SUMMARY

At the beginning of the seventies, a new branch of genetics named genetic engineering, was developed. It became possible to introduce precise changes in genetic material and to transfer genes from one organism to another. The classic example of a useful genetic manipulation is the construction of the bacterial strain containing the human gene encoding for insulin, which can be used for treating diabetes. Previously, it was obtained from the pancreases of pigs and cattle, now it is easily available by extraction from bacteria growing in huge fermenters.

Quite recently, a new, powerful method of gene engineering was developed. The method, named CRISPR-Cas, is an efficient and reliable way to make precise, targeted changes to the genome of living cells. CRISPR (Clustered regularly interspaced short palindromic repeats) and CRISPR-associated (Cas) gene coding for nuclease are essential in adaptive immunity of bacteria, enabling the organisms to respond to and eliminate invading genetic material. Using the CRISPR-Cas technique, one can precisely destroy the target gene or change a mutated gene into the wild type one. It is expected that the technique will be used to "repair" genes responsible for hereditary diseases. A group of Chinese scientists undertook the first trials and injected a person with cells that contain edited genes. They manipulated genes responsible for cell proliferation and delivered them to a patient with aggressive lung cancer. The results were promising and there are plans to use the same technique, in both China and the US, for treatment of patients with other types of cancer.

Improvement of methods of genetic engineering together with methods of DNA isolation and sequencing, made it possible to examine genomes

(aDNA) of ancient plants, animals and humans. This allows us to study the process of evolution at the DNA level. The genomes of animals such as mammoth, cave bear, woolly rhinoceros or moa have been sequenced, as well as genomes of people belonging to ancient cultures, which enables us to solve mysteries concerned with the ethnicity of our ancestors, to identify bacterial species which caused the historic plagues, and to study evolutionary relations between various species.

aDNA studies are of great importance in forensics. They allow identification of the criminal based on sequence of DNA isolated from blood, hair or even very small fragments of other tissues left at the site of crime. aDNA analyses make it possible to return to crimes which happened many years ago.

The book *Ancient DNA and Genetic Engineering* should help the reader to become familiar with the wide possibilities of the genetic engineering and its various applications.