Title of Project : Homeostatic Regulation by Various Types of Cell Death

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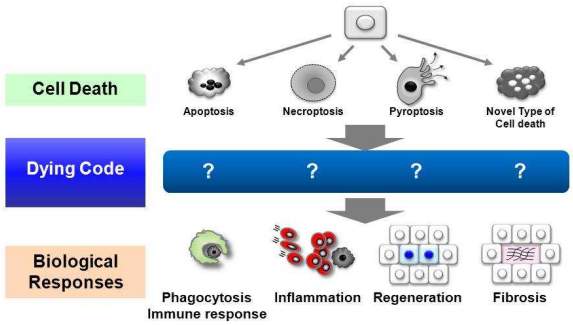
【Purpose of the Research Project】

Senescent cells, virus-infected cells, and cancer cells are eliminated by cell death. It is well recognized that cell death is the terminal step in the lives of cells, and that dead cells should be swiftly removed. Recently, however, it appears that dead cells are the source of signals that initiate several biological responses, including immune reaction, inflammation, repair, regeneration, and fibrosis.

Most cells possess several programs for cell death. In metazoan physiology and pathology, different types of cell death are thought to take place simultaneously and complementarily. Therefore, it is very important to uncover the biological cascades initiated by each type of cell death, and to integrate those findings to better understand biological phenomena associated with cell death.

In this project, we focus on signals derived from dead cells, and attempt to reveal how those signals contribute to regulating biological responses, thereby creating a new paradigm, “dead cells as signaling cells.”



“Dying Code” Regulates Various Biological Responses

【Content of the Research Project】

We will analyze the molecular mechanisms of cell death and the biological responses initiated by it, with the aim of elucidating the physiological and pathological roles played by each type of cell death. Specifically:

1. We will attempt to reveal the molecular mechanisms underlying each type of cell death, and elucidate the physiological and pathological conditions involved by developing detection methods and in vivo imaging techniques.

2. We intend to identify signaling molecules derived from dead cells, and reveal the biological responses induced by those molecules in dead cell removal, immune reaction, inflammation, repair, and regeneration.

In addition to the individual projects of each member of our research group, collaborative research projects will be conducted by all members. In the collaborative research projects, researchers from different fields of expertise will analyze a tissue-injured model, and integrate their findings in an effort to thoroughly understand the underlying mechanisms of the biological responses to the tissue injury, by developing a new concept, “not only cell death itself but also its signals regulate biological responses.”

【Expected Research Achievements and Scientific Significance】

As a variety of biological responses associated with tissue injury, including immune reaction, inflammation, repair, and regeneration, are initiated by cell death to promote the biological cascade, this innovative research area will further clarify the roles of signals derived from dead cells, and provide us with a common principle of the biological responses. Furthermore, as this common principle is assumed to be deeply involved in the pathology of various diseases, this research project is also expected to provide therapeutic targets and candidates for biomarkers of several diseases in the future.

【Key Words】

Nowadays, the programmed cell death includes not only apoptosis, but also non-apoptotic cell death, such as necroptosis and pyroptosis.

【Term of Project】 FY2014-2018

【Budget Allocation】 953,900 Thousand Yen

【Homepage Address and Other Contact Information】

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