

Profiling circulating serum miRNAs as potential biomarkers for patients with syndromic mitochondrial diabetes mellitus

Mitochondrial diabetes mellitus is a form of monogenic diabetes caused by mutations in mitochondrial DNA (mtDNA). Mutation in mtDNA can lead to diabetes by damaging the cells that produce insulin (β -cells) and may be accompanied by insulin resistance. Patients often have symptoms of syndromic conditions such as MIDD (maternally inherited diabetes and deafness) or MELAS (mitochondrial encephalopathy, lactic acidosis and stroke-like episodes), in which diabetes occur with other symptoms including hearing loss, muscle weakness, neurological issues and heart problems.

Even though we have genetic proof of the m.3243A>G variant (most common mitochondrial mutation), it is still hard to predict what symptoms individual patients will develop, or how the disease will progress. Tests that check for signs of illness in the blood are not very reliable. So, there is an urgent need for new, non-invasive ways to measure how severe and how quickly mitochondrial diabetes is getting worse.

Recent studies suggest that certain molecules (microRNAs) in the blood may be a sign of problems with the mitochondria. These molecules could be used as a medical marker for these problems. These molecules have already shown that they can be used to diagnose and predict the course of cancer, heart disease and neurological disorders. They could also offer similar insights into mitochondrial disorders.

The aim of our project is to find out if there are any special types of miRNA in the blood of people with a m.3243A>G mutation and diabetes. We will compare these molecules with those found in the blood of people without diabetes who are the same age and sex. We will use next-generation sequencing (NGS) to create a detailed catalogue of all detectable miRNAs in serum. We will then look at how these patterns are connected to how bad the illness is, how the body processes glucose, and other signs of metabolic disease.

This study will be one of the first to look at how miRNAs are involved in mitochondrial diabetes mellitus. Our ultimate aim is to find a specific miRNA that can help us diagnose and predict the course of mitochondrial diabetes, and to deepen our understanding of the molecular mechanisms behind it.