Genetic modification

- Engineering of CD63 Enables Selective Extracellular Vesicle Cargo Loading and Enhanced Payload Delivery
- Regulatory mechanisms of O6-methylguanine methyltransferase expression in glioma cells
- Senescence-resistant human mesenchymal progenitor cells counter aging in primates
- Neutralizing Antibodies: Role in Immune Response and Viral Vector Based Gene Therapy
- Adaptive Evolution of Gene Regulatory Networks in Mammalian Neocortical Neurons
- CRISPR/Cas9-mediated editing of VHL in induced pluripotent stem cells: A model for early cell fate in von Hippel-Lindau syndrome
- Natural Killer Cell Immune Checkpoints and Their Therapeutic Targeting in Cancer Treatment
- Overcoming temozolomide resistance in glioma: recent advances and mechanistic insights

Genetic modification, also known as genetic engineering or genetic manipulation, refers to the direct manipulation of an organism's genes using biotechnology. This process involves the introduction, deletion, or modification of specific DNA sequences within an organism's genome to achieve desired traits or characteristics. Genetic modification can be applied to various organisms, including plants, animals, and microorganisms.

Here are key aspects of genetic modification:

Techniques:

Recombinant DNA Technology: This is a common method used in genetic modification. It involves isolating and manipulating specific DNA segments, often from different organisms, and then recombining them to create a novel DNA sequence.

CRISPR-Cas9: This revolutionary genome editing tool allows for precise and targeted modifications to the DNA of an organism. It has become widely used due to its efficiency and accuracy in editing specific genes.

Applications:

Agriculture: Genetically modified (GM) crops are developed to exhibit traits such as resistance to pests, diseases, or herbicides. Examples include insect-resistant Bt crops and herbicide-tolerant crops.

Medicine: Genetic modification is used to produce pharmaceuticals, such as insulin and human growth hormone, through genetically engineered microorganisms. It is also employed in gene therapy to treat genetic disorders by correcting or replacing faulty genes.

Research: Genetic modification is a valuable tool in scientific research for studying gene function, understanding biological processes, and developing models for diseases.

Industry: Some bacteria and yeast are genetically modified to produce enzymes and other industrial chemicals on a large scale.

Ethical Considerations:

The genetic modification of organisms raises ethical concerns and debates. Issues include potential environmental impacts, unintended consequences, the release of genetically modified organisms into

the wild, and the long-term effects on ecosystems. Regulation:

Many countries have established regulatory frameworks to oversee the development and release of genetically modified organisms. These regulations aim to ensure safety, environmental protection, and proper labeling of genetically modified products. Controversies:

The use of genetic modification has been a subject of controversy and public debate. Some concerns include the potential for unintended ecological consequences, the creation of "superweeds" and "superbugs," and the long-term effects on human health. Precision and Specificity:

Emerging technologies, such as CRISPR-Cas9, offer a high level of precision in genetic modifications, allowing for targeted changes to specific genes without affecting the rest of the genome. Future Applications:

Ongoing research continues to explore new applications of genetic modification, including the development of crops with enhanced nutritional content, the creation of disease-resistant animals, and potential interventions for genetic diseases in humans. Genetic modification has the potential to address challenges in agriculture, medicine, and industry. However, responsible and ethical use, along with careful consideration of potential risks, remains essential in the development and deployment of genetically modified organisms. Public engagement and regulatory oversight are crucial components of ensuring the responsible use of genetic modification technologies.

Genetic modification in a mouse model of IAs, including deletion or overexpression of a particular gene, provides an excellent means for examining basic mechanisms behind disease pathophysiology and developing novel pharmacological approaches. All existing animal models need some pharmacological treatments, surgical interventions, or both to develop IAs, which is different from the spontaneous and natural development of aneurysms under the influence of the classical risk factors. The benefit of such animal models is the development of IAs in a limited time. However, clinical translation of the results is often challenging because of the artificial course of IA development and growth. Khan et al. summarized the continuous improvement in mouse models of IAs. Moreover, they discussed the pros and cons of existing mouse models of IAs and highlighted the main translational roadblocks and how to improve them to increase the success of translational Intracranial Aneurysm research [1].

[1]

Khan D, Li X, Hashimoto T, Tanikawa R, Niemela M, Lawton M, Muhammad S. Current Mouse Models of Intracranial Aneurysms: Analysis of Pharmacological Agents Used to Induce Aneurysms and Their Impact on Translational Research. J Am Heart Assoc. 2024 Jan 23:e031811. doi: 10.1161/JAHA.123.031811. Epub ahead of print. PMID: 38258667.