



## **LEVEL 3 CERTIFICATE / DIPLOMA**

4463U10-1A



S19-4463U10-1A

## **MEDICAL SCIENCE**

**UNIT 1: Human Health and Disease**

**Summer 2019**

**Pre-Release Article for use in the following  
examination on 20 May 2019**

**Level 3 Diploma in Medical Science**

**Level 3 Certificate in Medical Science**

4463U101A  
01

## **Multiple Sclerosis drug ‘a landmark’**

The following article has been adapted from <http://www.bbc.co.uk/news/health-38392548>

The drug, Ocrelizumab, which alters the immune system has been described as “big news” and a “landmark” in treating multiple sclerosis (MS) according to doctors and charities.

Trials published suggest the drug, a new therapy, can slow damage to the brain in two forms of MS.

This is the first drug shown to work in the primary progressive form of the disease.

More than 100 000 people have been diagnosed with MS in the UK and around one-in-five cases are the primary progressive form.

MS is caused by a faulty immune system that mistakes part of the brain as foreign and attacks it. It destroys the myelin sheath which is the protective coating of the nerves.

The disease can either just get worse, known as primary progressive MS, or come in waves of disease and recovery, known as relapsing-remitting MS.

Ocrelizumab kills B cells in the immune system which are involved in the attack of the myelin sheath.

In patients with primary progressive MS, the percentage of patients that deteriorated decreased compared with those without the drug treatment.

Patients taking the drug also scored better on the time needed to walk 10 metres, had less brain damage detected on scans, and the relapse rate with Ocrelizumab was half that of different drugs.

Ocrelizumab is being considered for use by the European Medicines Agency and the US Food and Drug Administration.

Scientists warn that patients in the UK may be disappointed as it may be hard for the NHS to fund everyone getting a drug that is likely to be expensive. The risk of side-effects is also high, as any drug that weakens the immune system increases the risk of infection.

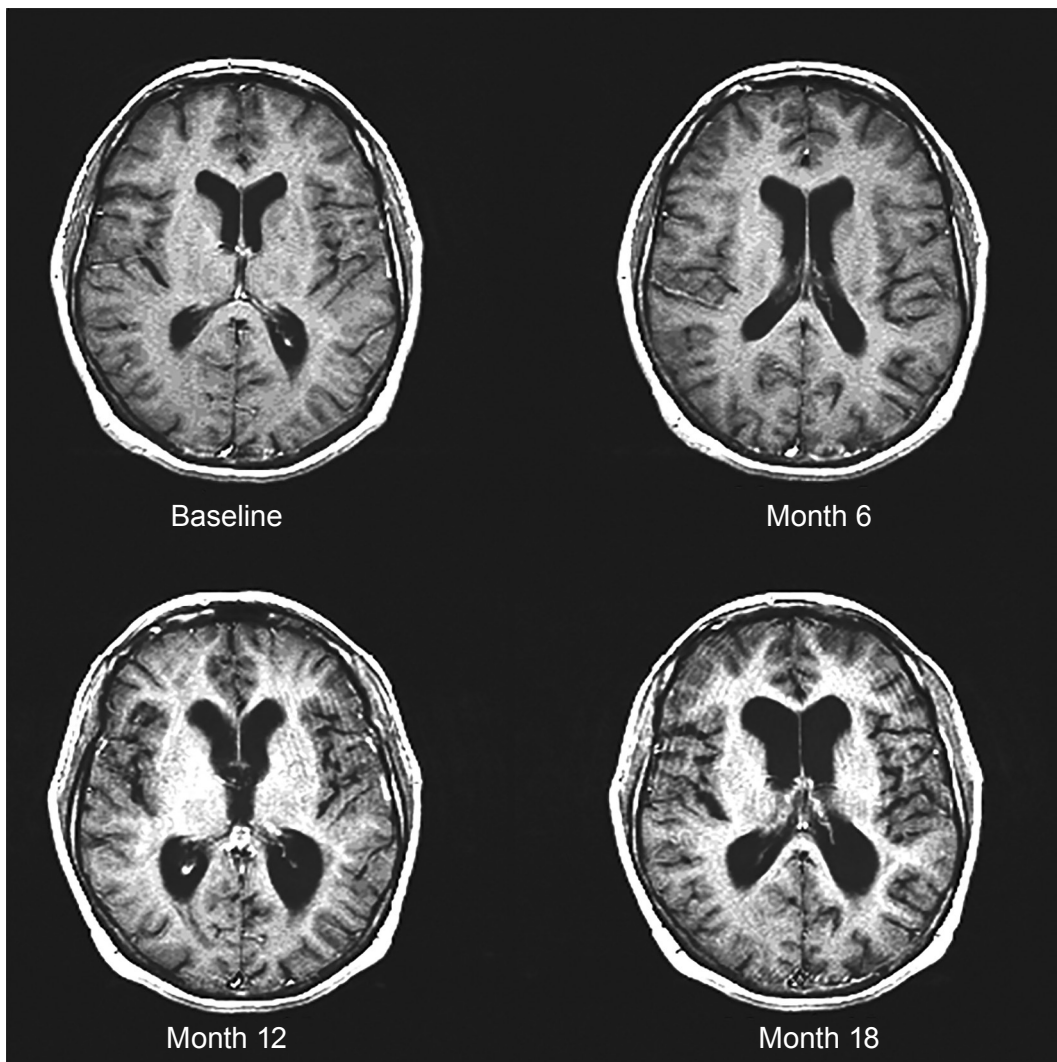
## Multiple Sclerosis

Multiple Sclerosis (MS) is a condition which can affect the brain and spinal cord. It is an autoimmune condition, which means the immune system mistakes part of the body for a foreign substance and attacks it.

The myelin sheath is attacked in MS. The attacks cause the myelin sheath to become inflamed in small patches which can be seen on a magnetic resonance imaging (MRI) scan. These patches of inflammation can slow down, jumble, or stop the messages travelling along the nerves. This disruption leads to the signs and symptoms of MS.

When the inflammation goes away the myelin sheath can be left scarred, this is called sclerosis. If the attacks are frequent they can lead to permanent damage to the nerves.

**Figure 1:** MRI scans showing the wasting away of brain tissue in a MS sufferer over 18 months.



<http://multiple-sclerosis-research.blogspot.com/2013/06/rebranding-ms-as-dementia.html>

## Causes of MS

Some of the factors that have been suggested as possible causes of MS include:

- **Genetics** – MS is not inherited directly, but people who are related to someone with the condition are more likely to develop it.
- **Lack of sunlight and vitamin D** – MS is more common in countries far from the equator, which could mean that a lack of sunlight and low vitamin D levels may play a role in the condition. It is not clear whether vitamin D supplements can help prevent MS.
- **Smoking** – people who smoke are twice as likely to develop MS compared to non-smokers.
- **Viral infections** – it has been suggested that infections, particularly those caused by Epstein-Barr virus, might trigger the immune system, leading to MS.

## Symptoms

MS affects each person with the condition differently.

Some people's symptoms develop and worsen steadily over time, while for others they come and go. Periods when symptoms get worse are known as 'relapses'. Periods when symptoms improve or disappear are known as 'remissions'.

Some of the most common symptoms include:

### *Fatigue*

Fatigue is often described as an overwhelming sense of exhaustion. This can significantly interfere with daily activities and tends to worsen towards the end of each day, in hot weather, after exercising or during illness.

### *Vision problems*

In approximately 25% of cases of MS, the first noticeable symptom is a problem with the eyes called optic neuritis. This may cause the following:

- Temporary loss of vision in the affected eye, lasting for days or weeks.
- Colour blindness.
- Eye pain, which is worse when moving the eye.
- Flashes of light when moving the eye.
- Double vision.
- Involuntary eye movements.

### *Abnormal sensations*

Abnormal sensations can be a common initial symptom of MS. They are often in the form of numbness or tingling in different parts of the body which can persist for a few days.

### *Mobility problems*

MS can make walking and moving around difficult, particularly if another symptom is muscle weakness or muscle spasms. Mobility problems could include clumsiness, ataxia, tremors and vertigo.

### *Pain*

Some people with MS experience pain which can take two forms:

- **Neuropathic pain** caused by the MS itself which is caused by damage to the nervous system. This may include stabbing pains in the face and a variety of sensations in the body, including feelings of burning, pins and needles, or squeezing.
- **Musculoskeletal pain** in the back, neck and joints is caused indirectly by MS, in particular for people who have problems walking or moving around, as this can put pressure on the lower back or hips.

### *Other symptoms*

- problems with thinking and learning
- muscle spasms, stiffness and weakness
- depression and anxiety
- sexual problems
- bladder problems
- bowel problems
- speech and swallowing difficulties

## **Diagnosis**

Initial symptoms of MS are similar to other conditions so early diagnosis can be difficult.

### *Neurological examination*

The GP will refer suspected MS sufferers to a neurologist for a specialist assessment. They will look for abnormalities including changes or weakness in vision, eye movement, hand or leg strength, balance and co-ordination, speech and reflexes. These tests may show whether the nerves are damaged in a way that might suggest MS.

### *Magnetic resonance imaging (MRI) scan*

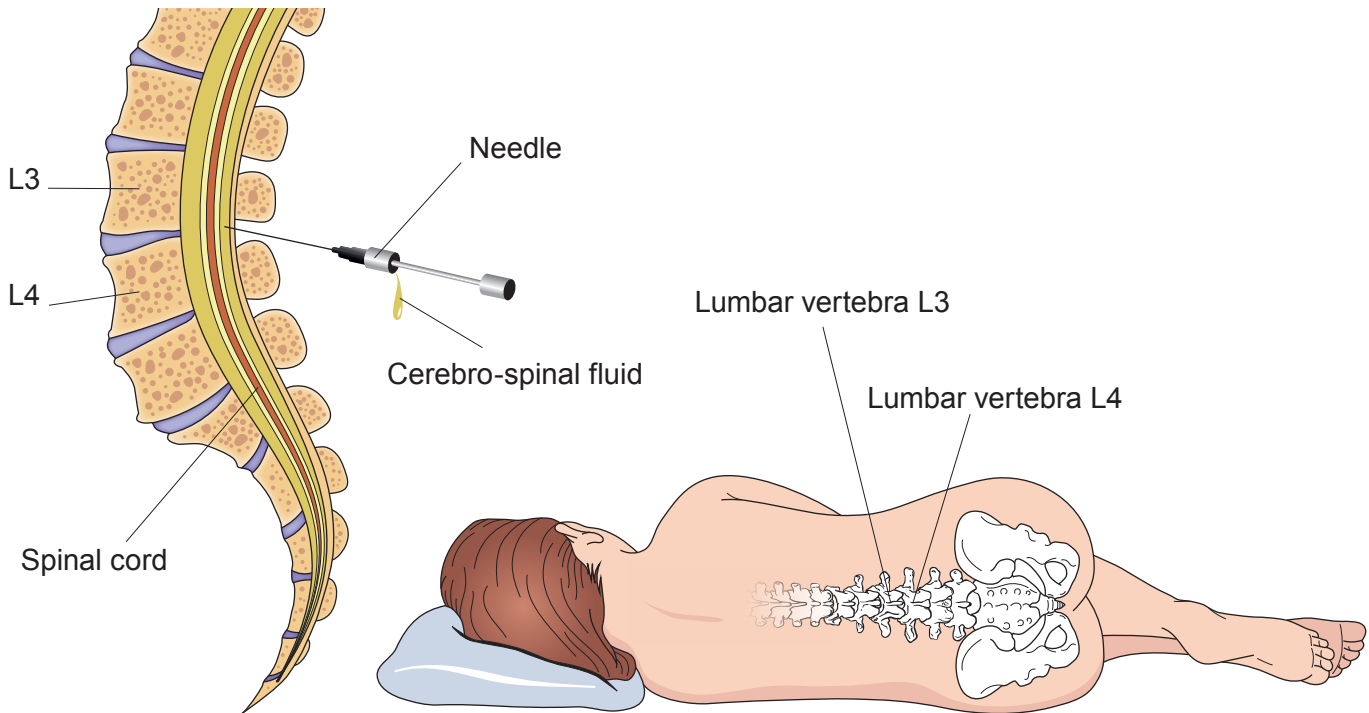
An MRI scan is a painless scan that can show whether there is any damage or scarring of the myelin sheath in the brain and spinal cord.

### *Evoked potential test*

The most common type of evoked potential test assesses the eyes. Light patterns are shone into the eye while the brainwaves are monitored using an EEG. This test can show whether it takes the brain longer than normal to receive messages.

### *Lumbar puncture*

During a lumbar puncture a sample of cerebro-spinal fluid is removed by inserting a needle into the lower back. Changes in this fluid can suggest problems with the nervous system. This procedure is done under local anaesthetic. The sample is tested for raised levels of immune cells and antibodies. This is a very safe procedure but can be uncomfortable.



<http://www.msunites.com/what-is-a-spinal-tap/>

### *Blood tests*

Blood tests are usually performed to rule out other causes of the symptoms, such as vitamin deficiencies or a very rare, but very similar condition called neuromyelitis optica.

### **Treatment**

There is currently no cure for MS, but it is possible to treat the symptoms with medication and other therapies. Treatment for MS depends on the specific symptoms and difficulties that are experienced.

### *Treating relapses of MS symptoms*

Symptoms can sometimes be caused by something other than a relapse, such as an infection, so a nurse or GP will check for other possible causes.

Treating a relapse usually involves either:

- a five-day course of steroid tablets taken at home
- injections of steroid medication given in hospital for three to five days

Steroids can help speed up the recovery from a relapse but do not prevent further relapses or stop MS getting worse over time. They are prescribed for a short period of time to avoid possible steroid side effects such as osteoporosis, weight gain and diabetes.

### Treating specific MS symptoms

**Table 1:** Treatments for specific MS symptoms.

MS Symptom	Treatments
Fatigue	Taking the drug amantadine as well as exercise, healthy sleep patterns, and avoiding painkillers.
Visual problems	MS-related visual problems will usually improve on their own. Severe symptoms are treated with steroids and medication such as gabapentin.
Muscle spasms and stiffness	Physiotherapy, stretching exercises and muscle relaxants are sometimes used for severe muscle spasms.
Mobility problems	Physiotherapist–supervised exercise programmes including vestibular rehabilitation. Medication for dizziness or tremor. Mobility aids such as wheelchairs and stairlifts.
Neuropathic pain	Medication to treat the stabbing pain such as carbamazepine or certain types of antidepressants.
Musculoskeletal pain	Physiotherapy, painkillers or using a transcutaneous electrical nerve stimulation (TENS) machine.
Emotional problems	Outbursts of laughing or crying can be treated with antidepressants. Sometimes cognitive behavioural therapy is used.
Bladder problems	Many medications are prescribed for an overactive bladder. A catheter can be used to empty the bladder if incontinence is an issue.
Bowel problems	Diet and laxatives can be used to treat mild to moderate constipation. Anti-diarrhoea medication can be used for bowel incontinence.
Speech problems	A speech and language therapist can help overcome these problems.
Swallowing difficulties	When swallowing problems are severe a tube can be fitted into the stomach to feed the patient.

### New therapies

These are medicines, such as Ocrelizumab, that are used to help reduce the number of MS relapses. They work by reducing further damage to the myelin sheath by the immune system. They can also slow down the worsening disability caused by MS but they are not suitable for all MS sufferers. There are also possible side-effects of these medicines.

## **Living with MS**

MS is an incurable condition but it is possible for sufferers to change their daily lives so that they adapt to their symptoms. This involves sufferers taking responsibility for their own health and wellbeing whilst having support from care workers.

### *Healthy eating and exercise*

No diet has been proven to improve or reduce the symptoms of MS. Generally staying healthy and eating a balanced diet will help to reduce the risk of developing other health problems.

Exercise can also help with some symptoms of MS such as reducing fatigue, improving muscle strength, mobility, bowel and bladder function.

### *Stopping smoking*

Smoking increases the rate at which MS progresses. Stopping smoking slows the progression of MS.

### *Keeping well*

MS sufferers are encouraged to get a flu jab each autumn to reduce the risk of infection. Some vaccines are not recommended, as they can weaken the immune system which is already damaged by the MS.

### *Regular reviews*

It is important that sufferers of MS have their care reviewed at least once a year. During this time, current treatments and new problems or symptoms can be discussed.

### *Driving*

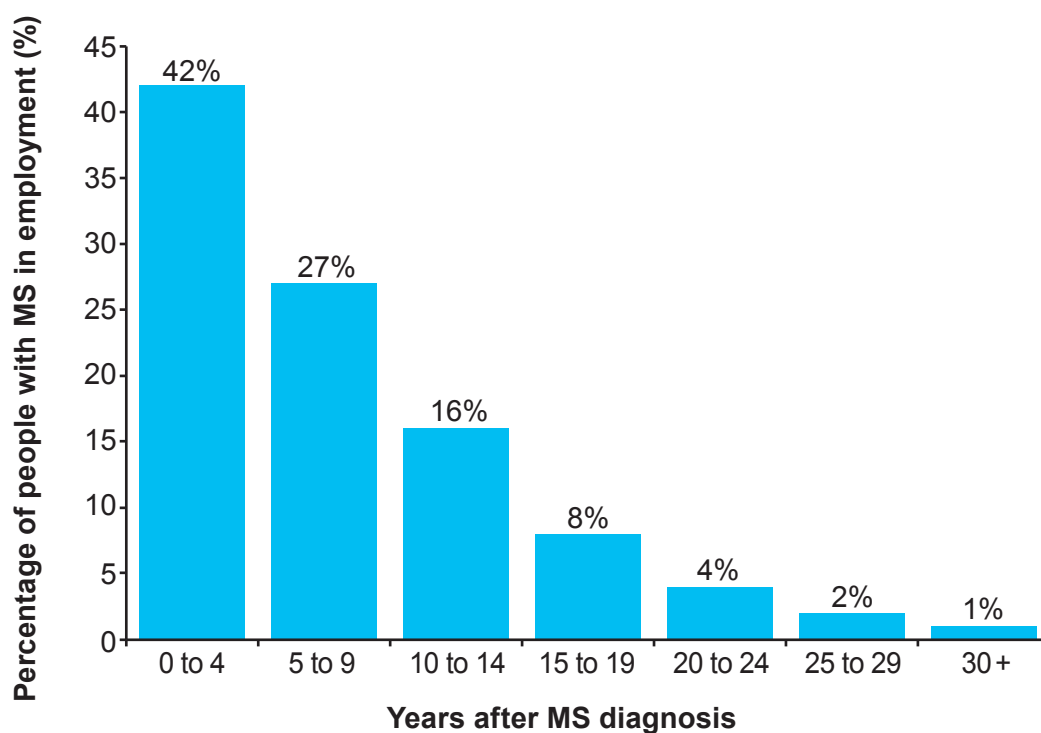
Sufferers must inform the DVLA of their condition but they are able to continue driving. They may need to modify the controls of the vehicle depending on their symptoms.

### *Money and financial support*

It is possible for sufferers of MS to work subject to the progression of the condition.

There are many benefits and allowances available to eligible MS sufferers if they are unable to work.



**Graph 1:** The percentage of people with MS that are in employment in the UK.

## MS Statistics

The average life expectancy is slightly reduced for people with MS.

It is estimated that there are more than 100 000 people diagnosed with MS in the UK. Wales has the lowest rate of MS with approximately 138 cases per 100 000 population and Scotland has the highest with approximately 209 cases per 100 000 population. Approximately 5 000 people are diagnosed with MS each year in the UK.

**Table 2:** UK nations MS statistics, 2012.

Nation	Total population (million)	People with confirmed MS	Newly diagnosed cases of MS each year
England	53	87 686	3 983
Wales	3.1	4 235	200
Scotland	5.3	11 119	666
Northern Ireland	1.8	3 188	183

There are an estimated 2.5 million people worldwide with MS. It is more commonly diagnosed in people between 20 and 40 years old, although it can develop at any age. It is between two and three times more common in women than in men.

**Table 3:** Number of patients diagnosed with MS in 2012.

Age (years)	Number of patients diagnosed		
	Female	Male	Total
<b>Under 10</b>	3	1	4
<b>10-19</b>	43	13	56
<b>20-29</b>	410	137	547
<b>30-39</b>	696	245	941
<b>40-49</b>	938	350	1288
<b>50-59</b>	726	325	1051
<b>60-69</b>	430	229	659
<b>70-79</b>	201	124	325
<b>80-89</b>	98	49	147
<b>90 +</b>	23	0	23
<b>Total</b>	<b>3568</b>	<b>1473</b>	<b>5041</b>

**BLANK PAGE**