LEVEL 3 CERTIFICATE / DIPLOMA

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MEDICAL SCIENCE

UNIT 1: Human Health and Disease

Resource Folder for use in the following examinations on Monday, 20 May 2024

Level 3 Diploma in Medical Science

Level 3 Certificate in Medical Science

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Article adapted from: Parkinson's disease breakthrough: PD13R could calm involuntary movements by 85%, Express.co.uk 03/12/2021

Parkinson's breakthrough: New treatment could minimise involuntary movements by 85%

Parkinson's disease describes a condition which causes parts of the brain to become damaged over the years. A new drug has been identified which may help calm involuntary movements, called dyskinesia, linked to the condition.

Dyskinesia are involuntary, erratic movements of the face, arms and legs. This isn't a symptom, but is a common side effect associated with certain types of Parkinson's medication.

A study has found that a drug called PD13R may reduce dyskinesia by more than 85%.
The study was conducted on animal models of Parkinson's disease. The animals also saw improvements in their sleep after taking the drug, compared to another drug prescribed for dyskinesia.

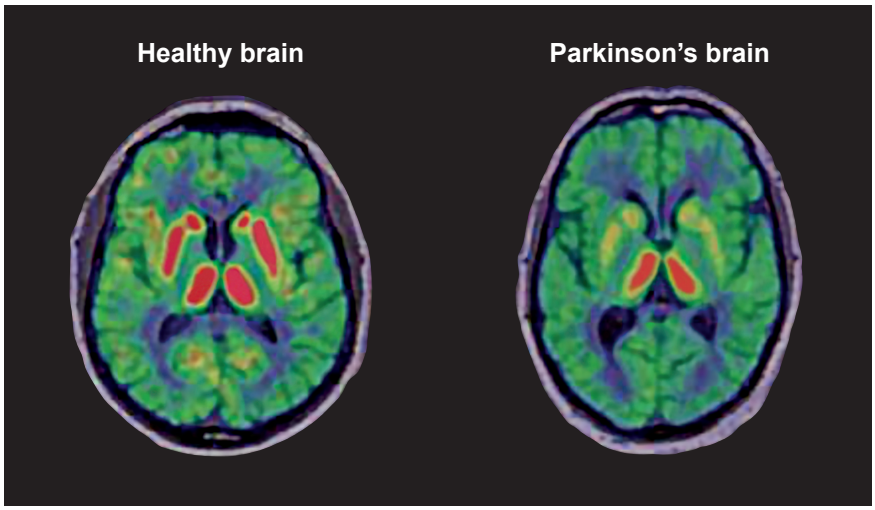
Dyskinesia usually appears about five years into taking a medication called levodopa, which is the leading medication used for restoring balance, reducing shaking and managing other motor control problems.

Safety and efficacy studies will be required before starting human clinical trials.

Parkinson's Disease

Parkinson's disease is a condition in which parts of the brain become progressively damaged over many years.

Figure 1: MRI scan showing a healthy brain and the brain of someone suffering with Parkinson's disease



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Symptoms

The symptoms of Parkinson's disease usually develop gradually and are mild at first.

There are many different symptoms associated with Parkinson's disease, but the order in which these develop, and their severity, is different for each individual.

The three main symptoms of Parkinson's disease that affect physical movement are:

- tremor – shaking, which usually begins in the hand or arm and is more likely to occur when the limb is relaxed and resting
- slowness of movement, which can make everyday tasks difficult and result in a distinctive slow, shuffling walk with very small steps
- muscle stiffness, which can make it difficult to move around and make facial expressions, and may result in painful muscle cramps.

These main symptoms are sometimes referred to as parkinsonism, as there can be causes other than Parkinson's disease.

Other symptoms can include:

- balance problems – these can make someone with the condition more likely to have a fall and injure themselves
- loss of sense of smell – this sometimes occurs several years before other symptoms develop
- nerve pain – this can cause unpleasant sensations, such as burning, coldness or numbness
- problems urinating, such as having to get up frequently during the night or incontinence
- constipation
- sudden drop in blood pressure – this can cause dizziness, blurred vision or fainting
- excessive sweating
- swallowing problems – this can lead to malnutrition and dehydration
- excessive production of saliva
- depression and anxiety
- mild cognitive impairment, such as slight memory problems
- dementia.

Complex Parkinson's disease

Complex Parkinson's disease is defined as the stage when treatment is unable to consistently control symptoms, or the person has developed uncontrollable jerky movements.

Causes

Parkinson's disease is caused by a gradual loss of nerve cells in the brain that are responsible for producing a neurotransmitter called dopamine.

Dopamine acts as a messenger between the parts of the brain and nervous system that help control and coordinate body movements.

If these nerve cells die or become damaged, the amount of dopamine in the brain is reduced. This means that the part of the brain controlling movement cannot work as well, causing movements to become slow and abnormal.

The symptoms of Parkinson's disease usually only start to develop when many nerve cells have been lost. It is not known why the loss of nerve cells associated with Parkinson's disease occurs, although research is ongoing to identify potential causes.

Genetics

A number of genetic factors have been shown to increase a person's risk of developing Parkinson's disease, although exactly how these make some people more susceptible to the condition is unclear.

Parkinson's disease can run in families, but it appears to be rare for the disease to be inherited.

Environmental factors

Environmental factors may increase a person's risk of developing Parkinson's disease. It has been suggested that pesticides and herbicides used in farming, and traffic or industrial pollution may contribute to the condition. However, the evidence linking environmental factors to Parkinson's disease is inconclusive.

Other causes include taking some medications and cerebrovascular disease.

Diagnosis

No tests can conclusively show that a patient has Parkinson's disease. The doctor will base a diagnosis on the patient's symptoms, medical history and a detailed physical examination. They will talk to the patient about the problems they are experiencing and may ask them to perform some simple mental or physical tasks, such as moving or walking around, to help with the diagnosis.

In the early stages, the GP may find it difficult to say whether the patient has the condition because the symptoms are mild. If they suspect Parkinson's disease, the patient will be referred to a neurologist or a geriatrician.

A diagnosis of Parkinson's disease is likely if the patient has at least two of the following symptoms:

- shaking or tremor in a part of the body that usually only occurs at rest
- slowness of movement
- muscle stiffness.

If the symptoms improve after taking the medication levodopa, it is likely that Parkinson's disease is the cause.

Brain scans may also be carried out in some cases to try to rule out other causes of the symptoms.

Treatment

There is currently no cure for Parkinson's disease, but treatments are available to help relieve the symptoms and maintain quality of life.

During the early stages of Parkinson's disease, when symptoms are mild, treatment may not be needed. However, regular appointments with a specialist are recommended so that the condition can be monitored and a care plan agreed between the patient and the healthcare team.

Supportive therapies – these can make living with Parkinson's disease easier and help the patient with their symptoms on a day-to-day basis.

Physiotherapy – this can work to relieve muscle stiffness and joint pain through movement and exercise. It aims to make moving easier and improve walking and flexibility as well as trying to help improve fitness levels.

Occupational therapy – this can identify areas of difficulty in everyday life, such as dressing or getting to the local shops. It also ensures the patient's home is safe and properly set up so that they can maintain independence for as long as possible.

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Speech and language therapy – many people with Parkinson's disease have problems with their speech and swallowing. A speech and language therapist can often help improve these problems by teaching speaking and swallowing exercises.

Diet advice – for some people, making dietary changes can help improve some symptoms. These include:

- increasing the amount of fibre in the diet and drinking enough fluid to reduce constipation
- increasing the amount of salt in the diet and eating small, frequent meals to avoid problems with low blood pressure
- making changes to the diet to avoid unintentional weight loss.

Deep brain stimulation – involves surgically implanting a pulse generator, similar to a heart pacemaker. A tiny electric current is produced by the pulse generator, which runs through a wire and stimulates the part of the brain that is affected by Parkinson's disease. This device does not cure Parkinson's disease but can ease symptoms for some people.

Medication

Figure 2: The three main types of medication used to treat Parkinson's disease

Medication	Levodopa	Dopamine agonists	Monoamide oxidase-B inhibitors
Mode of administration	tablet or liquid	tablet or skin patch	tablet
Action	absorbed by nerve cells in the brain and turned into dopamine	act as a substitute for dopamine in the brain and have similar effects to levodopa	block the effects of an enzyme that breaks down dopamine
Side effects	• feeling and being sick • tiredness • dizziness • dyskinesia	• feeling and being sick • tiredness • dizziness • hallucinations and increased confusion • compulsive behaviours • sudden onset of sleep	• feeling sick • headaches • abdominal pain • high blood pressure
Dosage	usually low dose initially, gradually increased until it takes effect	initially low dose if taken with levodopa	depends on the drug prescribed and the stage of Parkinson's disease

Clinical trials

Progress has been made in the treatment of Parkinson's disease as a result of clinical trials, where new treatments and treatment combinations are compared with standard ones.

All clinical trials in the UK are carefully overseen to ensure they are worthwhile and safely conducted. If asked to take part in a clinical trial, patients will be asked to sign a consent form. The patient can refuse to take part or withdraw from the clinical trial without affecting their care at any time.

Living with Parkinson's disease

A diagnosis of Parkinson's disease is life changing. Long-term treatment to control symptoms is needed and the patient will need to adapt to do simple everyday tasks.

Patients are encouraged to stay physically and mentally healthy by:

- taking regular exercise to relieve muscle stiffness, improve mood and reduce stress
- eating a balanced diet containing the nutrition needed to stay healthy
- keeping up-to-date with vaccinations.

Support

Being diagnosed with Parkinson's disease can put a strain on the patient, family and friends.

Healthcare practitioners can help with any questions about the condition as well as being able to refer patients and their support network to trained counsellors or psychologists and other care and support services available.

Parkinson's disease facts and statistics

- Parkinson's disease is the fastest-growing neurological condition worldwide that has no cure.
- 1 in 37 people alive in the UK will be diagnosed with Parkinson's disease in their lifetime.
- Estimates show that around 145 000 people were living with a Parkinson's disease diagnosis in the UK in 2020.

Figure 3: The number of people, by age group, with Parkinson's disease in the UK, 2020

Age group (years)	Number of individuals with Parkinson's disease
Under 50	1752
50–59	8889
60–69	25 916
70–79	60 470
80–89	40 420
90 +	7553

Figure 4: Typical financial impact, per annum, of living with Parkinson's disease in the UK (based on 2021 figures).

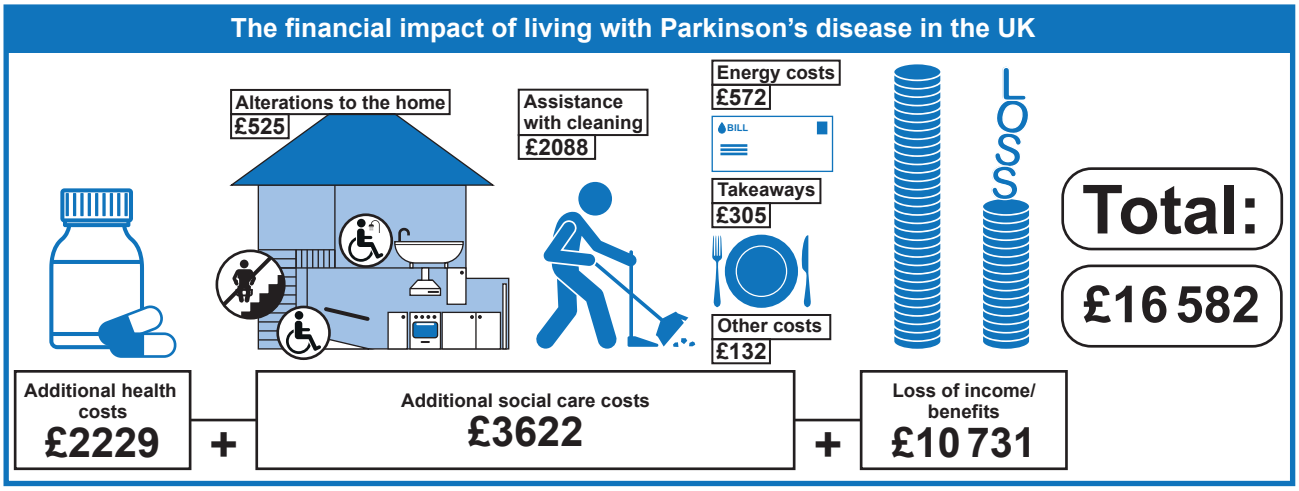

Figure 5: Projected prevalence of Parkinson's in the UK from 2025 to 2065, for people 50 years old and above

Age	Estimated prevalence of Parkinson's in the UK				
	2025	**2035**	**2045**	**2055**	**2065**
50–54	2929	2991	3104	2762	3204
55–59	5789	5120	5697	5386	5692
60–64	11 111	10 468	10 747	11 196	10 009
65–69	17 895	20 736	18 521	20 722	19 753
70–74	27 222	34 690	33 081	34 325	35 984
75–79	38 919	41 128	48 596	44 207	50 112
80–84	34 176	41 414	54 603	53 453	56 983
85–89	20 195	30 818	34 725	43 019	41 110
90 +	8591	12 935	18 864	26 951	31 927