Multicolor Cell-sorting and Electrical Signal Measurement System for iPS Cell Analysis

Background

The effect of electromagnetic fields on human health is an important management risk for the electric power industry and is associated with realizing a stable supply of electricity (power frequency magnetic fields) and the promotion of a safe and secure society based on the use of electricity (intermediate-frequency magnetic fields). Thus, public concern regarding this issue has been growing. To solve the above problems, the Environmental Science Research Laboratory has been addressing two important scientific themes: (1) scientific clarification of the effect of power frequency magnetic fields on childhood leukemia, by using humanized mice, in which a human complex system of blood cell differentiation is reproduced, and (2) clarification of the stimulating effect of intermediate-frequency magnetic fields on normal human cells, such as neural cells and cardiomyocytes, which derived from human induced pluripotent stem (iPS) cells. The analysis system consists of: (1) a cell-sorting system used for cell analysis and collection of target cells differentiated from human iPS cells, and (2) an electrical signal measurement system used for the real-time measurement of the activity of human neural cells and cardiomyocytes. Both systems will be indispensable for implementing the above evaluation.

Outline

The cell-sorting system mainly consists of cell sorters and can analyze up to 30,000 fluorochrome-labeled cells per second. In addition, the system can collect the live target cells from a cell population with a high degree of accuracy.

The electrical signal measurement system can monitor the activity of neural cells and cardiomyocytes by real-time measuring of the changes in the fluorescence signals and extracellular potential. Furthermore, the stimulation of an arbitrary cell region with a specific electrical stimulus is also possible.

Specifications

(1) Cell-sorting system (Photo 1)
• Main configuration
– BD FACSAria III cell sorter with six lasers that can measure up to 13 colors (fluorescent dyes) simultaneously

(2) Electrical signal measurement system (Photo 2)
• Main configuration
– Inverted epifluorescence microscope
– Fluorescence analysis system (high-sensitivity cooled CCD camera, imaging software, etc.)
– Extracellular potential analysis system (64-ch microelectrode array [MEA], software for data analysis, etc.)
– Electrical stimulation system (isolator, micromanipulator, etc.)

[Installed location and date]
Abiko area/March 2012

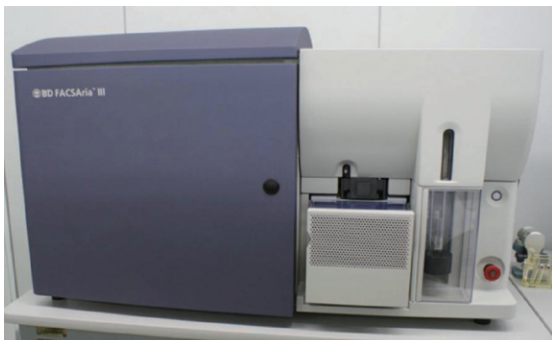

Photo 1: Cell-sorting system

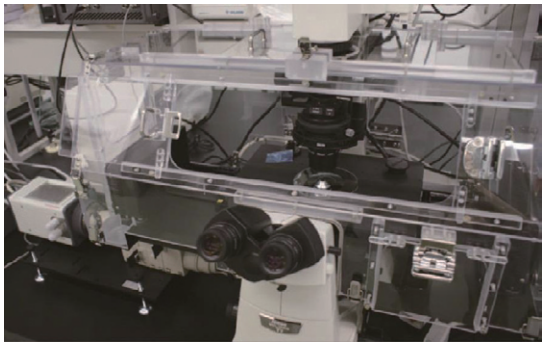

Photo 2: Electrical signal measurement system