Luncheon Symposia

[Korean]

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Research Ethics Symposium

Genome Editing Using CRISPR Nucleases

Sangsu Bae, Ph.D.
Department of Chemistry, Hanyang University, Korea

Genome editing with programmable nucleases such as ZFNs, TALENs, and CRISPR/Cas9 or CRISPR/Cpf1- derived RNA-guided endonucleases is broadly useful for biomedical research, biotechnology, and medicine. Now, CRISPR nucleases become one of the hottest topic in the scientific world due to the ease of use and inexpensive cost; researchers can induce gene editing at different DNA sites by simply altering the guide RNAs. Notably, in April 2015, Chinese group performed human embryo editing using CRISPR-Cas9 nucleases for the first time. And recently, DNA-free CRISPR nucleases, the delivery of preassembled Cas9 protein-gRNA ribonucleoproteins (RNPs), has been introduced in various organisms including plants. It could be exempt of regulation that applies to genetically modified organisms (GMO) due to the absence of foreign DNA sequences in the transformant cells. Furthermore, CRISPR would be used for various applications such as disease control, making drugs, de-extinction, vector control, better food production, improving pets, making disease models. Here I introduce the brief history of CRISPR and would like to discuss the pros and cons of it.

CRISPR-Cas9 Technology and Bioethical Considerations

Myeong Jin Nam, Ph.D.
Department of Biological Sciences, Gachon University, Korea

The recent development of the clustered regularly interspaced short palindromic repeat (CRISPR)/associated nuclease system, has greatly accelerated genome engineering applications. When these systems bind to a target DNA sequence in the genome, they create a DNA double strand break (DSB), the repair of which leads to specific DNA sequence modifications.

Recent results (Introducing precise genetic modifications into human 3PN embryos by CRISPR/Cas-mediated genome editing) call for immediate attention being paid to the regulation of the genetic modification of human germline cells. It is believed that any attempt to generate genetically modified humans through the modification of early embryos needs to be prohibited. For any germline genetic modification, the resulting allele needs to be precisely predefined. The specificity of the technologies needs to be further investigated and improved to ensure that no off-target mutations will be introduced. For any introduced allele, the effect of its introduction into a different genetic background needs to be carefully evaluated.

It is advocated for preventing any application of genome editing in the human germline until after a rigorous and thorough evaluation and discussion are undertaken by the global research and ethics communities.

Co-Organizers : Myeong Jin Nam, Ph.D. (Department of Biological Sciences, Gachon University, Korea)
Jong-Il Park, M.D., Ph.D. (School of Medicine, Chungnam National University, Korea)
Chair : Myeong Jin Nam, Ph.D. (Department of Biological Sciences, Gachon University, Korea)