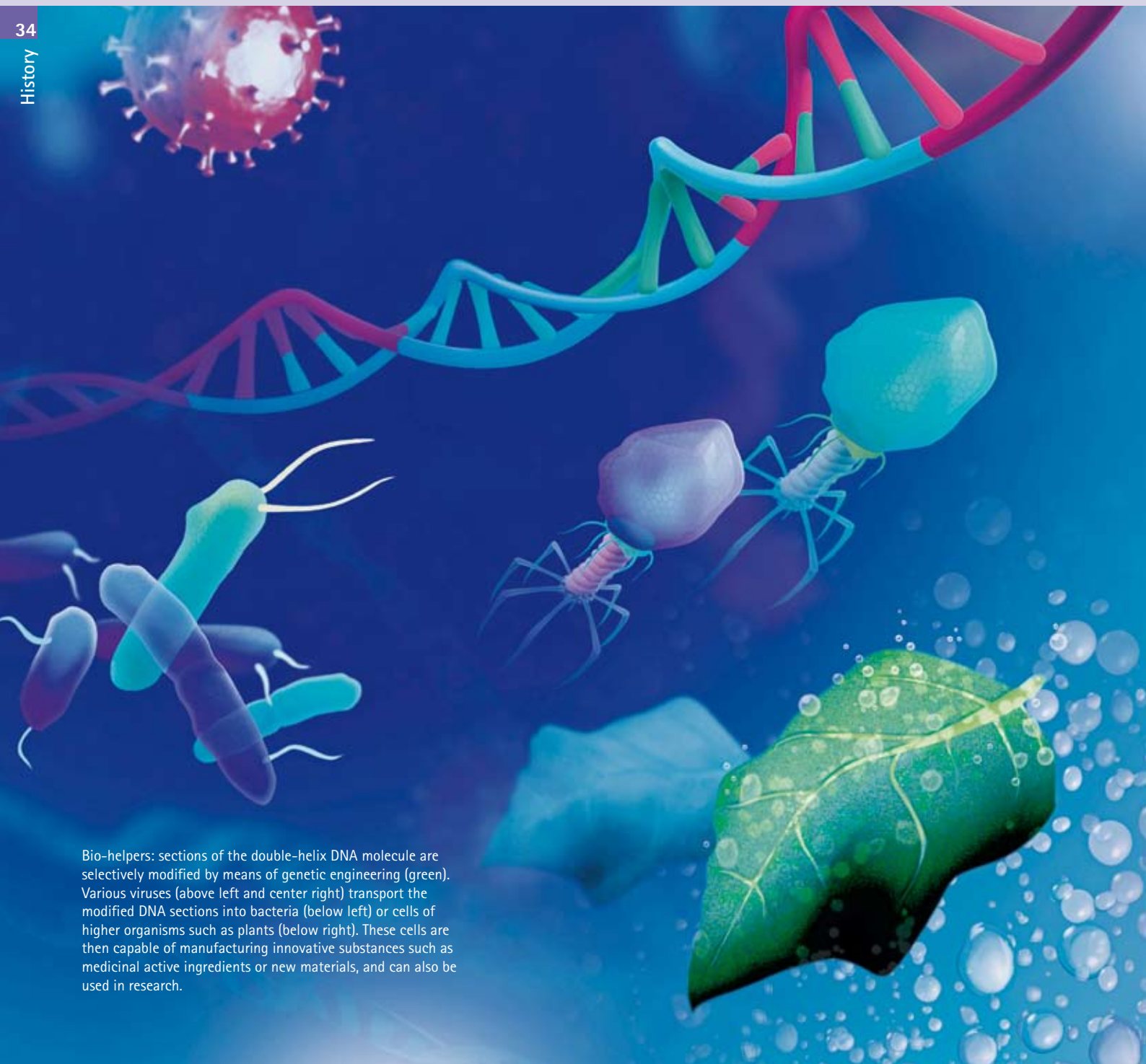


Innovative products from biotechnology

## From yoghurt to medicinal plant

34  
History



Bio-helpers: sections of the double-helix DNA molecule are selectively modified by means of genetic engineering (green). Various viruses (above left and center right) transport the modified DNA sections into bacteria (below left) or cells of higher organisms such as plants (below right). These cells are then capable of manufacturing innovative substances such as medicinal active ingredients or new materials, and can also be used in research.

*Man has been using biotechnology for many thousands of years, for example by using bacteria or yeasts to produce yoghurt and cheese from milk or fermenting grapes and barley to make wine and beer. New methods have become available since the discovery of the genetic molecule, DNA. Genetic engineering, undoubtedly the most important field of biotechnology at present, can cause microorganisms, cultured higher cells and even entire plants to grow innovative substances and thus become producers of active substances for medicines, for example.*

Many people believe that biotechnology and genetic engineering will help us to solve urgent problems, such as how to safeguard food supplies for a growing world population, develop and economically manufacture novel medicines, employ renewable raw materials and fuels, and avoid and eliminate all kinds of damage to the environment.

### Genetic engineering is vital for innovation and production

At Bayer, too, innovative biotechnology has a diverse range of applications. Since the late 1980s, recombinant technology has been used in the manufacture of the drug Kogenate® which replaces blood clotting Factor VIII in hemophiliacs. This was the largest, most complex protein molecule ever to be produced using recombinant technology at that time. Today, it would no longer be possible to meet the increased demand for Factor VIII from plasma alone. Dr. Wolfgang Plischke, member of the Bayer Board of Management with responsibility for innovation, technology and the environment, is quite certain: "Biotechnology will enable us to produce pharmaceutical active substances reliably and in sufficient quantities in the future as well. In addition, we can also develop completely new kinds of medicines." This is because at the DNA level, there are hardly any barriers between different species. A protein in snake venom, for example, may therefore be of help to humans (see page 55).

The development of new chemical active substances that selectively influence proteins in cells of diseased organs such as the heart is likewise now unimaginable without recombinant methods (see page 46).

Other Bayer researchers are experimenting with genetic modifications to plants so that they can be used in the future to manufacture medicines (see page 36). Biotechnological methods can also aid conventional crop growing, as has been demonstrated by Bayer researchers in Ghent. They have bred a variety of rapeseed with a special fatty acid composition that allows the plant oil to be processed to yield particularly healthy foods (see page 50).

One of the world's oldest biotechnologies, the fermentation of carbohydrates to alcohol, is gaining new significance as fossil raw materials become increasingly scarce and the planet is being polluted with the greenhouse gas, carbon dioxide (CO<sub>2</sub>). Engineers at Bayer are therefore now developing large-scale plants for the manufacture of bioethanol and other plant-based fuels (see page 42).

Dr. Plischke is well aware of the importance of biotechnology: "Biotechnology and genetic engineering will be key in meeting the challenges of the 21st century. They will offer us the opportunity to develop many new, innovative Bayer products aimed at improving health and nutrition, as well as allowing the development of new materials."

## Biotech products at Bayer

**Acarbose (Glucobay®)** This substance slows the absorption of glucose by the small intestine, thus modifying blood sugar levels in diabetics.

**Alfimeprase** This genetically engineered protein is derived from the venom of the copperhead snake and can dissolve blood clots (see page 55).

**Factor VIII (Kogenate®)** Hamster cells produce this human clotting factor, which replaces the absent endogenous proteins in patients with hemophilia (see *research* 17).

**FiberMax®** These genetically modified high-yield cotton varieties provide top-quality fibers and are tolerant to the herbicides Liberty® and Roundup® (see *research* 17).

**InVigor®** These hybrid rape varieties are suited to different climatic and soil conditions. Genetic modification has made them tolerant to the herbicide Liberty®.



[www.bio.org/](http://www.bio.org/)

The American Biotechnology Industry Organization website provides information on recent developments in the field of biotechnology research.