



Genetic engineering as a threat to the safety of the population and the environment

Introduction

Genetic engineering is one of the most important scientific inventions influencing our lives on a daily basis. Since the 1970's, when the first genetically modified crops were introduced, genetic engineering has met with worldwide concerns. Yet still the discovery has saved lives and overall has brought many advantages. It has dramatically changed the research fields of living organisms, such as plants, animals and micro-organisms.

What is genetic engineering?

Genetic engineering is a microbiological technique through which a specific gene of a particular characteristic, from a chromosome of one organism, is inserted into the DNA of another organism (perhaps of a different species). The transferred gene produces the same characteristics. This is done by special enzymes. The implementation can be done at a very early stage of the organism's or plant's development.

What advantages does it have?

An answer to such question differs, based on which field of application we are concentrating on. It has been used especially in agriculture, medicine, research and industry.

The most controversial area of genetic modification (or GM) use is agriculture. The original reason for producing genetically modified plants was protection of crops. GM allows them to be resistant to different types of diseases caused by insects or viruses. At the same time they can survive the use of herbicides. Some may be even modified in order to survive in specific environmental conditions. Their growth speed is accelerated. GM crops have increased shelf life. They often have much better nutritional values. They can be used to produce biofuels.

Production of GM crops has helped economies of developing countries. In 2012, there has been 28 countries producing GM crops, from which 20 were developing countries. They held a majority in the amount of crops produced. Since GM crops are as any other traded internationally, they support economies worldwide.

In medicine, genetic modification has helped in developing drugs. It has also supported mass production of many, for example insulin. Gene therapy, a method used for treating diseases such as chronic lymphocytic leukaemia or Parkinson's disease, is based on the effects of genetic modification –defective genes are replaced by their functional copies.

For researchers, the discovery of genetic engineering has made their work a bit easier. For example, a very common method of transforming genes from organisms to bacteria represents a very useful tool for speeding up the research, since the bacteria has the ability to grow and reproduce quickly. It is a cheap method and provides the researches a nearly unlimited supply for the research. Very important are genetically modified mice, which are helpful in the laboratory, especially for testing diseases. Genetic engineering has also helped the innovation of several new methods, used for testing in the laboratory.

What are the main concerns?

The international debate about potential threats of genetic engineering always went along with the genetic engineering uprising. There are two main areas in which genetic engineering is potentially believed to cause harm: health and environment.

In terms of health, it is mainly genetic engineering in the fields of food and crop modification, which is believed to bring potential harm. GM food and crops are generally tested for different aspects of potential harm on health. This is usually done by the national authorities, with the help of the World Health Organization. It is important to bear in mind that naturally produced food and crops do not often undergo these assessments.

There are three main concerns: allergens, gene transfer and outcrossing. Even though there have not been found any allergic effects resulting from GM crops and food that are currently on the market, the problem of them being potential allergens is still debated.

Gene transfer has a very low percentage of probability. However it could be a very big problem, if the transferred genes caused harm to human health. Outcrossing is a feature where genes of a genetically modified crop combine with others, but natural ones. A similar type of problem occurs, when seeds are combined – this is a realistic problem, since there were

cases, where crops, which were not meant to be for human consumption, got combined with the normal ones.

Outcrossing relates to potential environmental harm – it is important to evaluate the capability of the genetically modified organisms to spread their genes on to wild populations. This might cause problems, since GMO's are unnatural and their interference into wild populations is, to some extent, against evolution processes.

The loss of biodiversity is another important aspect in the concerns about potential threats. Also, when it comes to genetically modified crops, another problem might be represented by the endangered survival of organisms, which are not seen as "enemies" (such as pests etc.).

Opponents of genetic modification often refer to lack of understanding what might genetic modification cause at a longer period of time. Another potential threat may be seen in the misuse of genetic engineering. Since it is a very powerful tool in modifying the natural evolution, irresponsible use might lead to problematic consequences. This is closely linked to the controversial modifications of the human genome.

Who is responsible for the regulations?

Worldwide, genetic engineering regulations differ from country to country. There are international organizations or agencies regulating the research. Their regulations then apply to member countries. At a national level, every country has its own laws and rules for genetic engineering and its regulation. The amount of regulation depends on several factors, such as whether the particular country is an active or passive producer of genetically modified organisms or whether the country has an optimal economic background for this type of research. In general, research is mostly done by private companies, however in some countries it is heavily supported by the government.

The most extended regulations are made with genetically modified crops and food, since it is the biggest field, where genetic engineering has taken place. Nationally, some countries regulate GM crops with strict laws whereas others do not at all. There are organizations, such as the World Health Organization and Food and Agriculture Organization of the United Nations, which create protocols not only for GM crops, but for all Genetically Modified Organisms. For example, Europe and the United States have their own specific regulatory system.

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