Mitochondria are organelles of eukaryotic cells that primarily provide energy metabolism, but also participate in metabolic processes such as biosynthesis of amino acids, heme groups, Fe-S clusters etc. Mitochondrial disorders represent heterogeneous group of diseases which can occur in both child and adult life. They affect various tissues and organs in different ways, most often manifesting themselves as disorders of nervous system, skeletal muscle, liver, kidneys or endocrine system. Mitochondrial DNA deletions contribute to pathogenesis of many of those diseases and they are a symptom of several defined syndromes. They most likely arise as a result of replication stalling resulting in a double strand break of DNA. This can be caused primarily by pathogenic changes in replication apparatus and nucleotide metabolism proteins. The aim of this work is to summarize the knowledge about mitochondria and structure and replication of their genome, but also to create a summary of the most important proteins whose mutation leads to mitochondrial diseases accompanied by deletions in mtDNA and to outline the mechanism by which they arise.