hands-2906458

A truly global effort to battle PARKINSON'S DISEASE

The battle against Parkinson's disease has in recent years gone truly global, with South African doctors and researchers collaborating with colleagues from all across the world – showing the reach and strength of collaborative science.

Diseases that arise from the death of neurons within the brain are called neurodegenerative disorders. Parkinson's disease (PD) is a complex neurodegenerative disorder that affects dopamine-producing neurons in a region of the brain called the substantia nigra, shown in green (Figure 1). The death of these neurons and subsequent reduction in the hormone dopamine leads to movement problems such as rigidity, tremors, difficulty standing, and overall slow movement. The disorder is also considered degenerative as the symptoms get worse over time requiring more specialized care. There is no cure available for the disease with only so-called non-palliative treatments available, those that treat the symptoms of the disease rather than the cause.

PD is the result of the complex interplay between environmental factors, ageing, and genetic factors (Figure 2). Most PD cases (~ 90%) are sporadic, meaning that there is no family history of the disorder. Therefore, it is difficult to determine the underlying causes of the disease. As a result, researchers often study PD cases with a genetic cause, which relates to a person's specific genes.

When an individual is born, they inherit their genes equally from their parents. We know that some diseases occur more commonly in people that carry certain genetic abnormalities. For example, a child whose parents have

Figure 1: Section of the brain showing the location of the substantia nigra (green)

Type I diabetes is more likely to develop this disease themselves. A similar trend is seen in PD, whereby people with the disorder may have inherited a genetic abnormality from one of their parents that have the disease which made it more likely that they would get the disorder. These individuals can be useful for genetic studies which aim to better understand the causes of PD.

To study individuals with PD, they are recruited along with any of their family members that also have PD. The

DNA of these individuals as well as their affected family members are analyzed to find any genetic abnormalities. This approach has been relatively successful and has identified several genetic abnormalities in genes that are associated with PD, such as *SNCA, LRRK2, PINK1*, and *PRKN*. Analysis of these and the other genes identified has led to a better understanding of several of the cellular pathways underlying the progression of PD, improving our overall knowledge of the disorder.

However, to date, these PD genetic studies were mainly performed on European populations. Due to the early migration of populations out of Africa, each population has their own distinct genetic heritage and single DNA base changes, called single nucleotide polymorphisms (SNPs). Therefore, results from one population are not always relevant to another. This is important as the underlying cause of PD in these populations may be different from European populations and therefore treatments for PD may not be as efficient.

Our research group at Stellenbosch University focuses on studying PD in Sub-Saharan African (SSA) populations. There is a rich genetic diversity in these populations. Indeed, in PD, we and a few other African researchers have shown that known PD genes found in European populations are not often found in SSA populations. Therefore, there is an urgent need to do more genetic research on under-represented populations.

In an effort to do this, large worldwide collaborative groups studying PD have been established. One of these, the Global Parkinson's Genetics Program (GP2) is a collaborative program which aims to better understand the genetics of PD by studying diverse patient groups. The program has acquired cohorts of PD patient data from 56 unique locations around the world (Figure 2). They will be sequencing the DNA of these individuals to find genetic abnormalities. Approximately 160 000 samples are expected, making GP2 one of the largest collaborative efforts examining PD. Our research group and several others across Africa will be sending samples from their local populations to GP2 for sequencing. This should hopefully greatly improve our knowledge of PD in under-represented populations.

Large-scale collaborative science is the future of genetic research, and of research in general. It allows for the sharing of ideas and findings and a greater availability of resources. However, we always have to remember that the most important aspect of PD research is the patients. These collaborations would not be possible without the willingness of PD patients to participate in genetic studies. We are immensely grateful to all the patients that have participated in our studies over the years.

We encourage you to speak to your friends and family members and spread the word on this debilitating disease. Unfortunately, the symptoms of this disease are often confused with normal aging due to people being unaware of PD. By spreading the word and encouraging others to do the same, you might be able to improve the quality of life of people who unknowingly have PD.

If you or any of your family or friends have questions or are interested in finding out more about PD or our research, more information and our contact details are available on our university website: https://www.sun.ac.za/english/faculty/healthsciences/Molecular_Biology_Human_Genetics/parkinsonsdisease.

Article written by Katelyn Cuttler, Kathryn Step and Jessica Burns from the Parkinson's Disease Research Group of the Division of Molecular Biology & Human Genetics at Stellenbosch University.

Figure 2: World map showing the location of all the contributing countries involved in the GP2 initiative