Developing advanced human resources for genome editing to find solutions to humanity's problems

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Prof. Yamamoto graduated from the Department of Biology of the School of Science at Hiroshima University and went on to the Graduate School of Science, which he left before completing in order to work as an assistant at the Faculty of Science, Kumamoto University, from which he obtained his doctorate (Science). After serving as a lecturer and associate professor at HU's Graduate School of Science, he was appointed to his current post in 2004. Prof. Yamamoto specializes in genome biology, and his main research interest is the development and application of genome editing, which can be used in various living organisms. He is also Director of the Hiroshima University Genome Editing Innovation Center and President of the Japanese Society for Genome Editing. His publications include the book *Genomu henshu no kihon genri to oyo (The Basic Principles and Application of Genome Editing)* published by Shokabo.

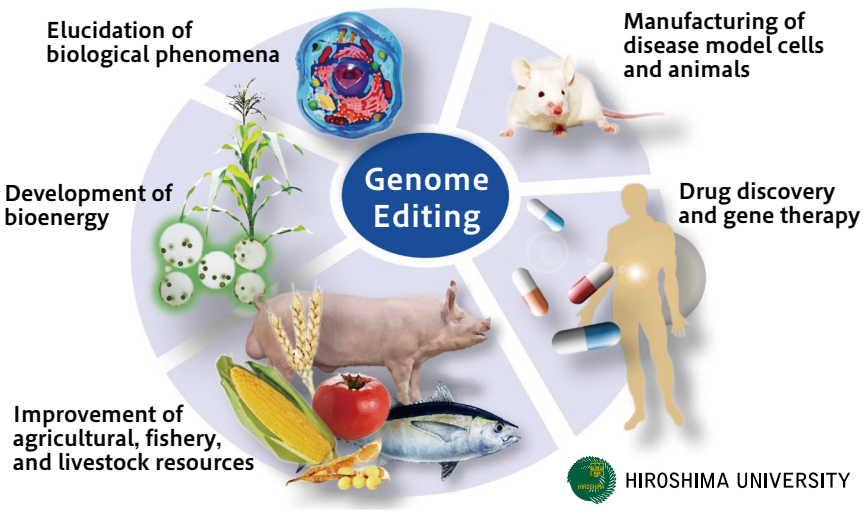
Genome editing is the emerging biotechnology that makes it possible to modify genetic information (genome) in living organisms exactly as desired. Genome editing involves the use of artificially generated enzymes (genome editing tools) to cut the DNA of a cell at a specified sequence. With humans, this means precisely targeting a spot along the approximately three billion basic sequences (of A, G, C, and T) in the human genome. To accurately modify genes, genome editing makes use of the intracellular repair mechanism that is immediately activated when the DNA is damaged. Capable of inducing various types of mutations in microorganisms, plants, and animals just like naturally occurring mutations, genome editing is expected to bring about technological innovations that can lead to the development of biofuels using microorganisms, the improvement of useful species, drug discovery, and the creation of new medical treatment methods.

At Hiroshima University, we began basic technological development for genome editing in 2008. We have produced many positive research results, including successful genome editing in microorganisms, insects, sea urchins, amphibians such as frogs and newts, and some mammals, using HU's originally developed genome editing tool (Platinum TALEN). Moreover, improvement of this technology has made it possible to regulate and visualize (by using imaging technology) the functions of genes in cells.

In 2016, Hiroshima University led the establishment of a genome editing consortium for academia-industry collaboration. It now serves as a platform for industrial technology development projects with the participation of many private businesses. For example, Mazda Motor Corporation and HU are pursing the development of a microalgae-based renewable energy to replace fossil fuels. In the field of healthcare, we are promoting the production of model iPS cells and model animals for research on hereditary diseases with researchers in and outside Japan. Because of the high potential of genome editing for therapeutic purposes, we are also working hard on technological development for cell manufacturing for regenerative medicine and cancer treatment.

In 2018, HU's "Frontier Development Program for Genome Editing" was selected as an excellent graduate school program of the Ministry of Education, Culture, Sports, Science and Technology of Japan, putting in motion our advanced human resource development. This program is designed to train researchers who will work toward new industrial creation and developers of industrial technologies, both types equipped with the basics and advanced knowledge for application of genome editing. I would like to invite all those interested in the development and industrial application of genome editing to consider pursing research with us at Hiroshima University to contribute to future society through technological innovation.

Great Potential of Genome Editing



Much expectation rides on genome editing as a technology exploitable for a broad range of purposes from basic research to practical application (such as development of microalgae-based biofuel, improvement of useful species, drug discovery, and gene therapy).