# Parkinson's: let there be light

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By Suvi Mahonen

Margaret Jarrett was diagnosed with Parkinson's disease eight years ago. And although she was bothered by many of the symptoms that commonly afflict Parkinson's sufferers — resting tremor, uncertain gait and terrible nightmares — one thing that bothered her most was the loss of her sense of smell.

An avid gardener, she took great pride in her rose garden, but being unable to inhale the flowers' perfumed scent really got her down. "You take something like your sense of smell for granted," said Mrs Jarrett, 73.

"You don't realise how precious something is until it's gone."

Parkinson's disease is a combination of movement disorders including resting tremor, muscle rigidity, impaired balance and slowness of movement. It can also cause neurological problems such as depression, insomnia, memory loss and confusion.

Its cause is unknown but it is associated with dopamine depletion and the destruction of neurons in the basal ganglia region of the brain.

The current mainstay of treatment for Parkinson's disease involves physical therapy and medications that act to increase dopamine levels in the brain. One relatively new avenue of potential treatment for the disease is exposure to infrared light therapy.

In 2017, I wrote an article published in The Weekend Australian Magazine titled "Let there be light" about a group of patients in Tasmania who were trialling infrared light therapy for their Parkinson's disease.

The response was overwhelming, with scores of people contacting me, the newspaper and researchers named in the article, to request further information.

One person whose interest was piqued was Olivia Nassaris, the chief executive of Parkinson's South Australia. "When the article was released, it created this massive buzz and I had so many members of my community wanting more information about it," she told me.

Ms Nassaris contacted Ann Liebert, co-ordinator of photomolecular research at the Australasian Research Institute, Sydney, who informed her of an upcoming planned trial on infrared light therapy for Parkinson's disease.

Ms Nassaris subsequently persuaded the board of Parkinson's South Australia to partially fund the trial, on the understanding that at least some of the participants would be from South Australia. In addition to assessing the effectiveness of infrared light therapy for Parkinson's disease, Dr Liebert also wished to see if exposure to infrared light could modulate the gastrointestinal tract's microbiome in humans.

The science

The gut's microbiome — composing the trillions of bacteria, fungi and protozoa from hundreds of different species that normally inhabit our gastrointestinal tract — has come under increasing scientific attention over the past decade, with links being established between the microbiome and a number of conditions including obesity, Type 2 diabetes, cardiovascular disease and depression.

Several studies have also observed that the gut microbiome is markedly altered in patients with Parkinson's disease and that faecal microbiota transplantation can have a protective effect in animal models of Parkinson's.

The reason for this is unknown; however, an interesting observation is that another common pathology seen in Parkinson's disease is the accumulation of misfolded αa-synuclein proteins, called Lewy bodies, in the brain.

It has been shown that certain sensory cells of the gut contain αa-synuclein. Researchers have hypothesised that it is possible that abnormal forms of the αa-synuclein protein could travel from the gut to the brain through the vagus nerve, a phenomenon that has been shown in animal models of Parkinson's.

Further support for this theory comes from findings that people who have had a surgical vagotomy — where branches of the nerve are cut — have a lower lifetime risk of developing Parkinson's.

"We know that infrared light can reduce Parkinson's symptoms and offer protection to brain cells. So, we wanted to test if it could modulate the gut's microbiome as well," Dr Liebert said.

One of the principal researchers in Dr Liebert's planned study, Daniel Johnstone, scientist and lecturer at the University of Sydney's Bosch Institute, had previously undertaken a study showing that exposure to infrared light altered the gut microbiome in mice. "One possibility might be that we're

somehow influencing the microbes in the gut, and that's having an effect on the brain," Dr Johnstone said.

Based on the mouse study findings, Dr Liebert and Brian Bicknell, honorary fellow in the faculty of health sciences at the Australian Catholic University, conducted a case study last year that showed that infrared light could modulate the human microbiome as well.

In the study, a subject received infrared light therapy to the abdomen three times a week for 12 weeks. Faecal sampling showed an increase, after therapy, of some bacteria that are considered beneficial to the gastrointestinal tract, including Akkermansia muciniphila, Bifidobacterium and Faecalibacterium.

Dr Liebert wished to see if this finding could be replicated in patients with Parkinson's and a dozen participants each from Sydney and Adelaide were selected, including Mrs Jarrett.

The findings

Provisional results, from the first half-dozen Adelaide participants to have their gut microbiome analysed, before treatment and 12 weeks after treatment began, have been promising.

Cardiac Health Institute medical director and professor of cardiology at Macquarie University, Hosen Kiat, who oversaw the trial, told The Weekend Australian that the six patients put through a similar protocol as the mice showed an increase by up to 20 per cent "in the favourable microbiome which is associated with obesity reduction and short-chain fatty acid production''.

The bacteria associated with rheumatoid arthritis, Crohn's disease and insulin resistance also "all decreased".

Mrs Jarrett regained her sense of smell. "For the last three years I haven't been able to smell flowers," she said. "But several weeks into the trial I started to smell my roses, daphnes and gardenias again and it was wonderful."

Another participant, Barry Weldon, 70, had a similar experience. "My sense of smell improved significantly," he said. "One day I walked into the house and for the first time in a long time I could actually smell the soup my wife was cooking."

Ron Till, 68, had an even more dramatic improvement. "The trial gave me the ability to sleep again," he said. "It was amazing."

Mr Till's neurologist cautioned him not to get his hopes up before the trial but changed his mind when he saw the results. "He told me it was voodoo medicine and probably wouldn't work," Mr Till said. "But after the trial I went back for my three-monthly assessment with him, and he said to me: 'You're - actually testing better than when you first started with me 10 years ago.' "

Retired geologist Sean Kennedy, 76, also experienced an improvement in his co-ordination and balance. "My juggling skills have improved," he said.

In a review published this week in Photobiomodulation, Photomedicine, and Laser Surgery, titled Photobiomics: Can Light, Including Photobiomodulation, Alter the Microbiome?, Dr Liebert and her co-authors acknowledge that while the exact mechanism by which light therapy alters the microbiome is unknown, there is definite potential in light therapy.

"The ability of PBM (light therapy) to influence the microbiome (if proven to be applicable to humans) will allow an additional therapeutic route to target multiple diseases, including cardiovascular disease and Parkinson's disease, many of which have thus far eluded effective treatment approaches," the paper concludes.

The future

Professor Kiat is excited by light therapy's potential. "If we can create non-invasively a metabolically healthier microbiome through this extremely cheap and easy way, then inflammatory diseases and neurodegenerative diseases should be positively influenced," he said.

Gold Coast-based GP Mark Jeffery is a clinician who has been using lasers in his practice for more than four years. He says the research supports the use of light therapy for a wide range of diseases including Parkinson's, Alzheimer's, depression and chronic pain. "The reality is there are no real side-effects from low-level laser therapy and it's one of the safest treatments you can ever do," Dr Jeffery said.

Dr Liebert said the promising results seen thus far would inform a large, double-blind randomised control trial planned for 2020. "It has the potential to apply to huge fields of medicine," she said.

Mr Weldon's neurologist, Chris Kneebone, is keeping an open mind on the potential of infrared light therapy. "We all just have to wait and see what the trial results tell us," he said.

He had advice for people who wished to give it a try for their Parkinson's. "If you want to give it a go, give it a go," he said. "I've got no reason not to recommend it, but at this stage I've got no reason to think it is helpful either."

As for Mrs Jarrett, she has no doubts that infrared light therapy has helped her. She is enjoying pottering around in her garden again and has more energy than she has had for a long time.

"I feel like I could take on the world again," she said. "My garden has never looked better."