

CRISPR/Cas



Overview

- **Description:** CRISPR/Cas is a powerful new genome editing technology. Acting as a highly specific molecular scissor, the CRISPR/Cas system facilitates reliable and permanent DNA modification in all kinds of organisms, from bacteria to humans. Genetically modified organisms (GMOs) serve a huge variety of purposes, including (but not limited to) research, energy and food production, pharmaceutical and chemical production as well as waste management. In addition, CRISPR/Cas opens up new avenues in medicine.
- **State of research:** All possible avenues of CRISPR/Cas application are pursued with high intensity. Much research is conducted to validate desired effects, to identify unwanted consequences and to increase the safety and efficacy of CRISPR/Cas intervention. With regards to gene therapy, first (but highly controversial) experiments have been conducted in human embryos.
- **Capabilities:** CRISPR/Cas outshines older methods in its simplicity, cost and time effectiveness, versatility and reliability ^[1]. Due to its ease-of-use, there is concern that the method might be used for nefarious purposes (e.g. creation of new pathogens by terrorists).
- **Limits:** The introduction of additional, unwanted modifications (so-called off-target effects) still poses a major challenge.

Further Information

- **Key players:** A lot of research and methodological refinement is conducted in academic institutions, with biotech companies and start-ups developing first applications. According to publication numbers and patent applications, most research is conducted in the USA, Great Britain, Germany, Switzerland, South Korea and China ^[2].
- **Readiness:** The commercialization of CRISPR/Cas is underway, with pharmaceutical and agricultural products already on the horizon. However, many potential applications (e.g. in medicine) are still at a low readiness level.
- **Users:** Scientists, Companies (Biotech, Agricultural, Pharmaceutical, Chemical etc). Potentially also private persons (Do-It-Yourself Biologists, “Rogue Scientists”).
- **Future outlook and foresight:** First (commercial) applications of CRISPR/Cas in the near future are likely to affect pharmaceutical, agricultural and chemical production processes and to yield new drugs, crops, chemical compounds, fuels, materials etc. Mid- to long-term, CRISPR/Cas is poised to open groundbreaking therapeutic applications for the treatment of inheritable diseases, cancer, HIV etc.
- **Related Technologies:** Genome Sequencing, DNA Synthesis, Bioinformatics, Synthetic Biology, Gene Therapy
- **Links:** [1] <http://dx.doi.org/10.1007/s40778-016-0037-5> ; [2] <http://dx.doi.org/10.1080/07388551.2016.1271768> ;

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