Does science need a new “Hippocratic Oath”?

Genetic engineering as a toy?

Genetic engineering is used to investigate diseases, develop new therapies and genetically modify crops for agriculture. Ultimately, it will become a matter of manipulating human genetic material.

The first genetic engineering kits are now available in the USA: With do-it-yourself kits, such as the “CRISPR-Cas9”, manipulation of genetic material is easier and cheaper than ever before. The kits are used worldwide in research, but they are also freely available for anyone to buy. They are freely available online from various companies for as little as USD 150. The method is said to be so simple that anyone without previous knowledge can practice it successfully. In the USA, there is already a lively biohacker scene that tries to manipulate plants and animals in the home.

What does this look like in concrete terms?

An initial household experiment use could include, e.g. the manipulation of intestinal bacteria: You need a pipette, gloves, some containers with intestinal bacteria and some containers with DNA rings, which are already dissolved and supplied as a ready liquid in the do-it-yourself kit. Then you are ready to get started! The DNA rings are now transferred into the intestinal bacteria to modify their genetic material. The success of the manipulation is already visible after a very short time.

With genetic engineering kits like this for everyone, genetic research is no longer reserved for scientific laboratories: It is becoming a playground for amateurs. Instead of a metal construction kit, parents could now give their children a genetic engineering kit for Christmas.

This, of course, arouses fears. If an amateur can rewrite genetic material so simply, where are its limits and what impact does this have on mankind and the environment? Genetic modifications to living organisms are not a game. And those who try something like this at home can hardly prevent genetically modified organisms from getting into the environment. Buyers with bad intentions, like blackmailers or terrorists, do not bear thinking about at all.

In the USA, there are already dog breeders who want to use genetic engineering kits to eliminate the health problems of many dog breeds that have arisen as a result of overbreeding. Others want to introduce “glowing genes” into dogs or other animals or produce blue plants. There are already attempts to produce resistant bacteria.

All this is not only irresponsible, it is also fraught with immense risk for mankind and nature, which may then no longer be manageable or only manageable with immense effort and enormous costs. Should this be allowed to happen?

Legislation

The US has no legislation regulating genetic modification of organisms in private. Only their release is prohibited. But who can monitor and prevent this from happening with thousands of private individuals, even if the FBI is already watching the kit scene?

The situation in Germany is different: Here, genetic engineering in private is prohibited. Anyone who buys genetic engineering kits and uses them outside approved genetic engineering laboratories risks a prison sentence of up to three years or a fine of 50,000 euros. Under German law, the aforementioned experiment to make intestinal bacteria antibiotic-resistant using genetic manipulation would only be permitted in a genetic engineering facility with level 1 security. Bacteria with considerable damage potential are subject to security level 2, which means that every single experiment would require approval.

However, even in Germany there are people coming forward who think this strict legislation is excessive. They demand that at least simple kit experiments on harmless bacteria should also be possible for private individuals. In the further development of genetic engineering in Germany, the legislator will continue to strike a balance between scientific freedom and the protection of the public from possible consequential damage.

Exercises:

1. The Greek physician Hippocrates formulated the principle that man belongs to nature, but nature does not belong to man. Nobel laureate Joseph Rotblat therefore demands that man (and therefore also researchers) must once again become the “servant of nature”. What does he mean by that?
2. As early as the 19th century, English philosopher Francis Bacon formulated that science must serve humankind. Even Alfred Nobel, founder of the Nobel Prizes, stated that the prizes should be awarded to precisely those scientists who had achieved the greatest good for humanity over the course of the previous year. Using the examples of the diesel engine, penicillin and the computer, compare the advantages and negative effects of these three inventions in a table.
3. Many negative consequences of inventions are only noticed many years later; but by then it may be too late. Nobel laureates such as Roald Hoffmann, Joseph Rotblat and Rita Livi Montalcini therefore demand that researchers must also examine the negative consequences of their actions; they even call for a binding code of conduct, a commitment to which all researchers must submit. Nobel laureate Christian de Duve called on the young people of this world to develop a code like this to overcome man’s genetic tendency towards selfishness and hostility. Formulate three rules to which all researchers should submit and design a poster for this. The posters are then presented and discussed in a tour of the museum.

   http://www.mediatheque.lindau-nobel.org/videos/33615/2014-mini-lecture-science-ethics-society

