DRUG
- **Mylan’s generic version of Biogen’s Tecfidera®**

### SIDE EFFECTS
- The most common adverse reactions include upper respiratory tract infections, headache, and decreased lymphocyte counts

### HOW ADMINISTERED
- Two annual courses are given orally for a maximum of 20 days over two years. No treatment is needed for Years 3 and 4

### ADDITIONAL NOTES
- Approved to treat adults with relapsing-remitting MS and active secondary-progressive MS. 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.

In August 2020, the FDA approved Mylan’s generic version of Biogen’s Tecfidera®; it is given in the same dosage, with both 120-mg and 240-mg delayed-release capsules available.

*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.
## Oral Medications

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</tr>
</thead>
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<td>Vumery™ (diroximel fumarate) Immunomodulator with anti-inflammatory properties; may have neuro-protective effects, potentially protecting the nerves and myelin covering</td>
<td>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.</td>
<td>231-milligram capsule taken twice daily</td>
<td>Vumery 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 Vumery 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.</td>
</tr>
<tr>
<td>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</td>
<td>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</td>
<td>Oral medication given once daily as a 0.92 mg pill</td>
<td>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).</td>
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