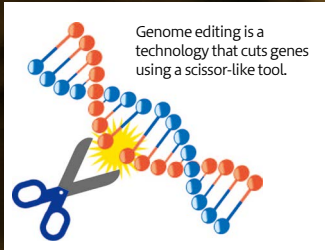
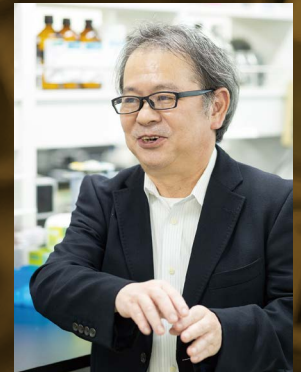


Creating a future that is kind to people and birds through digital breeding of poultry



We created chickens (black and brown chicks) that do not have the OVM gene, using two breeds of chickens. It was created in two different breeds in order to realize breeding as an original variety in the future.

Europe is moving toward banning the killing of male chicks in the egg industry from the perspective of animal welfare, and the development of technology to distinguish the sex at the egg stage is progressing at a rapid pace. Professor Horiuchi says, "Birds have a different structure of sex chromosomes than mammals, so we are still at the basic research stage, but in the future, we would like to establish technology for sex selection technology."



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There may be few people who immediately know what poultry means when they hear that word. Birds that are raised for human use of their meat, eggs, feathers, etc. are poultry. Typical poultry includes chickens, quail, and ducks. Poultry in particular is an animal species with few religious restrictions, and therefore it is raised and its products are used all over the world. In our laboratory, we are conducting research focusing on the immune and reproductive functions of chickens and quail, which are the most familiar poultry. In particular, we are developing poultry research that leads to a world that is friendly to both people and birds, using research methods that combine genome editing technology, the latest biotechnology, and data science. Let me introduce some of our research.

Chicken eggs have become an essential part of our diet. On the other hand, chicken eggs are the number one allergenic food for Japanese people, and many people cannot eat foods that contain chicken eggs. Eggs are also used in the production of noodles, fish paste products like kamaboko (steamed fish paste), and vaccines, which are not so obvious, and some people may have allergic reactions to them. Therefore, we used genome editing technology developed at Hiroshima University to create chickens that do not produce ovomucoid (OVM), one of the

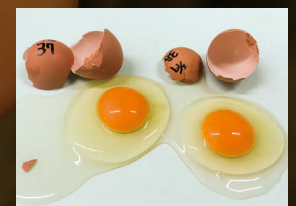
proteins (allergens) found in chicken eggs that causes allergies. The safety of these chicken eggs, a concern for consumers, has been proven using the latest data science.

This type of research spanning over many years has also led us to realize other points of importance. This is one of the aspects that makes research interesting. One is the idea of animal welfare. Companies that produce chicken eggs need females, but not males. Therefore, male chicks are currently being culled. As a countermeasure to this problem, we are working on the development of sex selection technology for chickens and technology for early determination of the sex of fertilized eggs. Here, too, we are accumulating basic research using genome editing technology and conducting interdisciplinary research that combines the engineering of detection technology and AI. Another important point is infectious disease control. In AY 2022, more than 17 million poultry birds were culled due to an outbreak of highly pathogenic avian influenza across the country. This has resulted in a shortage of eggs, leading to soaring prices. To find a solution to this problem, our laboratory is currently accumulating research results to combat highly pathogenic avian influenza through analysis of the chicken immune system.



The date of collection is written on the eggs, and they are heated in an incubator in the laboratory and hatched.

We must cope with the rapidly changing global environment, including rising seawater temperatures, and we are stepping into an era in which food production requires breeding using new biotechnology such as genome editing, rather than conventional breeding. Consumers will also need to have the ability to understand the mechanisms and safety of technology and make judgments based on scientific knowledge. Hiroshima University provides opportunities for consumers to deepen their knowledge, so please take advantage of them.



An egg with reduced allergens (right).
On the left is a normal egg.

<Background photo>

A chick hatched in the laboratory. Chicken egg embryos are said to begin to develop a sense of pain seven days after they are laid. In addition to prohibiting culling after hatching, there is a need to develop technology for early sex determination so that selection at the egg stage is painless.

supporting world-class research

- Translational Research Center
- Resilience Research Center
- Center for Brain, Mind and KANSEI Sciences Research
- Hiroshima University Genome Editing Innovation Center
- Hiroshima University Digital Monozukuri (Manufacturing) Education and Research Center
- Education and Research Center for Artificial Intelligence and Data Innovation

- The IDEC Institute
- Academic-Environment Social Governance Science and Technology Research Center
- Town & Gown Institute of Innovation for the Future
- Hiroshima University PSI GMP Center
- The Institute for Diversity & Inclusion
- Seto Inland Sea Carbon-neutral Research Center

*HISIM (Hiroshima-University STARC IGFET Model) is a transistor model used in circuit design that has been developed by Hiroshima University in collaboration with the Semiconductor Technology Academic Research Center (STARC).

National Joint Usage Facility

Hiroshima Synchrotron Radiation Center

Synchrotron radiation is generated when an electron traveling at the speed of light is forced to change direction by a magnetic field. Synchrotron radiation is called "dream light" because it is not only powerful but also includes light of various wavelengths. The center promotes advanced materials science and emerging interdisciplinary fields using synchrotron radiation.

