

Nutrition and Parkinson's

What does research say?

TIME TO TAKE PART Introducing the Take Part Hub

DEMENTIA IN PARKINSON'S We ask the expert

TRIALS TO TREATMENTS Towards gene

therapy treatments

PARKINSON'S^{UK} CHANGE ATTITUDES. FIND A CURE. JOIN US.

WELCOME



n our lab, we measure how people move their bodies and eyes to understand how people control their movements and make sense of the world around them.

I have always been interested in the connection between our brains and behaviour, so I chose to study Neuroscience and Psychology.

When I began my research career I focused on how Parkinson's affects the way that people pay attention and respond to their environment. People with Parkinson's have always been central to my research.

To begin with, I mainly met people when they visited the

lab to take part in my research, which involved doing tasks such as making simple hand movements or remembering lists.

Often, we also need to find volunteers without Parkinson's so we can compare people of a similar age with and without the condition. Our volunteers – with and without Parkinson's who give up their time – are crucial for our research to understand the effects of Parkinson's.

I quickly realised it was also important to listen to people with Parkinson's. One person told me that they found it particularly hard to move when they saw lots of people moving around them. This inspired our current line of work, in which we are looking at the effects of watching and imitating other people's actions in Parkinson's.

In recent years, I have been lucky enough to involve people with Parkinson's in my research team. Their insights have helped to ensure our research is as relevant as possible, as well as improving the practical aspects of the work such as the tasks that we give to people.

I hope you enjoy reading about our most recent study, and the experience of someone who took part, on pages 6–9 of the magazine.

Eller

CONTENTS

ON THE COVER

Parkinson's or does research suggest something more?

21 Diets, nutrition and Parkinson's

NEWS

4

News roundup

We find out what news has hit the headlines over the past few months. In this issue, new research into a potential drug molecule and the extent of impulsive behaviours.

13

New research

Towards new and better treatments, we feature three new research projects aiming to improve life and develop a new measure for Parkinson's.

30

Research results

Our research projects have discovered a new way to look inside brain tissue, borrowed tech from computer games and are finding new ways to help protect brain cells from Parkinson's.

Progress is our free, twice-yearly magazine on the latest research into Parkinson's. You can find previous issues and subscribe to Progress on our website at parkinsons. orq.uk/progress or by contacting the Research team directly by email at research@parkinsons.org.uk or phone on 020 7936 9316.









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FEATURES 6

Research needs you

Discover why taking part is essential for research.

18

Ask the expert

Answering your questions about dementia and Parkinson's.

26

Trials to treatments: gene therapy

On the road to a new treatment, how far have we come?

ALSO IN THIS ISSUE...

11 VOLUNTEERING Help us decide what research to fund

12 FEEDBACK



What do you like? What do you not?

16 PARKINSON'S VIRTUAL BIOTECH

An update from our drug discovery initiative

34 BRAIN BANK

How brains power Parkinson's research

PROGRESS | 3

NEWS

Dopamine agonists and risk of impulsive behaviours

ew research, published in the scientific journal *Neurology*, suggests that around half of people taking dopamine agonists may develop impulsive behaviour within five years.

The study followed 411 people with Parkinson's, who had been diagnosed fewer than five years, for up to five years. The French researchers found that 52% of people who had ever taken

dopamine agonists developed an impulse control disorder – such as compulsive gambling, shopping or eating – compared to just 12% of people who never took this type of medication.

They also found that the behaviour gradually resolved after stopping dopamine agonists. You can find out more about this side effect, and how to spot the signs, by visiting our website **parkinsons.org.uk/impulsive**

ROUNDUP

NEWS

New drug molecule, NLYO1, could slow Parkinson's

Researchers at John Hopkins University have discovered that, in a mouse model of Parkinson's, a new drug molecule prevented the loss of dopamine-producing brain cells.

NLY01 works in a similar way to diabetes drugs like exenatide by targeting glucagon-like peptide-1 (GLP-1) receptors.

While activating the GLP-1 receptors in the pancreas causes insulin to be released, researchers believe activating the same receptors in the brain may help to protect the cells affected by Parkinson's.

Dr Beckie Port comments on these results: "This is promising news, particularly as existing research supports the potential of diabetes drugs that work in the same way as NLYO1.

"Up to now, most research has focused on existing diabetes drugs, like exenatide, to treat Parkinson's but NLYO1 may have some advantages over these. It may be able to penetrate the brain and reach the brain cells affected by Parkinson's more easily, which could make it more effective.

"We eagerly anticipate the next stage for this drug – clinical trials – to show whether it is truly able to slow the progression of Parkinson's – something no current treatment can do."

Study finds potential benefits of vitamin B3

team of researchers has discovered that nicotinamide riboside, a form of vitamin B3, may boost energy in nerve cells and help prevent them being lost in Parkinson's.

The researchers, based in Germany, used both brain cells grown in the lab and fruit flies that carried a change in the glucocerebrosidase (GBA) gene. This is one of the more common genetic changes found in people with Parkinson's.

The study, published in *Cell Reports*, highlights that nicotinamide riboside could help protect dopamine-producing brain cells by boosting the energy producing mitochondria in these models of Parkinson's. More research is needed to understand whether these encouraging findings hold true in people.

Read more about diet and nutrition in our feature on p21.

READ OUR BLOG

Find out the latest research news, and go behind the headlines, by visiting our research blog at **parkinsons.org.uk/blog** ■

FEATURE

RESEARCH NEEDS <u>YOU</u>

Many people think of researchers working in laboratories, wearing lab coats and peering down microscopes, but this is only part of the picture. Whether testing new treatments, developing better diagnostic tools or understanding what living with Parkinson's is really like, it's in clinical research we find our answers.

linical research is research that involves people, and it has many different forms. Some studies involve questionnaires and interviews, others blood or saliva samples, or even taking a new treatment. Ultimately, clinical research can only happen because of the goodwill of the people taking part.

A sense of control

Involvement varies according to each piece of research but, regardless of this, many people find taking part gives them a sense of control over their condition. This was certainly the case for those who took part in Dr Ellen Poliakoff's research study. As Co-Director of the Body, Eyes and Movement (BEAM) Lab at the University of Manchester, her project idea was inspired by people affected by Parkinson's. She has involved people with the condition throughout - as volunteers forming part of the research team who give feedback and as participants in the study.

To find out more about this research, visit **beamlab.lab.manchester.ac.uk**



Meet Anne-Marie – participant in a clinical research study looking into how Parkinson's affects the way we respond to, and interact with, our environment. Anne-Marie tells us what it was like being involved in Dr Ellen Poliakoff's study.

How did you decide to take part? "I was having a difficult time coming to terms with my Parkinson's diagnosis, so I began looking for alternative ways to help myself and others.

"I attended a workshop set up by the Body, Eyes and Movement (BEAM) Lab at the University of Manchester, which I heard about through the Parkinson's UK Research Support Network.

"There, I learnt more about observation and imitation as a potential technique to improve movement in people with Parkinson's.

"It motivated me to ask questions about my own condition and began me feeling I could have some control."

○ What was involved?

"The trial took place over six weeks and involved using an app on a tablet at home. I watched videos of everyday tasks I find difficult because of the fine motor skills they require, such as buttoning a shirt, manipulating loose change and unscrewing a jar. I recorded my responses twice daily.

"Instead of rushing tasks, I took my time, imitating the techniques as best I could – this repetition invariably had an impact on my dexterity.

"On more 'off' days it was a challenge but the routine of doing the tasks twice daily motivated me to try harder. I became really motivated to complete the task, not just for the trial data but my own benefit, as I noticed I became more adept at completing the actions. "The research team was always respectful of opinions, thoughts and feelings. They explained things clearly and asked questions to tailor the observation activities to my needs, as well as their own research purpose. It was a collaborative approach."

How did you find taking part?

"I've noticed some initial improvements in using my hands. The surprising benefit to me was the improvement in my mental wellbeing. Taking part really helped me focus, stay positive and deal with my diagnosis and symptoms.

"Another surprising outcome has been an increase in my confidence, which diminished after my diagnosis. Parkinson's is often unforgiving in what it takes away from you, so it's a joyful moment when you gain something back and take control."

Have you taken part in any other research since?

"I've since been involved in a trial group with BEAM Lab looking at the effects of dance on Parkinson's.

"We recently completed a six-week pilot programme in conjunction with English National Ballet and Equilibrium Dance and Arts, which has been fascinating."

What would you say to others thinking about taking part?

"Researchers need our support to do what they do. Do your research on the research. Be curious. I have met some incredible people doing amazing things. It is such a positive thing to do."

FEATURE

Contributing to better treatments

When it comes to developing new and better treatments, clinical trials form an essential part of the research pipeline.

Taking an experimental treatment can be a big commitment, particularly as they often involve travel and require symptoms to be measured when not taking medication.

<u>Meet Michael Broad – participant</u> <u>in the PD-STAT clinical trial.</u> <u>Michael tells us about taking part.</u>

"It's fair to say my life has been full and varied. I'm always looking for stimulation and since being diagnosed in 2013, just two years after I chose to retire, I haven't stopped.

"I've taken part in many research studies, particularly online questionnaires and phone interviews. As a member of the Parkinson's UK Research Support Network, opportunities like this are emailed to me and are usually quick and easy to do at home.

"In October 2018, I will come to the end of a two-year trial called PD-STAT, which looks at statins as a neuroprotective treatment.

"The trial is 'double blind', which means neither we participants or the researchers know who is taking the statins, and who the placebo – an important part of the trial.

"I first heard about the trial in an email from Parkinson's UK, and registered my interest with Leeds General Hospital to be assessed for suitability.

"The research team hoped to find over 200 people with Parkinson's. Finding enough people to take part often causes delays in research. "At the beginning, tests were performed to establish a baseline. Some were standard examinations assessing balance, gait and walking.

"I have been continuously monitored throughout the trial, and at the end of the study will have visited the hospital eight times over the two



"The staff treat me with such respect and answer any questions I have." Michael Broad years. A few of these times my Parkinson's medication had to be stopped the night before the visit, and not taken again until after the assessments have been carried out the next day. Fortunately, this wasn't too bad for me.

"I understand that research might not be for everyone but it can't go on without people like me taking part. I feel that I can't just sit and look on. The more people who take part the quicker we can find new and better treatments.

"The results of the trial are some years away. But, I feel positive about the future of Parkinson's research – there's so much going on. We all just need to get involved." ■



FEATURE



Time to take part

Today, all over the country, clinical research studies need people to take part – but one of the problems can be finding those opportunities.

Amelia Hursey, Research Participation Lead at Parkinson's UK, explains: "A huge 97% of you told us you wanted to know about opportunities to take part in research within the first year of diagnosis.

"We won't find better treatments and a cure without people taking part in research. So we developed the Take Part Hub to make it easy for people to find out what they can take part in.

"The Hub brings many opportunities for people to take part in research into one place. Anyone can browse and connect with the latest world-leading research projects looking for participants, simply by entering a UK postcode or area. "There are opportunities for people with and without Parkinson's.

"While most studies take place in hospitals and universities, some research can happen in your own home or online. There really is something for everyone."

Help researchers find better treatments and a cure

<u>Step 1</u> Visit parkinsons.org.uk/takepartresearch

<u>Step 2</u> Enter your location or postcode.

<u>Step 3</u> Discover research opportunities.

VOLUNTEERING

Help us decide what research to fund

Did you know that people affected by Parkinson's play a vital role in awarding research grants? Find out about volunteering with the Research team and help shape the future of Parkinson's research.

e want everyone affected by Parkinson's to feel that they can get involved in the research funded by Parkinson's UK.

Every research funding application the charity receives is reviewed by both scientific experts and people affected by Parkinson's, who are known as our lay grant reviewers.

Our lay grant reviewer volunteer role enables people affected by Parkinson's to use their personal experience of the condition to help us decide which research grant applications to fund.

Only people who are living with Parkinson's, and their family members, friends and carers, can bring this vital knowledge and experience to the funding process. These volunteers help to make sure the research we fund is important and relevant to people affected by Parkinson's. Lay grant reviewers help to make sure that people affected by Parkinson's who take part in research studies have a better experience.

Their comments and suggestions for improvements help to make studies more tailored to people with the condition.

And there is no need to have any knowledge of science as we make sure that our researchers explain their work in plain English.

Lesley, a lay grant reviewer, says: "We can sit back and wait or we can play an active part in finding that elusive cure. Parkinson's research is entering an exciting time with many new ideas and research opportunities, but no one understands the condition better than those affected or caring for a loved one.

"The role of lay grant reviewer is therefore essential to ensure that the unique experience of the patient is taken into account. This is an opportunity to shape the future of Parkinson's research by sharing your perspective. The time commitment is minimal and extremely worthwhile."

Have any questions or want to get involved? Email us at **researchapplications@ parkinsons.org.uk**



YOUR THOUGHTS ON PROGRESS

Progress has changed a lot over the past 23 issues but we can only continue to improve if we get your feedback. You can fill in our survey online at parkinsons.org.uk/progressfeedback, email us your comments at research@parkinsons.org.uk or call 020 7963 9313. Or return the completed survey to Research team, Parkinson's UK, 215 Vauxhall Bridge Road, London SW1 1EV.

 How interesting do you find <i>Progress</i> magazine? Very interesting Quite interesting Some articles are more interesting than others Not interesting How easy to read do you find <i>Progress</i> magazine? Very easy to read Quite easy to read Some articles are easier than others Not easy to read
3. What do you find most interesting in the magazine?
4. What do you find least interesting in the magazine?
5. Do you have any other comments about <i>Progress</i> magazine?





We highlight three of our newest research projects that aim to tackle bladder problems, understand delirium and develop a measure that could one day be used in clinical trials.

RESEARCH





• Exploring a new treatment for bladder problems

Who? Professor Doreen McClurg Where? Glasgow Caledonian University What? £6,887 over two years

Bladder problems, such as a frequent and urgent need to pass urine, affect many people with Parkinson's. They can lead to sleep disruption, embarrassment and isolation. Current treatment options are limited. Transcutaneous electrical stimulation involves using a device to deliver small electrical impulses to the skin. This approach is sometimes used to address pain, but has not been used to treat bladder problems before.

"We will recruit people with Parkinson's and bladder problems to the study. Half will receive the active electrical stimulation, and the other half will receive a placebo stimulation twice a week for six weeks. The electrical stimulation will be applied to the ankle, close to a nerve that supplies the bladder. If we find that active stimulation reduces bladder symptoms, we hope that this kind of electrical stimulation will become available as a treatment option for bladder problems in Parkinson's." **Professor Doreen McClurg**

Ounderstanding delirium in Parkinson's

Who? Dr Rachael Lawson Where? Newcastle University What? £240,589 over three years

Delirium is a serious but often treatable condition that starts suddenly in someone who is unwell. People with delirium may appear confused, have difficulty following conversations or be unusually sleepy. They may also experience hallucinations or believe things that aren't true. Some of these features are also symptoms of Parkinson's, which can make delirium difficult to identify. This will be the first study to investigate delirium over time in people with Parkinson's admitted to hospital.

"I will find out how common delirium is in Parkinson's, clarify what the typical symptoms of delirium in Parkinson's are, and find out whether delirium is associated with poorer outcomes. I will investigate which assessments are most effective to identify delirium, with the aim of developing a Parkinson's-specific delirium tool. I will also develop educational materials to raise awareness of delirium for people with Parkinson's and their relatives and carers. People with delirium can often make a full recovery, so identifying delirium quickly could lead to improved outcomes for people with Parkinson's." **Dr Rachael Lawson**



Overloping a test to measure LRRK2 activity

Who? Dr Esther Sammler Where? University of Dundee What? £49,270 over two years

Genetic changes in the gene that makes the LRRK2 protein are a crucial player in the development of Parkinson's. These changes lead to the production of a slightly different version of the LRRK2 protein, which has a higher activity than the normal form. Therefore, compounds that inhibit the protein could be an avenue to new treatments. There are hurdles that need to be overcome before LRRK2 inhibitors can be taken into clinical trials. One barrier is that it is difficult to monitor LRRK2 activity, and therefore measure the effect of any drugs that target it.

"Recent evidence shows that LRRK2 interacts with another group of proteins called Rab proteins. Prior to this project, my focus has been setting up a blood test to measure the activity of LRRK2 on Rab proteins and the effect of LRRK2 inhibitors in blood samples. In this project, we are aiming to validate a test to directly measure the activity of the LRRK2 pathway in blood samples from people with and without Parkinson's.

A blood test such as this would be useful for measuring the impact of LRRK2 inhibitors in future clinical trials. An additional benefit is that this study would help set up more comprehensive genetic testing for Parkinson's and help make future treatments more personalised."

Dr Esther Sammler



PARKINSON'S VIRTUAL BIOTECH

DRUG DISCOVERY UPDATE

With the announcement that Parkinson's UK has committed a further £1 million to the Keapstone Virtual Biotech project, we go behind the scenes to learn more about the progress made. idden away in some of the most sophisticated labs in the country, researchers are painstakingly tweaking the structure of molecules that could become future drugs for Parkinson's. This vital stage of the research pipeline aims to take ideas for potential treatments, and develop drug molecules that are both safe and effective to take forward into clinical trials.

The starting point is normally a molecule that we know works in the right way. It may exist in nature, or be manmade, but often the effects of this first molecule are far too weak. The job of the chemistry specialists is to tweak the structure of the starting molecule, making minor alterations or substitutions, to find ways to make it more potent. In some ways, it's like playing with a sophisticated Lego set where, instead of blocks, the researchers are combining atoms in different ways to develop a range of potential drug molecules.

Having several viable molecules means if one molecule is found to have an insurmountable issue, such as serious side effects, you still have other options. It also means that later on you can choose the molecule with the best effects.

Drugs to slow Parkinson's

Supporting drug development projects is an important part of producing new treatments. So, in March 2017, we launched a new £1million project with Sheffield-based spin out company Keapstone Therapeutics. The project aims to develop drugs that combat oxidative stress and could halt brain cell death. This project was the first for Parkinson's Virtual Biotech which fast-tracks the most promising scientific discoveries to rapidly develop and test treatments with the potential to transform life for people with Parkinson's.

Our Drug Discovery Manager, Jan Kulagowski, gives us an update on progress so far.



Can you explain the project?

"The project started after a team of researchers at Sheffield University, led by Dr Richard Mead, identified a way to help protect brain cells in models of Parkinson's and other neurodegenerative conditions. What they discovered was a way to protect cells from the damaging effects of oxidative stress. Our bodies constantly produce naturally occurring molecules called free radicals simply by using oxygen in order to live. Most of the time, our bodies detoxify the free radicals that are produced to protect us from damage. But, left unchecked, these molecules can cause damage to our cells and tissues – this is called oxidative stress. We're particularly interested in the Nrf2 pathway, and potential drug molecules that interact with it. We believe it could be key to preventing oxidative stress and able to slow the loss of brain cells in Parkinson's."

What drugs interact with Nrf2?

"Broccoli, especially as young sprouts, is a rich source of sulforaphane – a molecule that has been shown to interact with the Nrf2 pathway. While sulforaphane is one of the reasons broccoli is meant to be good for us, it only has very weak activity. The challenge is to develop molecules that work in a different way and have a stronger effect on the Nrf2 pathway. The good news is we have a molecule that is a good starting point and, over the last year, we've been working on improving its potency, making it even more effective."

How have you been improving this drug molecule?

"By making small alterations to the structure of the molecule, we may see changes in how it works. They could be small or larger effects that either improve or reduce activity. Because it is hard to predict what effect a slight change may have, we have to make lots of different molecules and test them. So far, we've been highly successful. By tweaking the molecule, we have made it much better at interacting with the Nrf2 pathway. But it hasn't all been plain sailing..."

Have there been challenges?

"When it comes to treating Parkinson's, one of the key challenges is molecules need to be able to get into the brain.

Fortunately, our initial starting molecule was already able to get into the brain, so we could focus on improving its effectiveness. When you tweak a molecule to improve its potency you run the risk of reducing its ability to get into the brain. It's a fine balancing act, and there's still some more tweaking to be done, but our results so far are looking good."

What are the next steps?

"Part of what makes the Virtual Biotech special is that our hands-on funding and management approach allows us to pick up projects and drive them forward, while staying flexible. If a project is not working out, we can stop it and invest money in other areas.

Obviously, we are very happy with how this project is going. That's why we've just committed £1 million over a further nine months to continue developing drug molecules that target Nrf2. It's been challenging but progress has been made. And we hope by the end of this funding round we may have a candidate molecule to take forward to pre-clinical testing, bringing us one step closer to clinical trials."

FEATURE



What is dementia?

The word dementia describes a set of symptoms that may include memory loss and difficulties with thinking, problem solving or language.

These changes are often small to start with, but for someone with dementia have become severe enough to affect daily life. A person with dementia may also experience changes in their mood or behaviour.

Dementia is caused when the brain is damaged by diseases, such as Alzheimer's or a series of strokes. Alzheimer's is the most common cause of dementia, but not the only one.

The specific symptoms that someone with dementia experiences will depend on the parts of the brain that are damaged and the condition causing the dementia.

Dementia and Parkinson's: ask the expert

We're joined by Gemma Jolly, Knowledge Manager at the Alzheimer's Society, who answers some common questions about dementia and Parkinson's.

Why are people with Parkinson's at a higher than average risk of developing dementia?

Not everyone with Parkinson's will develop dementia, but having Parkinson's does significantly increase someone's risk of developing dementia by about six times. If you follow a group of people over time, about half will have dementia 8 to 10 years after their diagnosis of Parkinson's, rising to 80% by 20 years.

We still don't fully understand why some people with Parkinson's get dementia. It isn't entirely possible to predict who it will affect, but the risk of developing dementia is increased by several factors. These include being diagnosed with Parkinson's later in life, having the condition for a long time, or experiencing hallucinations and delusions early on in Parkinson's. Risk is also increased in those who have more severe motor symptoms or have a family member with dementia.

Recent research found that an MRI test may be able to predict which people with Parkinson's will go on to develop dementia. The team identified a specific brain region that is damaged before any thinking and memory symptoms appear.

The researchers found that people with Parkinson's with cognitive symptoms had lost more brain tissue in a structure in the brain called the nucleus basalis of Meynert, compared to those without cognitive symptoms.

The researchers compared people with Parkinson's who had cognitive symptoms to people with Parkinson's who did not. They also followed people for three years, comparing people who developed cognitive symptoms with those who didn't. Their findings suggest that damage of the nucleus basalis of Meynert predicts the development of cognitive symptoms, and may be useful for identifying people at higher risk of dementia.

What is the connection between Parkinson's and dementia?

Parkinson's, Parkinson's dementia and dementia with Lewy bodies are a group of conditions which all have the same underlying cause – Lewy bodies. Lewy bodies are small deposits of protein (mainly alpha-synuclein), which are found within nerve cells in the brain during autopsies. For this reason, conditions where Lewy bodies form are also called alpha-synucleinopathies.

The Lewy body conditions differ in how common and severe these symptoms are – for example dementia with Lewy bodies does not always have motor symptoms. The conditions also differ in the order in which symptoms occur – motor symptoms come before cognitive symptoms in Parkinson's dementia. In dementia with Lewy bodies, motor symptoms appear after (or with) cognitive symptoms.

Lewy body dementias are less common than Alzheimer's, or mixed or vascular dementia. Dementia with Lewy bodies represents 4% of all recorded dementia diagnoses (but this is an underestimate –



Lewy bodies and dementia You may have heard of Lewy bodies before – they're the sticky clumps of alpha-synuclein that form in brain cells affected by Parkinson's. We still don't fully understand their role, but their presence is linked to the loss of brain cells and they seem to spread as Parkinson's progresses.

Where Lewy bodies are found in the brain influences the type of symptoms people have. Lewy bodies in the substantia nigra (the part of the brain

it's probably more like 10-15%). Parkinson's dementia is just 2% of dementia cases.

Is there anything people with Parkinson's can do to reduce their risk of developing dementia?

This is a complicated question. We don't fully understand why some people with Parkinson's develop dementia and others do not. It's further complicated because we don't know what causes Parkinson's.

A risk factor is anything that increases a person's risk of developing a condition. For dementia there are a mixture of factors – some that can be avoided and others that are affected in Parkinson's) are linked to problems with movement. But when Lewy bodies are found in the cerebral cortext (the outer 'crinkled' layer of the brain) they are linked to cognitive symptoms – at worst, dementia.

The main Lewy body conditions often share similar symptoms such as cognitive impairment, mood disorders (including anxiety and depression), hallucinations and delusions, movement problems and sleep disturbances.

impossible to control. However, having any of the risk factors does not mean a person will necessarily develop dementia in the future.

Likewise, avoiding risk factors does not guarantee a person will stay healthy, but it does make this more likely.

In the case of Parkinson's dementia, many of the identified risk factors – for example age – can't be changed. However, lifestyle factors including smoking and hypertension may increase a person's risk of developing Parkinson's dementia.

In general, there are things which may reduce a person's risk of dementia including eating

ASK THE EXPERT

healthily, not smoking, keeping your mind active, looking after your health and staying physically active.

What are the current treatment approaches to Parkinson's dementia?

There is no cure for Parkinson's dementia, although there is ongoing research into this area. As with other forms of dementia, non-drug approaches, such as cognitive stimulation therapy, adapting the environment or providing opportunities for engagement or arts-based therapy, are important in helping a person live well with their condition.

There is usually a need for a range of professionals to be involved in supporting the person, due to the variety of symptoms they experience. Treatment should look at which symptoms the person (and those supporting them) find the most troubling, and should look at non-drug approaches in the first instance.

Someone with Parkinson's dementia is likely to already be taking a drug such as levodopa for motor symptoms. Such drugs work much better in Parkinson's and Parkinson's dementia than they do in dementia with Lewy bodies.

However, levodopa lowers levels of a chemical messenger in the brain, called acetylcholine, and so can make attention or hallucinations worse. This is a problem with medication for both Parkinson's dementia and dementia with Lewy bodies – drugs for motor symptoms tend to worsen cognition or hallucinations, and vice versa.

So, a balance has to be struck for that person, usually by trying out different drugs and combinations.

There is good evidence that the acetylcholinesterase inhibitors reduce hallucinations (and possibly improve cognition) in people living with Parkinson's dementia.

Rivastigmine is licensed and approved by the National Institute for Health and Care Excellence (NICE) for distressing hallucinations, but donepezil and galantamine may work just as well.

The use of antipsychotics is problematic and should only be used after other approaches have been tried and failed. The use of these drugs should be regularly and carefully monitored.

Are there any promising new potential treatments being developed?

There are new treatments being developed that aim to relieve the thinking and memory symptoms of Parkinson's dementia.

At the end of last year, the pharmaceutical company Eli Lilly launched a clinical trial of a drug designed to boost certain chemical messages in the brain. This aims to enhance the function of a particular type of dopamine receptor. The main effect they're looking for is an improvement in people's scores in tests of sustained attention to cognitive tasks.

It would be better to slow or stop the progression of Parkinson's altogether, which could prevent people from going on to get Parkinson's dementia. As such, there are a number of new treatments aiming to target an important part of the underlying biology of the condition, removing clumps of alphasynuclein from the brain.

What are the remaining research questions?

The relationship between Parkinson's, Parkinson's dementia and dementia with Lewy bodies is still not completely clear.

To make matters even more complex, research looking at changes in the brains of people who have had Parkinson's dementia reveals that most have some aspects of the biological changes seen in Alzheimer's too.

What causes this to happen? Does this contribute to the symptoms that people experience? And will we need to treat these changes as well as the alpha-synuclein clumps? These are just a few questions that need answers if we are to be successful in finding treatments that can prevent people from developing Parkinson's dementia.

Diets, nutrition and Parkinson's

Not a week goes by that there isn't something in the news about what we should or shouldn't be eating. But the general advice for people with Parkinson's is still the same old 'healthy, balanced

diet' – so why don't we know more about diet and nutrition?

utrition is undoubtedly important in Parkinson's and research has shown people with the condition are more likely to lose weight and suffer from malnutrition.

And there is a growing body of evidence that suggests that improving nutritional status could improve quality of life.

However, unlike with conditions like scurvy and anaemia which can be solved by upping the intake of key nutrients, the solution to Parkinson's isn't as simple as eating more citrus fruits or iron-rich foods.

Parkinson's is a complex condition that develops gradually over many years, which may involve a myriad of genetic, lifestyle and environmental factors, combined with the natural process of ageing.

This makes teasing out aspects of diet that may play a part in this process messy and complicated. And, despite decades of research, we've struggled to find conclusive

proof that any particular diet is beneficial for Parkinson's.

Let's take a look at some of the main types of studies that have been done and where the problems lie.

Studying big groups

So far, most research into diet has used the same basic approach:

- Take a big group of people (usually hundreds of thousands).
- Ask them about their diet regularly over a long period of time (usually decades).
- Then see whether any patterns linking particular dietary factors and their risk of developing a particular illness emerge.

This approach can be helpful in identifying things that affect the risk of developing illnesses. For example, eating lots of processed and red meat can increase the risk of bowel cancer.

But one of the challenges is that the patterns you spot may actually be due to something else entirely. For example, if a study

were to find that people who eat lots of caviar and drink lots of champagne live longer, healthier lives you might wonder whether other factors (such as wealth) could be at play?

Another challenge is that it can be difficult to interpret the results.

A number of studies have suggested that people who drink more milk are more likely to develop Parkinson's. But it's unclear what is causing the increased risk – could it be pesticide contamination in the milk or milk's ability to lower urate levels (known to be linked to Parkinson's)? Or, could it be explained by changes in eating behaviour in the early stages of the condition?

In the lab

At the other end of the spectrum, researchers based in the lab are also investigating the effects of chemicals that can be found naturally in our diets.

In these studies, researchers may test the effect of a dietary

FEATURE

chemical on cells in a dish, in an animal model, or in a test tube to see how it interacts with key proteins inside our cells.

The problem with this approach is that researchers will often use extremely high concentrations of the chemical in their experiment.

And this may not be possible (or even safe) to achieve through diet or supplements.

So, while this research is very interesting scientifically and could provide a route to developing new treatments, it's usually too far removed from people to be helpful as a source of nutritional advice.

What about clinical trials?

When new treatments are developed, they must be tested in people through clinical trials to see whether they are safe and effective.

With a drug, designing a clinical trial is relatively straightforward. If you have 100 participants, 50 may get the real drug and 50 a 'placebo' (an inactive or dummy version that looks exactly like the real one).

Neither participants or researchers will know who is receiving what. This helps ensure that the only difference between the two groups is the drug itself.

With a diet, things are considerably more complicated. If you are asking participants in a trial to follow a specialist diet how do you create a placebo version? And how do you 'blind' the participants to whether they are on the real diet or the placebo version?

In addition, making significant lifestyle changes – whether it's eating more healthily, quitting smoking or doing more exercise – is difficult for participants to maintain.

So, getting participants in a trial to stick to a diet can be challenging.

Time for a new approach

So far, research into nutrition and diet for Parkinson's has not provided the clear results needed to provide helpful advice to those living with the condition. It's time for something new.

A research study at Bastyr University in the US is investigating the influence of diet and lifestyle factors in Parkinson's using a very different approach.

The team is using an online survey to collect a broad range of data from people with Parkinson's and related conditions from all over the world.

Participants are surveyed every six months, answering questions about medications, diet, supplements, exercise and an array of other factors.

At the same time, they are asked to rate the severity and impact of their Parkinson's symptoms. The goal is to collect as much data as possible over a five-year period, with the hope of finding dietary and lifestyle factors that are linked with a slower progression of the condition.

The first results from this innovative study (based on data collected from over 1,000 people) were published in September 2017 and have already identified foods associated with slower and faster progression:

- Foods associated with slower progression included fresh fruit and vegetables, nuts and seeds, non-fried fish, olive oil, wine, coconut oil, fresh herbs and spices.
- Foods associated with faster progression included canned fruits and vegetables, diet and non-diet fizzy drinks, fried foods, beef, ice cream, yogurt and cheese.

It's still early days and, as with other population-based studies, there may be more to these patterns than meets the eye. But it's definitely a study we will continue to keep an eye on.

Let's take a look at some of the diets and supplements we're most often asked about by people with Parkinson's and the emerging research.



Research into diets and Parkinson's

If you have Parkinson's, there is no specific diet you should follow. Getting the right nutrition is vital, so it's really important to speak to a professional before making any significant changes. Let's take a look at the research.

<u>Mediterranean</u> diets are high in vegetables, fruits, legumes, nuts, beans, cereals, grains, fish, and unsaturated fats such as olive oil. They usually have a low intake of meat and dairy.

What does the research say?

Studies suggest that following a Mediterranean diet is linked to improved health and reduced risk of cardiovascular diseases, cancer, Parkinson's and Alzheimer's. They also suggest that the more closely you follow the diet the stronger these protective effects.

Ketogenic diets are specialist medical diets that are much higher in fats and lower in carbohydrates than typical diets. This forces the body to shift its usual energy source from sugar to fats, or ketone bodies. What does the research say?

Studies in cells and animal models suggest that a ketogenic diet may have protective effects on the brain. Results from a very small, 28-day study in seven people with Parkinson's showed some benefit in symptoms but no large, long-term studies have been carried out. So we don't know whether this diet is practical, safe or effective in the long term.

Intermittent fasting is an umbrella term for various diets that cycle between a period of fasting and non-fasting. One of the most popular is called the 5:2 diet in which people eat normally five days a week, and significantly cut their calorie intake on the other two.

What does the research say?

Studies in rats and mice suggest that restricted calorie diets or intermittent fasting regimes help to protect brain cells. But, so far, there haven't been any research studies looking at either calorie restriction or intermittent fasting in people with Parkinson's.

Low or restricted protein diet involves eating less high protein foods including dairy products, eggs, beans, pulses, fish, and meat, and eating more low-protein food such as cereal products (eg bread, rice, and pasta), fruit, and vegetables.

What does the research say?

For some people with Parkinson's, protein can interfere with how well levodopa is absorbed and can cause fluctuations in symptoms. Studies show that low protein or redistributed protein diets can be beneficial for people. However, there can be side effects including increasing dyskinesia and weight loss, which need to be carefully monitored.

What about vitamins, minerals

and supplements?

Vitamins and minerals are nutrients your body needs in small amounts to work properly and stay healthy. Most people should get all the nutrients they need by having a varied and balanced diet, but let's take a look at a few that may play a role in Parkinson's.

Vitamin D helps keep bones, teeth and muscles healthy. The body makes vitamin D when the skin is exposed to direct sunlight, but there are small amounts present in certain foods.

What does the research say?

Higher vitamin D levels are linked to a lower risk of Parkinson's and vice versa. Research in rats and mice indicates that vitamin D may have protective



properties and studies in people suggest people with Parkinson's with higher vitamin D levels tend to have better mobility. However, more research is needed to understand and confirm these potential benefits.

Vitamin B3 or niacin, is found in meat, fish, eggs and milk. Our cells convert niacin into NAD+ which is vital in a range of processes inside cells.

What does the research say?

Levels of NAD+ decrease as we age and are further reduced in people with Parkinson's. Research has also shown that people who eat more foods containing niacin may have a lower risk of developing the condition. A recent, small clinical trial of niacin showed encouraging signs of benefit and now larger and longer studies are under way.

Coenzyme Q10 occurs naturally inside the cells in the body. It's an important player in the production of energy and an antioxidant.

What does the research say?

An analysis of data from eight clinical trials suggests that Coenzyme Q10 is safe for people with Parkinson's but no more effective than a placebo in terms of improving symptoms.

Glutathione is an antioxidant that occurs naturally inside the body. It is not easily absorbed into the bloodstream though so N-acetyl-cysteine (or NAC) - a precursor that the body can convert into glutathione – is also being investigated. What does the research say?

Studies using postmortem brain tissue suggest that glutathione levels are low in brain areas affected in Parkinson's. While experiments have shown that NAC can prevent the Parkinson's-like damage to brain cells in mice. Clinical trials in people with Parkinson's are ongoing and will help us understand the potential effects.

Fish oil (omega 3) is a family of fatty acids important for the growth and development of brain cells. It is made in our bodies, but very slowly, so we mostly get it from our diet. Oily fish, such as mackerel, tuna, herring, and salmon have high levels of omega-3.

What does the research say?

There have not been any large, long-term clinical trials so far but a recent study in 60 people with Parkinson's suggested that omega-3 combined with vitamin E improved symptoms over a 12-week period. Another recent, small trial in the US is investigating whether omega-3 supplements may be helpful for dyskinesia and results are expected soon.

Curcumin is a bright yellow chemical produced by some plants. It is found in turmeric and research suggests it may have both anti-inflammatory and antioxidant properties.

What does the research say?

Studies in the lab both in cells and animals have suggested that curcumin may have potentially protective effects for Parkinson's. However, curcumin is not easily absorbed into the bloodstream and, so far, there have not been any clinical trials to see whether these effects hold true in people.

Caffeine is a chemical stimulant found in coffee, tea, cola and chocolate. As well as being a stimulant (that helps keep us awake), caffeine has antioxidant, anti-inflammatory and other protective properties.

What does the research say?

Caffeine consumption is associated with a decreased risk of developing Parkinson's. However, results published recently from a small clinical trial showed no difference in movement symptoms of Parkinson's between participants who received caffeine supplements compared to a placebo.



Trials to treatments: **GENE THERAPY**

With news that a new gene therapy trial for Parkinson's is due to start in the UK later this year, we take a look at how this treatment works and far it has come.

ene therapy, a technique first described in 1972, works by using genes as a treatment. The idea is to provide the genetic instructions cells need to change their fate. This could be by replacing a faulty gene with a functional one, or providing the instructions the cell needs to make certain protective factors.

However, getting the lab-made DNA inside nerve cells is tricky. Right now, the most effective way of putting DNA into a cell is to 'hijack' a virus. Some viruses are very good at infecting a cell by getting inside and inserting their own DNA into the DNA already in the cell. This can cause the cells to stop working or even die. Scientists have found a way to re-programme viruses by removing the part of the DNA that allows them to reproduce and cause disease – making them harmless. The trick is to let them keep the ability to infect a cell. They can then be used as a carrier to take the genetic instructions into the cell, where they are needed.

While there has been active research in this area for around 45 years, gene therapy is – for the most part – still being developed. Treatments using this technique have rarely made it past the clinical trial stages, however researchers believe they still have much potential.

How does gene therapy for Parkinson's work?

People with Parkinson's don't have enough of the chemical dopamine, as nerve cells in a specific part of the brain – called the substantia nigra – have died. Current treatments replace the dopamine

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in the brain to alleviate symptoms, but they do nothing to slow the loss of brain cells and can cause serious side effects.

One way gene therapy could work is by protecting the dopamine-producing brain cells. By targeting the underlying causes, rather than masking symptoms, this type of treatment could be the answer to slowing or even reversing the course of the condition.

Alternatively, gene therapies that increase the production of dopamine could help to alleviate the symptoms of the condition, potentially with fewer side effects. They do this by targeting only the areas of the brain that are lacking in dopamine.

UK based gene therapy research

Improving symptoms was the aim behind ProSavin – the first gene therapy for Parkinson's to make it through to clinical testing in the UK. The therapy required ProSavin to be injected into the area of the brain that was lacking dopamine to help the remaining cells increase production of the chemical. Previous trials in the US had begun to produce interesting results for the AADC gene. As the AADC protein helps brain cells convert levodopa to dopamine, the idea was that AADC gene therapy could make levodopa more effective. But ProSavin – also known as OXB-101 – went one step further as it aimed to provide cells with three genes that are vital for making dopamine: AADC, TH and GCH1.

At the time, the trial was a huge step forward in advanced gene-based treatment and received much media attention. In 2011, the *Daily Mail* featured some of the earliest results from this study, which were presented at a scientific conference:

"Some [of the participants] were able to take the bus or complete a round of golf for the first time in years."

Soon after, published results supported the excitement shown by the *Daily Mail*. And, in addition to improvements in movement assessments, patient diaries and quality of life, measures also highlighted the participants were seeing improvements in their everyday life too.

However, expectations needed to be tempered against the reality that this was still an early stage trial and longer, larger and placebo-controlled studies were needed to prove the treatment was safe and effective.

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ProSavin continued into further clinical testing and promising – albeit modest – effects were published in 2014.

At the time, researchers reported an improvement in motor symptoms in all of those receiving the therapy 12 months following treatment. And, in some participants, the effect lasted up to 48 months after ProSavin was administered.

The trial is ongoing, as participants are taking part in long-term follow up assessments. But, while this has been going on, Oxford BioMedica has been working on a new way to get genes into brain cells.

A second-generation gene therapy

The latest announcement from Oxford BioMedica relates to a therapy called OXB-102. Like ProSavin, it works by giving cells in the brain the genes they need to boost dopamine production.

And, with a new viral delivery system, it is hoped that OXB-102 may improve the symptoms of Parkinson's for a number of years following a single treatment.



Phase I trials of OXB-102 are due to begin by the end of the year in up to 30 people. These are patients associated with Cambridge University Hospital and Queen's Square Institute of Neurology, University College London.

Will gene therapy be available in my lifetime?

Progress is being made at all stages of the research pipeline. While some treatments have yet to make it to clinical trials, there is much work developing gene therapies that may one day alleviate symptoms or slow the progression of Parkinson's.

There have also been huge improvements in technology, which could allow more targeted and safer delivery of therapies into the brain.

But one question remains – if these treatments do make it to clinical trials, will the clinical trials be able to demonstrate that the treatment is working?

Recent gene therapy trials in Parkinson's have demonstrated that the technique appears to be safe, at least in the short term, but we've yet to show that it is truly effective.

The difficulties come from the fact that we can't accurately measure Parkinson's and we may not be testing treatments in those who will benefit.

But through the Critical Path for Parkinson's initiative – an international collaboration of pharmaceutical companies, regulatory agencies, universities and charities sharing data from major studies and trial – Parkinson's UK is attempting to change that.

Clinical trials are planned but, without the right measures to test gene therapy's effects, we won't be able to show that it works.

So, we need to develop these better measures fast, to improve clinical trials so that therapies in development can finally make it to the people who need them.

A brief history of Parkinson's gene therapies

NLX-P101

This gene therapy aimed to introduce a gene called GAD to brain cells to even out signalling in the basal ganglia – the circuit in the brain that controls movement. Clinical trials started in 2003, making this the first gene therapy trial for Parkinson's. While results suggested the therapy may be able to reduce motor symptoms, research into NLX-P101 has since stalled.

---- 2004 AADC

2003

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Today, research of AADC gene therapies is still ongoing, although the mechanism for getting the AADC gene into brain cells has changed since trials started. The trials at the most advanced stages are currently being carried out by Voyager Therapeutics. Positive results so far have led to the Food and Drug Administration clearing a phase II/III trial of VY-AADCO2, which is expected to start at multiple sites in the US later this year.

····· 2005 CERE-120

This was the first gene therapy of a protective factor for Parkinson's. The aim was to deliver the gene coding for the protein neurturin, which belongs to the GDNF (glial cell line-derived neurotrophic factor) family of proteins. Results from clinical trials have been mixed, even after attempts to target more regions of the brain, which has resulted in the programme being suspended.

····· 2008 ProSavin

This gene therapy incorporates three genes that are vital for making dopamine – AADC, TC and GCH1 – to help cells make more dopamine to alleviate symptoms. Results have been promising and there is ongoing follow-up of participants.

2013 GDNF

A five-year phase I trial of the first GDNF gene therapy trial began in 2013. GDNF is produced naturally inside the brain and supports the survival of many types of brain cells. The hope is that encouraging brain cells to make more of this protein may help to slow the progression of Parkinson's. This trial is still active but not recruiting and we eagerly anticipate the results.

2018 OXB-102

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Oxford Biomedica's second-generation gene therapy incorporates the three genes in ProSavin with their own technology to get these genes into brain cells. The trial is starting soon.

NEWS

RESEARC RESULT

Borrowing technology from computer games to tackle freezing

Researchers at Brunel University in London have developed a new system that uses Microsoft's Kinect to help people with Parkinson's overcome debilitating freezing episodes.

The Kinect is a unique motion sensor that allows people to play computer games using just the movement of their bodies.

It's similar to the Nintendo Wii but completely hands free as it uses a camera, depth sensor and microphone to provide full-body 3D motion capture, facial and voice recognition.

While Microsoft has recently decided to discontinue the Kinect, the system is easy to find secondhand and is now being used by researchers to monitor and detect freezing of gait in people with Parkinson's.

When it detects that someone has a freezing episode, the sensor then projects two laser lines on to the floor to help the person overcome their freezing episode and restart their walking. "We chose the Kinect because it doesn't require people to attach any sensors to their bodies so it's very practical. The other advantage is that because the technology is already so advanced it was reasonably simple and very cost-effective to repurpose it – our prototype cost just £137 to build.

"We tested the system by inviting people with and without the condition to let us know what they thought and received really positive feedback.

"The next steps are further development and testing of the system, which we ultimately hope to be able to make available to be installed in patients' homes." **Dr Amin Amini**

What is freezing?

Freezing can be one of the most challenging aspects of the condition. Many people with the condition describe freezing as like having their feet 'glued to the ground'. Once frozen, an individual may not be able to walk normally for several seconds or minutes. For more information, visit **parkinsons.org.uk/freezing**

Tackling non-motor symptoms with tech

Almost everyone with Parkinson's experiences troubling non-motor symptoms at some point – such as difficulties with memory and concentration, bladder or bowel problems, anxiety and sexual dysfunction. But many don't report them and may be missing out on vital treatment and support. Could the solution lie in technology?

Why do non-motor symptoms go unreported?

In 2014, chartered psychologist Dr Catherine Hurt and her colleagues at City, University of London received funding from Parkinson's UK.

This was to develop and test a digital approach with the aim of helping people to seek support with non-motor symptoms.

Catherine says: "The first step for us was in-depth interviews with people with the condition to gain a better understanding of what is preventing them from raising these issues.

"When we analysed the results, we found that people find some non-motor symptoms more difficult to raise than others, and we were also able to identify some of the main reasons why."

Developing an interactive website

Catherine continues: "Once we had identified the key symptoms and barriers, we developed an interactive website with tailored information, tools and resources to address these specific issues. The next step was to test whether this approach is helpful for people with the condition."

A total of 35 people with Parkinson's were recruited to the study and received access to the website. The first thing participants were asked to do when they logged in was identify non-motor symptoms that they were experiencing but had not yet spoken to a professional about.



The website provided each participant with further information about the symptom they had highlighted.

This included how commonly it affects people with Parkinson's, guidance on how to manage it themselves, and what treatments or therapies they may be able to access.

Next, participants were asked to identify the main reason they hadn't reported the symptom to a medical professional.

Depending on what they chose, participants were provided with activities and information. This included specially created videos, activities to help them weigh up the pros and cons of raising the issue, and guidance on managing their stress levels and emotions.

Finally, participants were provided with communication tools to report their non-motor symptoms. These included simple forms that participants could complete and print off to take with them to their next appointment.

Did it help people seek support?

Of the 35 people who started the study, 27 made their way through all the steps on the website. They also completed a questionnaire about the website in which most participants reported they found using it very useful.

When the research team followed up with participants again, 18 out of 20 who had completed the final questionnaire said that they had raised the symptom with their professional.

Catherine says: "We're delighted with how useful and user-friendly participants found the website, and we're especially encouraged it helped 18 of our participants to raise previously unreported symptoms with their medical professionals.

"This was a small pilot study but we believe these results provide important evidence that this kind of system can be helpful and we're very keen to take it forwards. The next steps are looking to iron out some of the technical glitches we've had with the website, and look towards doing a larger study.

"Our ultimate goal is to develop practical and user-friendly tools that can be made available widely to people with Parkinson's. That will help them to access the right treatments, care and support for their individual symptoms."

Clearing toxic iron – the key to better treatments?

Higher levels of toxic forms of iron are found inside the brain cells affected in Parkinson's and may play an important part in the damage that occurs in the condition. So finding ways to neutralise toxic iron is an exciting potential route to better treatments.

In this nine-month project, Dr Charareh Pourzand and her team at the University of Bath made new molecules with the ability to 'mop up' toxic iron and tested them in Parkinson's-like cells grown in the lab.



Encouragingly, one of their molecules reduced cell death by almost half and helped protect the mitochondria (the energy producing batteries of the cell).

The team now plans to test their molecules further in an animal model of Parkinson's. It also hopes that the molecules could provide a blueprint for developing drugs that provide the same protective benefits for people with the condition.

Investigating the role of calcium in Parkinson's

Calcium is not just important for healthy bones and teeth. It also helps control the electrical activity of brain cells and is involved in making and releasing the chemical messengers (like dopamine) that brain cells use to communicate. But the precise role of calcium in Parkinson's is still a mystery.

In this project, a PhD student in Professor Sandip Patel's lab at University College London investigated how calcium activity changes in Parkinson's. In particular, they looked at the role of lysosomes – the tiny waste recycling centres inside cells that help to control calcium levels by storing and releasing it when needed.

They discovered that lysosomes look different in Parkinson's and release too much calcium in both rare genetic forms of the condition and the common, non-inherited form.

These findings suggest calcium may be involved in brain cell death and drugs that reduce calcium release could have therapeutic potential.

A new technique to see into the human brain

Studying human brain tissue has provided some of the most important clues to what may go wrong inside the brain in Parkinson's. Traditionally this involves slicing tissue into wafer-thin slivers and studying these tiny fragments under the microscope. But a brand new technique is revolutionising this.

The future is three-dimensional

When it comes to understanding the brain, two dimensions only go so far. Brain cells are large, complex and highly connected to their neighbours, so being able to study cells from every angle is important.

Until now, creating a 3D picture meant cutting many wafer-thin slices and using a computer programme to put the individual slices back together, like a giant 3D jigsaw puzzle. This was a laborious task that often resulted in a less-than-perfect picture.

Recently, researchers have developed a new way of making small pieces of tissue transparent so microscopes can be used to zoom in on cells at the microscopic level in 3D. This cutting-edge technique is called CLARITY and works by applying chemicals that remove molecules that make tissue opaque, such as fats and waxes, but leaves cells and their connections intact.

Bringing CLARITY to the structure of the human brain

CLARITY was originally developed using brain tissue from mice and rats. But further development was needed before it could be used in human brain tissue.

Now researchers at Imperial College London and the University of Hong Kong have developed a new tissue-clearing solution, called OPTIClear, that makes human brain tissue transparent.

Using the new technique in tissue from the Parkinson's UK Brain Bank is allowing them to see the brain in more detail than has ever been possible before. And it will help us uncover vital new clues about the condition.

Read more about the work of the Brain Bank on page 34. \blacksquare

BRAIN BANK

HOW BRAINS POWER PARKINSON'S RESEARCH

Weighing in at around 1.4kg, the human brain is our most precious and mysterious organ. Despite centuries of research, we still know surprisingly little about how our brains work or how to fix them when things go wrong in conditions like Parkinson's. ne of the reasons for this is that during life, the human brain is very difficult for scientists to study. Unlike some other organs, we cannot simply take samples to study under the microscope, and brain scanning techniques (although getting better all the time) are limited. In addition, complex brain conditions – such as Parkinson's, dementia, depression and schizophrenia – are pretty unique to humans, which makes them difficult to study in animals.

All this means that studying human brain tissue that is donated for research is still one of the most important ways we can study Parkinson's. Research made possible through the donation of brain tissue has already led to some of the most crucial advances in our understanding of Parkinson's, and resulted in new treatments being developed and tested.

Donated tissue is leading to the discoveries which will help us find a cure and improve the lives of the 145,000 people living with Parkinson's in the UK.



KEY DISCOVERIES

1912 Sticky clumps of proteins, Lewy bodies, first found in brain cells.

1960s Substantia nigra pinpointed as main brain area damaged in Parkinson's.

1980s Scientists identify key problems inside the brain cells affected.

1997 Alpha-synuclein – the key protein involved in Parkinson's – is revealed.

2000s Clues uncovered that damage may spread gradually through the brain.

BRAIN BANK STATS

- ✦On average, the team collects 7 brains per month for research.
- There are currently over 1,000 brains stored at the Brain Bank.
- More than 200 research projects have requested tissue since 2009.
- + Almost 7,000 people, with and without Parkinson's, are signed up to the donor register.



What is the Parkinson's UK Brain Bank? The Parkinson's UK Brain Bank, based at Imperial College London, collects precious tissue from people with and without Parkinson's who have decided to leave their brains to Parkinson's research. The tissue is supplied to researchers studying Parkinson's all over the world, enabling research that is helping us uncover discoveries that will lead to better treatments and a cure.

What tissue is collected for research? The Brain Bank team collects the entire brain, the entire spinal cord and a sample of cerebrospinal fluid – the clear, colourless liquid that surrounds the brain and spinal cord. If a full postmortem is being conducted by the hospital, or on the order of the coroner, we may also collect samples of other tissues.

As more is learnt about Parkinson's, and other parts of the body that can be affected, in future samples of other tissues, such as from the gut or of skin tissue, may be important for research.

QCan I donate other parts of my body through other donor schemes as well? Yes, the Brain Bank can work with other UK organ donor schemes, including the NHS Organ Donor

Register, for transplantation and research. Just let them know which other donor scheme you are registered with and they can update your record. Unfortunately, it's not possible to donate to both the Brain Bank and a whole body donation scheme as these require the whole body including the brain.

QI don't have Parkinson's. Could my brain still help researchers?

Yes, researchers urgently need brains without Parkinson's – also called 'control' brains. Control brains are essential for experiments. Scientists can only work out what is going wrong in Parkinson's by comparing control brains with the brains of people with Parkinson's.

What about people with other Parkinson's-related conditions?

The Brain Bank also collects tissue from people with Parkinson's-related disorders, including multiple system atrophy and progressive supranuclear palsy. Studying brain tissue from people with these conditions – and comparing it to tissue from people with Parkinson's – is absolutely crucial for us to understand the similarities and differences between them and develop new and better treatments.

Find out more

Find out more about the Parkinson's UK Brain Bank and how to register at **parkinsons.org.uk/ brainbank.** Or contact the Brain Bank directly at **brainbank@imperial.ac.uk** or on **020 7594 9732.** Every hour, two people in the UK are told they have Parkinson's – a brain condition that turns lives upside down, leaving a future full of uncertainty.

Parkinson's UK is here to make sure people have whatever they need to take back control – from information to inspiration.

We want everyone to get the best health and social care. So we bring professionals together to drive improvements that enable people to live life to the full.

Ultimately, we want to end Parkinson's. That's why we inspire and support the international research community to develop life-changing treatments, faster. And we won't stop until we find a cure.

Together we can bring forward the day when no one fears Parkinson's.

Parkinson's UK 215 Vauxhall Bridge Road London SW1V 1EJ

Free confidential helpline **0808 800 0303** (Monday to Friday 9am–7pm, Saturday 10am–2pm). Interpreting available. NGT Relay **18001 0808 800 0303** (for textphone users only)

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