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FUJIFILM and National Cancer Center Japan

Launch a joint research project on a new cancer immunotherapy using liposome, a drug delivery system technology

— Goal is to identify its actions on immune cells, and elucidate the mechanism by which survival periods are extended

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FUJIFILM Corporation
National Cancer Center Japan

FUJIFILM Corporation (President: Kenji Sukeno) and the National Cancer Center Japan (President: Hitoshi Nakagama; hereinafter "National Cancer Center") today announced the launch of a joint research project for a new cancer immunotherapy. The aim of this joint research is to create a new cancer immunotherapy using a liposome formulation that contains a drug inside liposome. Liposomes, drug delivery system (DDS) [*1] technologies, are artificially constructed vesicles made from the same organic phospholipids that make up cell membranes and bio membranes. Liposomes, designed with Fujifilm's expertise, exit only from the immature blood vessel walls of the tumors which can cause the enclosed drug to accumulate within the tumor – this method is expected to suppress adverse effects and improve pharmacological efficacy.

Cancer immunotherapy is a treatment method that eliminates cancer cells by enhancing the immune functions of a host defense system and can be expected to have results such as prolonging survival and providing relief of various symptoms. Therefore it has attracted great deal of attention as a treatment method that follows surgical treatment, chemotherapy and radiation treatment. At present, cancer immunotherapies that use immune checkpoint inhibitors [*2] are being performed, however, it is effective only in a small group of patients.

In this joint research, Fujifilm and the National Cancer Center will detail the mechanism of action in which the survival period is extended in mice with tumor models that were given immune checkpoint inhibitors together with FF-10832 [*3] and FF-10850 [*4], liposome formulations by Fujifilm containing the anti-cancer agents. Specifically, the research will combine Fujifilm's advanced technologies and expertise in liposome formulations and the National Cancer Center's cutting-edge analytical technologies of immune cells, and expertise in research that uses clinical specimens and animal models, to identify the actions that liposome formulations exert on immune cells, and understand the associated survival period extensions. Based on the research discoveries, Fujifilm and the National Cancer Center hope to illuminate the requirements for liposome formulations with cancer immunotherapies and will develop new cancer immunotherapies and deploy in clinical situations.

Fujifilm will utilize its advanced nanodispersion technologies as well as analytical and process technologies that have been cultivated through its history in the development of broad-ranging products to promote the research and development of liposome formulations. Experiments in mice have showed that with FF-10832 and FF-10850, single-drug administration significantly reduces the size of a tumor, while coadministration with immune checkpoint inhibitors extends the survival period more than monotherapy

alone. In addition, FF-10832 has been observed to possess a mechanism by which it continuously acts on the cancer tissues by gradually releasing active ingredients from FF-10832-internalized immune cells (macrophage) after accumulating inside the cancer tissues via the Enhanced Permeability and Retention (EPR) effect *5.

The National Cancer Center Japan is a national research and development agency that leads Japan's cancer medicine and research. The Center's Exploratory Oncology Research & Clinical Trial Center, Immune Translational Research Department (department director: Hiroyoshi Nishikawa), uses basic immunology as well as genomics, metabiology and various types of omics analyses*6 to elucidate the nature of anti-tumor immune responses in a tumor microenvironment, and is engaged in the development of new immunotherapy. Their aim, in particular, is to elucidate the complex immunosuppressive networks comprising regulatory T-cells*7 that exist inside this microenvironment in large numbers, by promoting research using animal models and samples of cancer patients, and identify the molecular mechanism that controls immune system from cancer immune surveillance*8 to immune-tolerance*9.

Fujifilm has been harnessing its advanced technologies such as a compound's synthesizing and designing capabilities as well as nanodispersion technologies, to develop new drugs in the key areas of cancer, the central nervous system diseases and infections. The company also focuses on the development of technologies related to liposome and other DDS, and carries out R&D to apply DDS technologies to not only low-molecular drugs but also to next-generation drugs such as nucleic acid drugs and gene therapies. Fujifilm will contribute to solving social problems and challenges by developing and offering innovative and high value-added drugs.

The National Cancer Center Japan will address all challenges imaginable in a cross-organizational manner towards suppressing cancer, and aim at offering cancer medicine that enables all cancer patients and their families to continue having hopes for the future.

*1: A system is used to deliver the required amount of a drug to the specified part of the body on the necessary schedule.

*2: A general term for drugs that demonstrate efficacy as the immune cells become activated by impeding the mechanism of attenuating the actions of immune cells (immune checkpoints), and attack cancer cells. These drugs are widely used for malignant melanoma as well as cancer of the lung, stomach, and kidney.

*3: A liposome formulation that contains gemcitabine, an anticancer agent indicated for treatment of pancreatic cancer and other diseases, inside a unique liposome. A phase I clinical study is currently underway in the U.S.

*4: A liposome formulation that contains anticancer agent topotecan, a drug indicated for ovarian cancer, etc., inside a unique liposome.

*5: Cancer tissues newly form peripheral blood vessels as they multiply. However, newly formed blood vessels are immature, and have a gap in the vascular walls that does not exist with normal blood vessels. If liposome and polymers are made to stagnate inside the blood, they do not pass through normal vascular walls that have no gaps. Instead, they pass through vascular walls only around the cancer tissues. Because cancer tissues have immature lymph tissues, moreover, liposomes and polymers that have passed through the vascular wall are difficult to be eliminated, and end up accumulating in cancer cells. This is called the enhanced permeability and retention (EPR) effect.

*6: A method of comprehensively analyzing biomolecular information such as genes, protein and metabolism.

*7: A type of T-cells having the ability to suppress and control immune-responses. It serves as a “brake” for suppressing excessive immune responses.

*8: An action to eliminate abnormal cells and suppress carcinogenesis.

*9: An action to suppress immunoresponses.

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