Multiple sclerosis (MS) is one of the most common and crippling diseases of the nervous system. It is a particularly important issue, because it affects mainly young people - MS is usually diagnosed between age 20 and 40. The disease is the most common cause of nontraumatic neurological disability in young people. The prevalence of MS is about 1/1000, and affects approximately 2,5 mln people worldwide. Poland is a country with a high incidence of MS.

Until recently, medicine had very few achievements in the field of treatment of MS, not having drugs that could slow down the progression of the disease. In the past 20 years, however, there has been a great progress in this field. It stems from the introduction of new diagnostic techniques and knowledge of some immunopathological mechanisms of the disease.

The significant problem is capricious and unpredictable course of the disease, which forces scientists to further exploration of biomarkers that would be prognostic. Further research is needed to allow better understanding of the mechanisms of the disease and ultimately implement a satisfactory treatment.

One of the most important discoveries in recent years in the field of epigenetics was identification of the group of short non-coding particles called microRNA (miRNA). It is believed that they may play a key role in the immunomodulation and regulation of immune cells with a significant influence on the development of an autoimmune reaction. Some miRNAs have been associated with regulation of autoimmune demyelination in experimental autoimmune encephalomyelitis in mice (Experimental autoimmune encephalomyelitis - EAE), as well as in patients with MS.

CircRNAs are a class of non-protein-coding RNAs (ncRNAs) that recently re-grabs the attention of scientists. They were discovered over 20 years ago, yet until recently being considered splicing errors, or molecules characteristic of only a few pathogens. Recent work has demonstrated the presence of thousands of endogenous circRNA in many organisms. It is believed that some of them may regulate the function of miRNAs and play a role in the control of transcription. They regulate gene expression at the transcriptional level or post-transcriptional by interaction with miRNAs or other molecules. They are called "natural sponges for miRNA". They are very stable molecules.

Analyzes indicate that circRNAs may have an impact on disease in humans. It is believed that they may be related to the development of cancer. Their function has been implicated in Parkinson disease, stress handling, brain development and cellular proliferation. Furthermore, it was found that specific circRNAs are less abundant in the hippocampal regions in patients with Alzheimer disease. Furthermore, circRNAs' involvement in prion disease is speculated. The formation of circular forms might enhance the disease phenotype in patients with a dystrophinopathy.

We plan to analyze circRNAs in peripheral blood cells of 80 subjects: 20 healthy controls and 60 MS patients (20 patients with relapsing-remitting course of the disease (RRMS) with clinical exacerbation (relapse), 20 patients with relapsing-remitting course of the disease (RRMS) with remission (at least 30 days since the end of last relapse), 20 patients with progressive course of the disease (primary progressive MS [PPMS] or secondary progressive MS [SPMS]).

We believe that our research may significantly contribute to understanding of the mechanisms leading to autoimmune demyelination. In future it may provide a biomarker for monitoring disease, clinical status as well as a potential target for therapeutic intervention in MS.