



Practicing Practical Biology for the Earth

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<http://endo.ar.a.u-tokyo.ac.jp/OldWebPage/shingroup/English/index.html>



Animals, including us, are heterotrophs that must depend on other organisms on the Earth for energy to survive. However, human beings have given so much priority to economic profit and enriching our lives that we have caused great damage to other organisms and to the Earth itself. Extreme weather conditions caused by human activities, loss of biodiversity, as well as resource depletion and pandemics, are piling up daily on the planet, threatening the survival of humanity. Many scientists believe that the survival of the human race depends on the resolution of these issues and on solving these problems, and that it will be fatal if we do not take the right course in the next decade.

How do we need to live for the future of humanity? We must reduce the burden of our activities as much as possible and find a way to coexist with other living things. For this purpose, we would like to promote research to maintain the lifelong health of animals, including humans, and to eliminate the waste of animals by humans in their daily lives, and to return the results to society. In order to achieve this goal, it is necessary to unravel the mechanisms of the complex and diverse life phenomena of animals and to explore the possibilities for their application. Based on this background, our department decided to propose the creation of the "International research core on the regulation of insulin-like activities for extension of healthy life span" by the Core-to-Core Program Supported by JSPS. This proposal was adopted.

In addition, in 2017, we started the "One Earth Guardians Development Program." The Guardians are a network of scientists who will take actions aimed at securing the future of the Earth for the next 100 years as a place where all living beings, including humans, coexist in harmony. In this activity to develop realistic solutions, we proposed "Creation of Next-Generation Food Supply Industrial Chains for a Natural Capitalism Society" to Moonshot Agriculture, Forestry and Fisheries Research and Development Program supported by BRAIN, and this grant application was also approved.

Proper regulation of insulin-like activity is necessary for extending healthy life span in animals

With the advent of the super-aging society, research aimed at extending healthy age is becoming increasingly important. Insulin and insulin-like growth factors (IGFs), which are structurally similar to insulin, promote anabolic reactions during development, development itself, growth, maturation, and aging in animals ranging from nematodes to higher organisms including humans. It is an essential and universal physiological activity for animals to live a healthy life. Abnormalities in these activities cause not only growth disorders but also malignant tumors, which are the leading cause of death in humans, neurological diseases, which increase in incidence with age, cardiovascular diseases, and diabetes, which are considered lifestyle-related diseases. We are conducting world-class research on the regulation of these activities in the production of insulin-like peptides, the production of binding proteins that regulate these peptides, and insulin-like signaling, with the aim of extending the healthy life span of humans and other animals.

<https://www.frontiersin.org/articles/10.3389/fendo.2015.00073/full>

Amino acids directly regulate material metabolism

It has long been known that nutritional factors, including amino acids, regulate material metabolism by precisely regulating the secretion of many hormones, such as insulin and IGF-I. Recently, however, we have discovered that the profiles of amino acids and other nutritional factors directly regulate protein, glucose, lipid, and nucleic acid metabolism, which we have named metabolic regulatory nutritional factor signals. In addition to clarifying the true nature of these signals, we are demonstrating their interactions, including organ coordination, through simulations and experiments using machine learning and mathematical models, and promoting the development of "DX Nutrition," a next-generation nutrition science that tailors the regulation of material metabolism and biological conditions using the diet.

<https://www.nature.com/articles/s41598-018-23640-8>

Agricultural science must lead the way in fostering global medicine

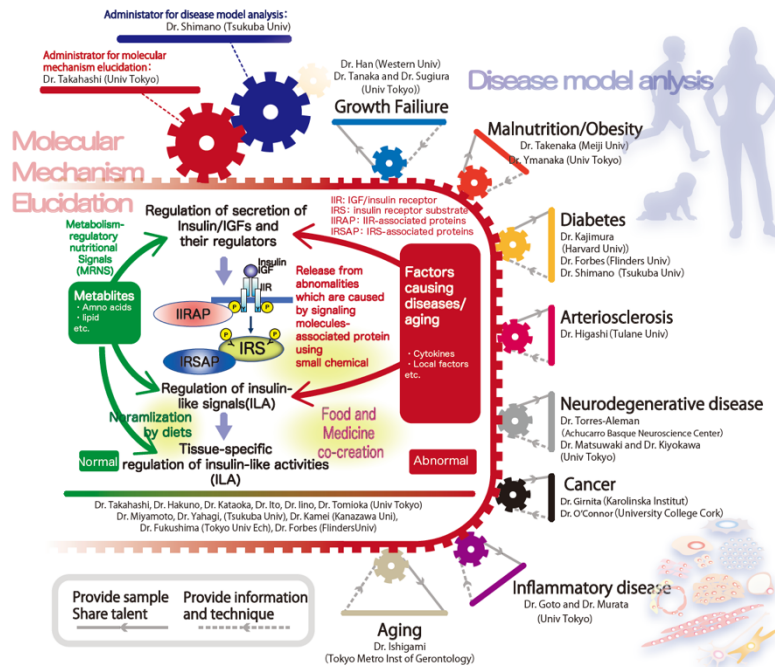
The academic discipline of agriculture, which has supported humanity's food, clothing, shelter, and health from many perspectives, has many seeds for solutions, and the establishment of sustainable and environmentally harmonious science and technology using these seeds has become an urgent issue. Against this background, we launched the One Earth Guardians Development Program in December 2017. The purpose of this program is to foster "One Earth Guardians," a group (network) of scientists who will research scientific solutions and put them into practice, while continuing human life activities to identify problems that have been caused by human use of the Earth's resources, in order to ensure the coexistence and symbiosis of life on Earth, including humans. The goal is to develop "One Earth Guardians," a group (network) of scientists who will research and implement scientific solutions to the problems that have been caused by the use of natural resources, and to shift the paradigm of society from "economic value-obsessed" to "nature (earth) capitalism" (a way of thinking that considers nature and the earth as assets) through activities that transcend age and national borders.

<https://www.one-earth-g.a.u-tokyo.ac.jp/en/>

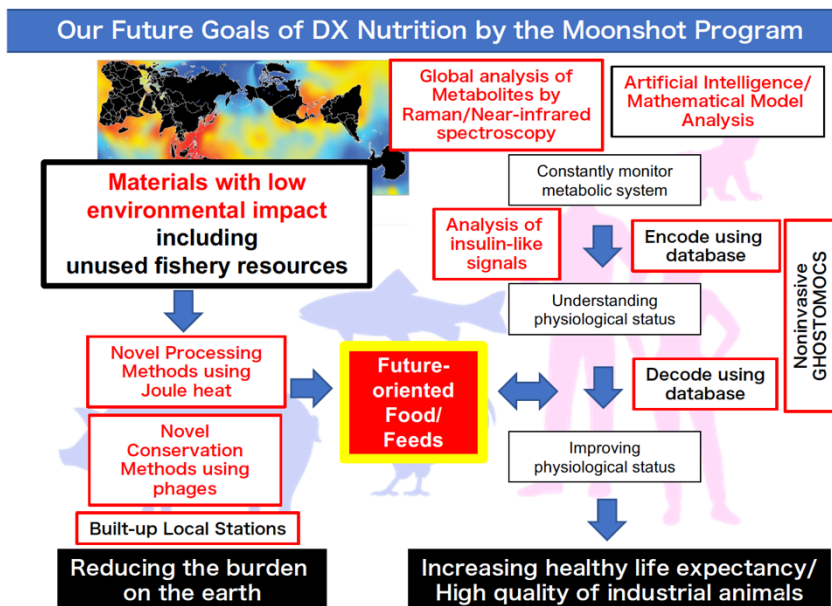
Creating the next generation of the food supply industry

Unutilized biological resources, such as the fact that nearly 80% of the fish we catch are currently turned into food losses, need to be thoroughly exploited for human beings to survive on the earth in the future. First, we will develop innovative extraction and preservation technologies for underutilized fish such as anchovy, and then we will establish basic technologies for "DX Nutrition" to comprehensively understand the effects of the nutrients that make up these foods and feeds on individual organisms, and to design biological information in a purposeful manner through medical-food collaboration. By establishing the basic technology for "DX Nutrition," which is a purposeful design of biological information through medical-food co-creation, we are promoting research to pave the way for the realization of "future food" that can extend healthy life span based on scientific evidence. Based on this, we are also researching the development of sales channels for new useful foods and feeds.

https://www.dropbox.com/s/n0ddcz519854p2n/210807_moonshot%20project%20summary_v2.pdf?dl=0



Core-to-Core International Collaboration supported by JSPS



Moonshot Agriculture, Forestry and Fisheries Research and Development Program supported by BRAIN