Mining for clues: New DNA mapping project to discover the causes of MND launched in Ireland

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The Irish arm of a new worldwide project which will dig deep into thousands of DNA profiles in order to discover the genetic causes of Motor Neurone Disease (MND) has been launched in Ireland by Professor Orla Hardiman's team of neurologists and geneticists in Trinity College Dublin.

With scientists certain that most forms of MND have a genetic basis, a team of international collaborators, including a team from Trinity's newly established Academic Unit of Neurology, have begun an unprecedentedly large scale genetic mapping project called Project MinE, which will map the DNA of at least 15,000 people with MND and 7,500 control subjects (healthy individuals without the disease). The Trinity Neurology team is planning to sequence at least 400 genomes (full DNA profiles) from MND patients and over 200 control genomes from all parts of Ireland.

More than 200,000 people worldwide are living with MND, a progressively degenerative neurological disease which affects about 300 people at any given time in Ireland, with some 110 new cases reported each year. While scientists and clinicians know the cause of MND in about 10-15% of patients with the disease in Ireland, the cause for the remaining 85-90% remains unknown, but is thought to be due to a combination of genetic and environmental factors.

The scientists will perform comparative analyses between MND patients and control subjects to uncover associations between specific variations or mutations in genes and different forms of MND. By examining the genomes of thousands of MND patients and controls in minute detail the ground breaking research will open up new opportunities to discover the various genes that cause different types of MND.

Through Project MinE, people in Ireland have a chance to make a unique and direct contribution to this important scientific research by sponsoring the mapping of these DNA samples. On the project's website (www.projectmine.com/country/ireland), visitors can opt to donate an amount of their choosing or sponsor a single chromosome or even a full DNA profile. 100% of all donations and funds raised for Project MinE will go directly towards the mapping and analysis of DNA profiles.

The samples that are collected will be profiled with the aid of whole genome sequencing techniques, using DNA extracted from blood samples. In 2001, the first full genome was sequenced at a cost of about 2.7 billion euros (in today's money), involving thousands of scientists and taking ten years. Huge improvements in the technologies used allows the Project MinE team to undertake this ambitious project today - a single genome can now be sequenced in one day, in one lab, at a cost of about two thousand euros.

The information Professor Hardiman's team gleans from the DNA profiles will be used in their research in Ireland and all data generated as part of the overall worldwide collaboration will be freely exchanged amongst those working on Project MinE. The genome sequences from control subjects will also serve as a rich resource of Irish genetic data for scientists and clinicians working on other disease areas which may have a genetic basis such as dementia, Parkinson's, diabetes, autism and some cancers.

Professor of Neurology in Trinity and Consultant Neurologist at Beaumont Hospital, Orla Hardiman said: "Ireland is a very good place to do this type of research. While we have a smaller population than colleagues in mainland Europe or the US, this can be used to our advantage as the complexity of the genetic background is lower which simplifies the search for disease genes. Furthermore, the genetic substructure of the population is already well understood, thanks to work in Professor Dan Bradley's group in the Smurfit Institute of Genetics in Trinity. The relatively small size of our island also allows us to uniquely identify people who are distantly related to each other, which can help when studying rare genetic variations in people with diseases like MND."

She continued: "Understanding the genetic substructure of the Irish population is valuable in general as we enter an era of personalised medicine, as we expect that new drugs for disease like MND, Parkinson's and other related conditions will be targeted to different genetic subgroups. The data generated by Project MinE in Trinity will be available to our international collaborators in MND across the world, as will theirs for us."

"But perhaps more importantly, the Trinity data will be shared with our colleagues and collaborators in Ireland who are engaged in similar research into different diseases. This approach will allow Irish researchers to build on the existing world class expertise in genomics within Trinity, and will provide superb training opportunities for younger scientists interested in exploring the huge potential of integrative genomics."

Dr Russell McLaughlin Post Doctoral Researcher in the Academic Unit of Neurology and Smurfit Institute of Genetics said: "We know that there are multiple genetic factors that contribute to people developing MND and that with complex diseases like MND it is often a

combination of these genetic factors that leads to the development of the illness. We also know that some of these genetic mutations can also be found in healthy individuals who never develop MND. Because of this complexity, it is imperative for us to compare as many genomes from MND patients with control subjects as possible, and to examine the genetic differences that lead to variability in the symptoms and progression of individual patients. This will allow us to come to a better understanding of the genetic causes of MND and it subtypes. The more profiles we study, the more trustworthy the results of our research will be."

Dr Alice Vajda, Research Coordinator at the Academic Unit of Neurology, Trinity said: "Project MinE is an important component of the work of the Irish MND research group, building on our established expertise in MND genetics. In 2006 we showed that the gene ANG is an important genetic modifier in MND. We have also shown that genetic admixture (populations of multiple different ancestral origins) is likely to be protective in MND, and that some neuropsychiatric conditions occur with higher frequency in MND families, suggesting a commonality in genetic susceptibility between MND and conditions like schizophrenia, bipolar disorder and autism. The Irish population is genetically homogeneous and we have a long-established detailed register of clinical information on patients with MND in Ireland. Through Project MinE, our ongoing work in the genetics of MND in the Irish population is therefore likely to provide further important insights into MND that can in turn translate into earlier diagnoses and new treatments."

More information: www.projectmine.com/country/ireland/

Provided by Trinity College Dublin