Choices

MS-UK
Supporting your MS journey

Disease modifying therapies

Multiple sclerosis information

www.ms-uk.org

Welcome to this Choices leaflet about disease modifying therapies

At MS-UK we believe in listening to the voices of people affected by multiple sclerosis (MS) to shape the information and support we provide. It is these people that bring us perspectives that no one else can give.

For every Choices booklet we produce, MS-UK consults the wider MS community to gather feedback and uses this to inform our content. All our Choices booklets are then reviewed by the MS-UK Virtual Insight Panel before they are published.

This Choices booklet has been designed with you in mind. We hope it will answer some of your questions and also provide some first-hand experience from those who have been in your position - people who can truly understand and empathise with your current thoughts and feelings.

Every time you find bold text with quotation marks like this, it is a quote directly from someone affected by multiple sclerosis

Contents

Disease modifying therapies

Disease modifying therapies (DMTs) are medications that modify the course of MS and are designed to reduce the number of relapses. Different DMTs affect the number and severity of relapses in varying degrees. Some of these drugs have been found to delay the long-term progression of MS and reduce the number of new lesions forming.

Not everyone with MS will benefit from DMTs in the same way and people will respond differently. It is important to note that not all side effects will be experienced and sometimes it can take a while to find the right drug for you.

A treatment algorithm was published in 2018 by NHS England, setting out the eligibility criteria for the prescribing of these drugs. It states that treatment should be recommended as soon as the patient becomes eligible (1).

Patients are eligible if they are showing sustained disability to a level of less than 7.0 on the Expanded Disability Status Scale (EDSS)

People with MS should be managed by a specialist neurologist,

> **The choice can be overwhelming at first, but you have control. You can change a drug if it doesn't agree with you**

who has experience of managing patients with this condition. They should assess your eligibility and suitability for DMTs and should explain the options available to you. You may well have choices over which (if any) you wish to take. Once treatment has started, patients should remain under the supervision of MS specialist neurologists and nurses.

For relapsing remitting MS (RRMS), the current list of licensed DMTs are divided broadly into three classes

Moderately effective

- Aubagio (teriflunomide)
- Avonex (beta interferon 1a)
- Brabio (glatiramer acetate)
- Copaxone (glatiramer acetate)
- Extavia (beta interferon 1b)
- Plegridy (beta interferon 1a)
- Rebif (beta interferon 1a)

More effective

- Gilenya (fingolimod)
- Mavenclad (cladribine)
- Ponvory (ponesimod)
- Tecfidera (dimethyl fumarate)
- Vumerity (diroximel fumarate)
- Zeposia (ozanimod)

Highly effective

- Kesimpta (ofatumumab)
- Lemtrada (alemtuzumab)
- Ocrevus (ocrelizumab)
- Tysabri (natalizumab)

It is important that if treatment is found to be ineffective, or intolerable side effects are experienced, it should be stopped, under the guidance of your health professional and an alternative offered if possible.

Other reasons for stopping treatment are if secondary progressive MS (SPMS) is confirmed, with the absence of relapse activity.

Pregnancy can also lead to a drug being stopped as many are not suitable to continue use. However, some DMTs may be considered safe or can be used instead of other drugs for an interim period until the original drug can be resumed safely.

> **You have to find what works for you based on your needs and preferences. Different drugs achieve different outcomes, so have outcomes at the front of your mind. All drugs come with an upside and a downside**

For secondary progressive (SPMS) and primary progressive (PPMS), there are also drugs available. Although currently not as

many as RRMS, there are many others in development.

Secondary progressive MS (SPMS)

- Extavia (beta interferon 1b)
- Mayzent (siponimod)

Primary progressive MS (PPMS)

- Ocrevus (ocrelizumab)

What is a relapse?

According to the National Institute for Care Excellence (NICE) clinical guidelines for MS, a relapse can be diagnosed by a GP or neurologist if (2)

'The person with MS has developed new symptoms or has a worsening of existing symptoms, and these symptoms have lasted for more than 24 hours in the absence of infection or any other cause, after a stable period of a least one month.'

Treating relapsing remitting multiple sclerosis (RRMS)

Patients with RRMS who have had two or more clinical relapses in the previous two years are considered to have 'active' disease which means they are eligible for treatment with a disease modifying therapy. People who have not had any clinical relapses yet show new MRI lesions are also considered for treatment.

All people with active RRMS should be considered for treatment as early as possible. Those with higher levels of disease activity may prefer to start with the more effective drugs (1).

Treating more active relapsing remitting MS

If a patient is experiencing frequent clinical relapses and/or further MRI activity when either untreated or on a moderately effective drug, they are considered to have more active MS (1).

To meet the criteria for high disease activity, a person must have had a relapse in the previous year despite taking beta interferon or glatiramer acetate and

a) One or more gadolinium enhancing MRI lesions or

b) at least nine T2-hyperintensive lesions on a cranial MRI

For patients with more active disease, a highly effective drug is recommended.

Treating secondary and primary progressive multiple sclerosis (SPMS and PPMS)

Currently, there are no disease modifying therapies recommended in non-relapsing, or non-active SPMS. Some people who experience relapsing SPMS, or 'active' SPMS, whereby relapses are present or there is disease activity shown on MRI scans, may

be eligible for disease modifying therapy.

In 2020, Mayzent was approved in England to treat 'active' secondary progressive MS (3). It was also approved in 2020 by the Scottish Medicines Consortium (SMC) (4). It is recommended as a treatment option for SPMS, with evidence of active disease in the form of relapses or evidence of inflammation on MRI.

In 2019, Ocrevus was approved in England to treat early-stage, inflammatory PPMS (5). It was also approved in 2020 by the Scottish Medicines Consortium (SMC) (6). This is the first drug to show evidence in clinical trials to slow down and reduce disability progression in PPMS.

There are several other drugs in development, some of which focus specifically on progressive forms of MS.

Other

Clinically Isolated Syndrome (CIS)

Although not technically a classification of MS, CIS is used to describe a first neurologic episode that lasts at least 24 hours and is caused by inflammation/demyelination in one or more sites in the central nervous system. This is sometimes diagnosed before a formal diagnosis of MS can be made. Those with CIS who show abnormalities on MRI scans within one year may be offered treatment with a DMT.

People aged under 18 years

The NHS England treatment algorithm states that children should be treated using the same guidelines as adults. Children may receive DMTs if they are licensed for children, or if there is a recommended

dose for children.

Ideally, children with MS who are aged under 16 should be treated in a specialist clinic with a combined team preferably including adult and paediatric neurologists with a particular interest in MS (1).

For further information on starting, stopping, or changing a disease modifying therapy please speak to your MS Nurse and/or neurologist.

Disease modifying therapies (DMTs)

The National Institute for Care Excellence (NICE) published guidelines in October 2014 for the management of multiple sclerosis (2). In these guidelines a relapse can be diagnosed by a GP or neurologist if,

'The person with MS has developed new symptoms or has a worsening of existing symptoms, and these symptoms have lasted for more than 24 hours in the absence of infection or any other cause after a stable period of a least one month.'

Aubagio (Teriflunomide)

How does it work?

Aubagio inhibits the function of specific immune cells that have been implicated in MS. It can inhibit a key enzyme required by white blood cells (lymphocytes) – which in turn reduces the T and B immune cells (that are active in MS) from multiplying. As well as this, it has been shown to have other anti-inflammatory and immune-modulating actions (7) (8).

How can it help?

Studies showed that Aubagio reduced relapses by one-third. In trials, a higher dose reduced the risk of disability progression (sustained for 12 weeks) by 30 per cent (7) (8).

How is it administered?

Aubagio is taken as a tablet, once a day.

Who manufactures it?

Genzyme

What type of MS is it prescribed for?

Aubagio is licensed for relapsing remitting MS (1).

What are the side effects?

Common side effects are gastrointestinal upset, hair thinning and changes in liver function. Aubagio should not be taken by women considering pregnancy because of potential risks to the unborn baby. A woman of child-bearing age considering Aubagio must take a pregnancy test and ensure adequate contraception is in place before starting the drug.

The drug stays in the body for a long time and if a woman taking Aubagio suspects pregnancy, she must immediately contact her GP and, if a pregnancy is confirmed, Aubagio can be 'flushed out' of the body by taking activated charcoal or cholestyramine over several days (7) (8).

Avonex (beta interferon 1a)

How does it work?

Interferons are proteins, produced naturally by the body, that help us fight infection.

Avonex blocks the action of one type of protein called gamma interferon. It reduces the autoimmune reaction that causes inflammation and destruction of myelin (9) (10).

How can it help?

It has been shown to reduce the rate of relapse by about one-third in people with RRMS. It also reduces the severity of relapses that occur (9) (10).

How is it administered?

Avonex must be injected into the muscle once a week and should be stored in the fridge.

Who manufactures it?

Biogen

What type of MS is it prescribed for?

Avonex is used in those diagnosed with RRMS (1).

What are the side effects?

The most common side effect experienced when taking Avonex is flu-like symptoms after injecting.

Injection-site irritations may also occur, such as redness, swelling, itching.

Other less common side effects from Avonex can be mood swings, fever and blood abnormalities. Most people find these effects reduce over a three-month period of taking the drug. If they persist, a conversation with an MS nurse or neurologist would be recommended (9) (10).

Brabio (glatiramer acetate)

How does it work?

Brabio works differently from interferons in that it is a synthetic combination of four amino acids that resemble the myelin protein. It is thought to work by preventing the production of immune cells that attack myelin (9) (11) (12).

How can it help?

The rate of relapse in people taking Brabio is generally reduced by one-third (9) (11) (12).

How is it administered?

It needs to be injected subcutaneously (under the skin). There are two doses, 20mg and 40mg, one is taken as a daily injection and the other is taken three times a week. It needs to be stored in the fridge.

Who manufactures it?

Mylan

What type of MS is it prescribed for?

Brabio is licensed for RRMS and some people with CIS (1).

What are the side effects?

Common side effects are injection-site reactions and lipotrophy (indentations under the skin), chest tightness, headache, anxiety, and nausea. Less common side effects include thyroid changes, blood cell changes, and palpitations. (9) (11) (12).

Copaxone (glatiramer acetate)

How does it work?

Copaxone works differently from interferons in that it is a synthetic

combination of four amino acids that resemble the myelin protein. It is thought to work by preventing the production of immune cells that attack myelin (9) (13) (14).

How can it help?

The rate of relapse in people taking Copaxone is generally reduced by one-third (9) (13) (14).

How is it administered?

It needs to be injected subcutaneously (under the skin). There are two doses, 20mg and 40mg, one is taken as a daily injection and the other is taken three times a week. It needs to be stored in the fridge.

Who manufactures it?

Copaxone

What type of MS is it prescribed for?

Copaxone is licensed for RRMS and some people with CIS (1).

What are the side effects?

Common side effects are injection-site reactions and lipotrophy (indentations under the skin), chest tightness, headache, anxiety, nausea. Less common side effects include thyroid changes, blood cell changes, and palpitations. (9) (13) (14).

> **Don't be put off by those who didn't get on with the medication**

Extavia (beta interferon 1b)

How does it work?

Extavia is thought to block the action of one type of immune cell, called a T-cell, and reduce the autoimmune reaction that causes inflammation and destruction of myelin (9) (15).

How can it help?

Extavia has been shown to reduce the rate of relapse by about one-third in people with RRMS and reduce the severity of relapses that occur (9) (15).

How is it administered?

Extavia must be injected subcutaneously (under the skin, into body fat) every other day. It does not need to be stored in the fridge.

Who manufactures it?

Extavia – Novartis

What type of MS is it prescribed for?

Extavia is used in those diagnosed with RRMS (1).

Extavia can also be given to patients with SPMS who show active disease, evidenced by relapses (15).

What are the side effects?

The most common side effects experienced with Extavia are flu-like symptoms after injecting and injection-site reactions. It can also cause changes in menstruation, reduced number of white blood cells, headache, and dizziness, however, these symptoms are less common (9) (15).

Gilenya (fingolimod)

How does it work?

Gilenya is an immune-modulating drug, which attaches to the surface of certain white blood cells (known as lymphocytes), causing a number of them to be retained within the body's immune system.

As a result, fewer lymphocytes get into the bloodstream and fewer reach the central nervous system meaning the potential for an immune attack on the cells of the brain and spinal cord is reduced (16) (17).

How can it help?

Gilenya was shown to reduce the risk of relapses by 67 per cent compared to a placebo in trials (18).

How is it administered?

It is taken in the form of a capsule, orally, once a day.

Who manufactures it?

Novartis

What type of MS is it prescribed for?

Gilenya is a 'more effective' drug treatment, meaning it has shown to be more effective than injectable therapies. It is licensed for adults with highly active relapsing remitting MS. Such people have a high disease activity, characterised as one relapse in the previous year despite being on another disease modifying therapy, such as an interferon, for at least 12 months (1).

In June 2014, NHS England published new guidelines to allow a switch to Gilenya for those patients with highly active RRMS, if they met the following criteria

- Patients whose relapse rate is unchanged, or has increased compared to the previous year, while on any of the beta interferons or glatiramer acetate (Copaxone and Brabio)
- Patients who are receiving natalizumab (Tysabri) and are at a high risk of developing progressive multifocal leukoencephalopathy (PML), a potentially fatal brain infection (19)

Additionally, in October 2014 the Scottish Medicines Consortium (SMC) licensed Gilenya as a first-line treatment for people with rapidly evolving severe relapsing remitting MS (RES RRMS).

First-line means it can be offered to people with RES RRMS without them having to have taken any previous medication (20).

What are the side effects?

Possible side effects include changes to liver function, macular oedema (an accumulation of fluid in the macular area of the eye (the central area of vision) that sometimes causes blurred vision), headache, respiratory tract infection, shortness of breath, diarrhoea and nausea. Gilenya can cause a decrease in heart rate so your first dose will be monitored in hospital for six hours (16) (17) (18).

Kesimpta (ofatumumab)

How does it work?

Kesimpta is a monoclonal antibody, similar to that of Ocrevus (ocrelizumab). It targets and attaches to specific markers in the immune system called CD20. These form the surface of a type of white blood cell called B cells. It is thought that these B cells are what attack the myelin that surrounds nerve cells and causes the inflammation. Kesimpta targets these B cells and removes them, reducing their overall activity (21).

How can it help?

Compared to Aubagio (teriflunomide), Kesimpta reduces the risk of relapse by 50 to 59 per cent. Trials showed that people taking this drug had fewer, smaller, or no new areas of active lesions on an MRI scan. It also helps to relieve symptoms and slow down the progression of the disease (21) (22).

It is suggested Kesimpta is as effective as Lemtrada, Tysabri and Ocrevus (23).

How is it administered?

Kesimpta is self-injected, subcutaneously (under the skin). It is injected weekly for the first three weeks, then you skip a week, before continuing with monthly injections.

It needs to be stored in the fridge and taken out 15 to 30 minutes before injecting to allow it to reach room temperature (22).

Who manufactures it?

Novartis

What type of MS is it prescribed for?

Kesimpta was approved for use in adults with active relapsing remitting MS. It is classed as a highly effective treatment.

It can be offered as a first-line drug therapy.

What are the side effects?

The most common side effects reported for Kesimpta include upper respiratory tract infections, urinary tract infections, injection-related reactions such as fever, headache, muscle pains, and tiredness. Injection-site reactions are also common, such as redness, itching and swelling. These reactions mostly clear up the same day (22).

Other common side effects include oral herpes, and a reduction in the blood level of immunoglobulins which help to protect against infection (22).

Lemtrada (alemtuzumab)

How does it work?

Lemtrada was originally licensed for the treatment of leukemia. It is a monoclonal antibody which kills T-cells, a type of lymphocyte involved in the MS immune response. Once the T-cells are killed, the immune system repopulates, leading to a modified immune response that no longer regards myelin and nerves as foreign, and therefore stops attacking them (24) (25).

How can it help?

In two studies, Lemtrada was shown to be effective in reducing the number of relapses in people with relapsing remitting MS. One clinical trial compared Lemtrada to Rebif in people who had not previously been treated with a DMT. Relapses were reduced by 55 per cent compared to Rebif.

In the second trial the drug was again compared to Rebif. In people who had experienced at least one relapse whilst on therapy, Lemtrada reduced the number of relapses by 49 per cent compared to Rebif (26) (27).

How is it administered?

Lemtrada is delivered by two infusions, 12 months apart. The first infusion is delivered over five days, and the second over three days. Infusions take place in a hospital or infusion clinic.

Who manufactures it?

Genzyme

What type of MS is it prescribed for?

Lemtrada is highly effective when treating more active forms of relapsing remitting MS (1).

What are the side effects?

Side effects reported for Lemtrada include one-third of people reporting changes to their thyroid function, which while treatable, can mean lifelong medication is necessary. One per cent of people reported a blood clotting disorder called Immune thrombocytopenic purpura (ITP). While serious, ITP can be treated effectively. Other adverse effects reported relate to kidney function, reactions at the infusion site and respiratory infections.

More common reported side effects were flu-like symptoms after the infusion was given, and some may experience an itchy rash which can be managed by antihistamines (24) (25).

Mavenclad (cladribine)

How does it work?

Mavenclad is an immune-modulating drug that targets specific lymphocytes, T-cells and B-cells.

The drug interferes with DNA synthesis and repair, therefore reducing the number of these lymphocytes. It is these cells that are thought to be involved in the immune response which attacks myelin, causing demyelination (28) (29).

How can it help?

Studies have shown that Mavenclad reduces relapse rate significantly and delays disability progression by reducing the loss of brain cells, sustained for six months compared with a placebo (30).

> **Everyone's experience is different and which DMT works for who and for how long, you can't tell. But, in my case, I have not had a relapse since I went on a DMT. They work for a lot of people. Go for it!**

How is it administered?

Mavenclad is taken as a tablet. It is taken in two courses, one year apart. The first course is taken over five consecutive days in the first month and over five consecutive days in the second month. The second course is given 12 months later in the same way as the first course. The number of tablets taken in each course is dependent on the individual's weight.

Who manufactures it?

Merck

What type of MS is it prescribed for?

Mavenclad is prescribed for people with RRMS. It is listed as 'more effective' meaning it is slightly more effective than the injectable therapies (30).

What are the side effects?

One of the most common side effects of taking Mavenclad is lymphopenia, which means a reduction in white blood cells. This can increase the risk of getting infections.

Other common side effects include shingles, cold sore, rash, and

hair loss. If a patient has shingles, then Mavenclad may need to be stopped until the infection is treated and cleared (29).

Mayzent (siponimod)

How does it work?

Mayzent is an immune-modulating drug from the same class of drugs as Gilenya. It works by reducing the amount of circulating white blood cells (lymphocytes), preventing them from being able to move freely within the body. Fewer cells are then able to reach the brain and spinal cord, therefore reducing nerve damage caused by SPMS (31).

How can it help?

Studies have shown that Mayzent helped to slow disability progression by 37 per cent, in those with active SPMS, compared to placebo. In slowing the progression, it also delayed the time to wheelchair dependency in a subgroup of patients, with an EDSS score of 6.5, who were high risk of reaching wheelchair dependency, compared to placebo (32).

How is it administered?

It is to be taken by tablet, once a day.

Tests will be required before starting treatment to determine the correct dosage. This will depend on how well the tablet is broken down in the body (31).

Who manufactures it?

Novartis

What type of MS is it prescribed for?

Mayzent is approved for treating SPMS when there is evidence of

disease activity. Either in the form of relapses or inflammatory activity on MRI (3).

What are the side effects?

Dosage is increased gradually over the first five days of treatment. This is to reduce the impact on the heart in case of irregular or slowed heartbeat.

Most common side effects from Mayzent include headache, high blood pressure, infections due to lowered white cell count (lymphopenia), visual disturbances (31).

Ocrevus (ocrelizumab)

How does it work?

Ocrevus is a monoclonal antibody that has been designed to target and attach to a specific marker in the immune system called CD20, on the surface of certain types of white blood cells (B cells). These B cells are what attack the immune system and cause inflammation and damage. Ocrevus targets these cells to help reduce their activity (33).

How can it help?

Studies have shown that Ocrevus can reduce annual relapse by 50 per cent compared to Rebif. Studies also showed that the drug reduced disability progression and reduced the number of lesions shown on MRI when compared with beta interferon. Loss of brain cells was also reduced, and no evidence of disease activity (NEDA) was seen in patients taking Ocrevus, again when compared to Rebif (34).

How is it administered?

Ocrevus is administered by infusion every six months. The initial

infusion is given in two separate doses, two weeks apart. After that it is one single dose. Each infusion takes around three to four hours to complete. At the start of each infusion, a corticosteroid and an antihistamine are given to the patient to help prevent any reactions (33).

Who manufactures it?

Roche

What type of MS is it prescribed for?

Ocrevus is highly effective when treating more active forms of RRMS. It can only be offered if Lemtrada (alemtuzumab) is contraindicated or unsuitable (35).

It is also available for those with early PPMS (5).

What are the side effects?

Infusion reactions are the most frequently reported side effect (itching, rash and difficulty breathing). They are generally short-lived. Additional medications may be given to prevent this as well as close monitoring during the infusion itself.

Infections are also common, such as chest infections, coughs and colds and herpes virus infections (cold sores or shingles) (36).

Plegridy (beta interferon 1a)

How does it work?

Interferons are proteins, produced naturally by the body that help us fight infection.

Plegridy blocks the action of one type of protein called gamma interferon. It reduces the autoimmune reaction that causes

inflammation and destruction of myelin (37).

How can it help?

It has been shown to reduce the rate of relapse by about one-third in people with RRMS. It also reduces the severity of relapses that occur (37).

How is it administered?

Plegridy must be injected under the skin every two weeks and should be stored in the fridge.

Who manufactures it?

Biogen

What type of MS is it prescribed for?

Plegridy is used in those diagnosed with RRMS (1).

What are the side effects?

The most common side effect experienced when taking Plegridy is flu-like symptoms after injecting. Injection-site irritations may also occur, such as redness, swelling, and itching.

Other less common side effects can be mood swings, fever and blood abnormalities. Most people find these effects reduce over a three-month period of taking the drug. If they persist, a conversation with an MS nurse or neurologist is recommended (37) (38).

Ponvory (ponesimod)

How does it work?

Ponvory is an immune-modulating drug. It reduces the amount of circulating white blood cells (known as lymphocytes) and keeps them in the lymph nodes. Fewer cells are then available to attack the myelin sheath. Decreasing nerve damage leads to a reduction in

the number of relapses (39).

How can it help?

Trials show that people taking ponesimod have fewer relapses than those taking teriflunomide. A significant improvement in fatigue was also seen in comparison (40).

Other trials show that ponesimod taken in a higher dose, showed a 52 per cent reduction in annualised relapse rate, compared to placebo (41).

How is it administered?

It is taken as a tablet, once per day

Who manufactures it?

Janssen

What type of MS is it prescribed for?

Ponvory is used as a first-line treatment for people with active relapsing remitting MS as defined by MRI. It can also be used as a second line treatment.

Active disease is defined as having one relapse within the last year, or two within the last two years. Or at least one T1 gadolinium enhanced lesion on brain MRI within the last six months (42).

What are the side effects?

The most common side effects include the common cold, raised liver enzymes and upper respiratory tract infection.

Other less common side effects include dizziness, headache, vertigo, macular oedema, anxiety.

Like Gilenya, ponesimod can cause an initial decrease in heart rate.

An electrocardiogram (ECG) will be given to check the electrical activity of the heart before the first dose. If there is an increased risk of a slowed heart rate, the first dose will be monitored for up to four hours. An ECG will also be repeated at the end of monitoring (43).

Rebif (beta interferon 1a)

How does it work?

Interferons are proteins, produced naturally by the body that help us fight infection.

Rebif blocks the action of one type of protein called gamma interferon. It reduces the autoimmune reaction that causes inflammation and destruction of myelin (9) (44).

How can it help?

Rebif has been shown to reduce the rate of relapse by about one-third in people with RRMS. It also reduces the severity of relapses that occur (9) (44).

How is it administered?

Rebif must be injected under the skin three times per week and should be stored in the fridge.

Rebif comes in two dosages – 22mcg and 44mcg (44).

Who manufactures it?

EMD Serono

What type of MS is it prescribed for?

All types of beta interferon 1a are used in those diagnosed with RRMS (1).

What are the side effects?

The most common side effect experienced when taking beta interferon 1a is flu-like symptoms after injecting. Injection-site irritations may also occur, such as redness, swelling, and itching.

Other less common side effects can be mood swings (mainly from Avonex), fever and blood abnormalities. Most people find these effects reduce over a three-month period of taking the drug. If they persist, a conversation with an MS nurse or neurologist would be recommended (9) (44).

Tecfidera (dimethyl fumarate)

How does it work?

It is thought that Tecfidera promotes an anti-inflammatory effect when the immune system attacks myelin, therefore reducing any damage that may be caused to the central nervous system (45) (46).

How can it help?

Studies have shown that Tecfidera reduces the annual MS relapse rate by around one-half. During trials, MRI scans showed fewer, smaller, or no new active lesions. Some studies also showed a significant reduction in the progression of the disease (45) (46).

How is it administered?

Tecfidera is taken as a tablet, twice a day.

Who manufactures it?

Biogen

What type of MS is it prescribed for?

Tecfidera is prescribed for people with relapsing remitting MS. It is listed as 'more effective' meaning it is slightly more effective than

the injectable therapies (1).

What are the side effects?

Common side effects reported are flushing and feeling hot, headaches, gastrointestinal upset and decreased white blood cell count – increasing the risk of infection (45) (46).

> **I believe my path through MS has been so good because I got my DMT right at the start of my diagnosis and therefore it has slowed down the progression and severity of the illness**

Tysabri (natalizumab)

How does it work?

A monoclonal antibody that works in a different way to injectable therapies, Tysabri binds to specific adhesion molecules within the immune cells. This stops the cells from crossing the blood brain barrier and entering the central nervous system, thereby reducing inflammation and damage (47) (48).

How can it help?

People with RRMS showed a reduction of around two thirds in the number of relapses, fewer MS lesions detected during MRI scans and a significantly reduced rate of disease progression.

In studies, people with RES RRMS showed a decrease of 81 per cent in relapses when taking Tysabri (47) (48) (49).

How is it administered?

Tysabri is administered by intravenous infusion every four weeks at either an infusion centre or a hospital.

Trials suggest Tysabri is as effective when administered every six weeks, lowering the risk of potential side effects. The trial is due to be completed in 2023 (50).

In 2021, Tysabri was authorized for use in injection form. This is to be given as a monthly subcutaneous (under the skin) injection, via a healthcare professional in clinic. Studies show that subcutaneous Tysabri is as effective and safe as intravenous Tysabri (51).

Who manufactures it?

Biogen

What type of MS is it prescribed for?

Tysabri is highly effective when treating more active forms of RRMS (1).

What are the side effects?

Side effects can include dizziness, nausea, joint pain, shivering and sometimes inflammation of the nose and throat.

Tysabri increases the risk of developing a serious infection called progressive multifocal leukoencephalopathy (PML), which is a rare but sometimes fatal brain infection that affects the central nervous system. Risk factors associated with an increased risk of PML are the presence of anti-JCV antibodies and the length of time on treatment.

There is a slightly increased risk for patients who remain on the therapy for more than two years.

PML is caused by a virus called the John Cunningham virus (JCV).

Each potential patient is tested to check whether they are positive for JCV as this can help to establish the risk of developing PML.

As the JCV is airborne, patients can develop it at any time. This means that patients who test negative for JCV should be retested regularly.

Patients who have been on immune suppressants prior to treatment also have an increased risk factor. Despite these factors, the benefits of the drug continue to outweigh the risks for many people with highly active RRMS (47) (48).

Vumerity (diroximel fumarate)

How does it work?

Vumerity is a similar drug to Tecfidera. It is thought to have an anti-inflammatory effect when the immune system attacks myelin, therefore reducing any damage that may be caused to the central nervous system (52).

How can it help?

Studies show that Vumerity significantly reduces the amount of active MS lesions on MRI scans. Studies also suggest it reduces relapse rate by the same amount as Tecfidera (53).

How is it administered?

It is taken as a tablet, twice a day.

Who manufactures it?

Biogen

What type of MS is it prescribed for?

Vumerity is prescribed for people with RRMS who have

moderately active disease in the form of a recent relapse, or new lesions (54).

What are the side effects?

Studies show Vumerity is more well-tolerated than Tecfidera with gastrointestinal upset being mild to moderate. It is still one of the more common side effects, but with a lesser impact on daily life (55).

Other common side effects include flushing, nausea, increased risk of infections (52).

Zeposia (ozanimod)

(Approved for use in Scotland only)

How does it work?

Zeposia belongs to a group of drugs, which work by reducing the amount of circulating white blood cells (lymphocytes), preventing them from being able to move freely within the body. Therefore, reducing inflammation and damage (56).

How can it help?

Comparison studies with Avonex, show that Zeposia is more effective in reducing the amount of new active lesions on MRI, and reducing brain volume loss. Zeposia was also studied in a higher dose, and this was shown to reduce relapse rate significantly compared to Avonex (57).

How is it administered?

It is taken as a tablet, once a day. The dosage is gradually increased over a period of eight days, to help manage side effects (56).

Who manufactures it?

Bristol Myers Squibb

What type of MS is it prescribed for?

Zeposia can be prescribed for people with active RRMS, in Scotland only (58).

It is currently not recommended by NICE for use in England and Wales.

What are the side effects?

The most common side effects are an increased risk of infection including coughs, colds, respiratory infection, lowered blood pressure (which will be monitored), slowed heart rate, increased liver enzyme levels (56).

Choosing a disease modifying therapy

Once diagnosed with MS, your neurologist will talk to you about any medication you may require and be eligible for. They should

> **Do your research very thoroughly indeed first, so that your choice is fully informed**

discuss with you all your possible options. One thing to consider when looking at these medications is your lifestyle and how the administration of these drugs will fit into your day-to-day living.

There are several factors you may want to consider and discuss with your family and neurologist.

For example

- What are the benefits of a DMT in the short, mid and long term?
- What are some of the common side effects?
- How is the therapy administered? Tablet, injection, or infusion?
- Is this right for my lifestyle?

Openly discuss all the options with your MS nurse and/or neurologist to come to a decision on what the best course of treatment is for you.

> **Do your research and ask questions if unsure if it is right for you**

The MS Trust website has a useful tool called 'MS Decisions' with an interactive section that compares the different drugs to help you find the one most suitable for you (59).

Side effects

The side effects of these drugs are different with each therapy and vary from person to person. It is important to talk to your MS nurse or neurologist about what side effects the drug may cause. Side effects are generally not severe and there are various ways to manage them.

> **Read any information available. You can seek advice but ultimately the choice is yours. Any problems speak to your MS nurse**

If you experience flu-like symptoms after injecting, try changing the time of day you take your injection, possibly to just before bedtime so you can sleep through the side-effects. Alternatively, providing they do not interfere with any other medication you are taking, it is recommended that you take paracetamol or ibuprofen two hours before the injection to ease the symptoms.

If you have injection-site reactions, you could try using Emla cream which numbs the area prior to the injection. Always rotate the injection site to avoid injecting the same area each time. It may also help to ensure the drug is at room temperature and warming your skin before injecting may also help make your injection more comfortable. If you are on any of the oral therapies, ask your MS nurse how to manage any side-effects you are experiencing.

If the side effects become severe or you feel unable to cope with them, contact your MS nurse or neurologist who will be able to advise you further. Contact the MS-UK Helpline if you need help to find your nearest MS nurse.

What if I choose not to have medication?

You may be eligible for DMTs, and it is your choice whether you wish to take them or not. Should you choose not to take any medications, this is described as 'drug naïve' by health professionals. Your healthcare team may advise you to use DMTs, however, the choice is still yours. If you choose to be drug naïve, it may be useful to keep a symptom diary in case you change your mind in the future.

> **You have to weigh up the pros and cons personally, but I think taking a DMT has helped slightly on balance. I believe this needs to go alongside living a healthy life – good diet, regular exercise and try and live in the moment**

Use me for your notes

About MS-UK

MS-UK is a national charity formed in 1993 supporting anyone affected by multiple sclerosis. Our hope for the future is a world where people affected by MS live healthier and happier lives.

MS-UK has always been at the forefront of promoting choice, of providing people with all the information and support they need to live life as they wish to with multiple sclerosis, whether that be through drugs, complementary therapies, lifestyle changes, a mixture of these or none at all.

We will always respect people's rights to make informed decisions for themselves.

The MS-UK Helpline

We believe that nobody should face multiple sclerosis alone and our helpline staff are here to support you every step of the way.

Our service is informed by the lived experience of real people living with MS, so we can discuss any treatments and lifestyle choices that are of benefit, whether they are clinically evidenced or not.

New Pathways

Our bi-monthly magazine, New Pathways, is full of the latest MS news regarding trials, drug development and research as well as competitions, special offers and product reviews. The magazine connects you to thousands of other people living with MS across the country.

Available in print, audio version, large print and digitally.

About MS-UK

Peer Support Service

Our Peer Support Service enables people to connect with others in a safe space and share experiences on topics of interest. Our Peer Pods take place regularly and are all volunteer led. Please visit the website to find out more www.ms-uk.org/peer-support-service or email peersupport@ms-uk.org.

Chair yoga

Pilates

Workshop

Information session

Mindfulness 8 weeks

Mindfulness 4 weeks

Writing for wellbeing

Fundraising for MS-UK

Exercise masterclass

Love To Move

Mat yoga

More coming soon

Online activities

MS-UK offers a variety of online activities to stay active and connected for those affected by MS and manage their symptoms to live happier and healthier lives. Activities include exercise sessions, mindfulness courses, chair yoga classes, information sessions and workshops. Visit our website to explore and find out more.

E-learning

Do you work with or support someone living with MS and want to increase your understanding and knowledge of this long-term health condition? Professionals at MS-UK have created accredited Learning courses that can help you do this. Visit https://ms-uk.org/excellence-ms/ to find out more.

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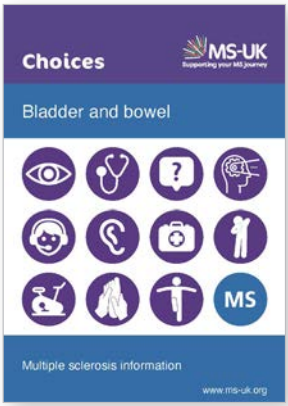
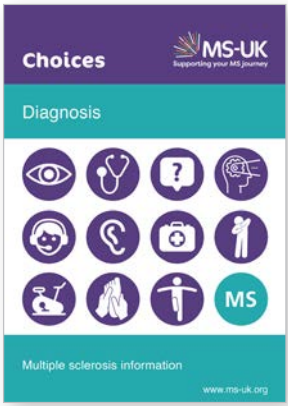
Last reviewed February 2023.

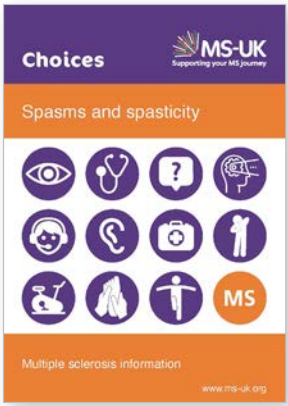
Information is accurate at time of publication, please see our online version for most up to date version.

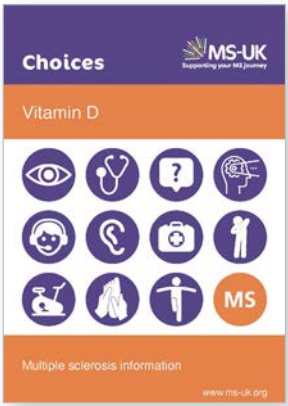
Read more Choices booklets

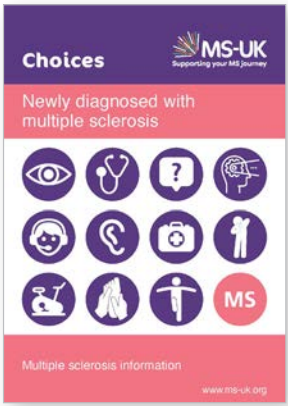
For more information about living well with multiple sclerosis, visit **www.ms-uk.org/choicesleaflets** where you can read more and download your free copy of any of our Choices booklets.











Check out MS-UK's online activities

Live a happier and healthier life with MS

- ✓ Accessible online exercise classes
- ✓ Chair yoga classes
- ✓ Mindfulness courses
- ✓ Interactive workshops
- ✓ Information sessions
- ✓ Peer Support Service

Don't miss out – sign up for our new online activities today!

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