Abstract

In this thesis the importance of studying genetically determined rare diseases is described and current methods and options to determine their genetic causes are evaluated.

The introduction describes the definition of rare diseases and the reasons why we study them. Currently it is known about 8,000 diseases which are caused by functionally serious mutations in one or more genes. The clinical symptoms of genetically caused rare diseases and the results of common functional and biochemical tests do not allow the exact diagnosis in most cases. The absence of the diagnosis and the causes of diseases reduces the quality of life of patients and their families. The determination of genetic causes allows accurate classification of studied cases and it is a base for qualified genetic counseling and prevention of rare diseases in the families.

The next chapters describe the methods of DNA analysis (DNA sequencing using different methods), the possibilities of finding the genetic cause of a disease and show the basic approaches to the study of functional impact of the mutations.

The practical use of these methods is shown in the case of two siblings with delayed psychomotoric development, special hair quality (*pili torti*), hearing impairment and hyperuricemic nephropathy in which the genetic analysis revealed the mutation in the gene *RMND1* as the cause of the disease.