



Title of Project : Plasma Medical Innovation

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【Purpose of the Research Project】

Plasma consists of a variety of reactive species (ions, electrons, radicals and emitting photons). In discharge plasmas, these reactive species are generated via ionization and dissociation of gaseous molecules through collisions with accelerated electrons. Due to enhanced reactivity of these reactive species, plasma has been employed as major tools for material processes including formations of ultrafine structures and functional layers, which are indispensable as key manufacturing technology for advanced industries and eventually have taken a role as core technology to support the state-of-the-art advancement of scientific frontiers.

Mean while, in the last decade, technological progress has been made to generate non-thermal low-temperature plasma in atmospheric-pressure gas and in liquid, in which the gas temperature is maintained at a room temperature. Recently the non-thermal plasmas have been applied to medical treatments, in which remarkable effects have been found in apoptotic behaviors of cancer cells, skin-disease therapy and wound healing, and thus the plasma is expected to bring significant innovations in medical science and technologies.

The goal of our research project is to create “Plasma Medical Innovation” as a novel academic field for development of innovative technologies in medical treatments through establishment of scientific basis involved in plasma interactions with biomolecules, cells and living bodies. In particular, our research project is to place special emphasis on studies and systematization of the interactions based on “plasma science” and “molecular biology”.

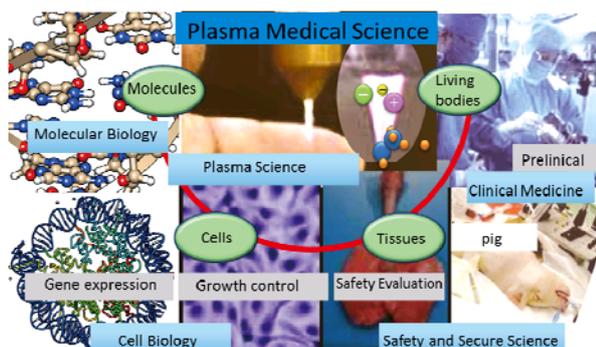


Figure 1. Outline of our projects: Our goal is to create a new academic field that merges molecular biology, cellular biology and clinical medicine with plasma science.

【Content of the Research Project】

For creation of the field “Plasma Medical Innovation” and leading the worldwide research activities, it is of key significance to establish following schemes to evolve the novel academic field via utilizing unique scientific achievements gained in the “advanced plasma-process science”, which has lead the industries worldwide, for development of medical science and molecular biology.

- 1) Development of unique plasma sources and diagnostic technologies through establishment of methodologies to study the interactions based on plasma science.
- 2) To study the interactions on the atomic and the molecular scales based on molecular biology for theoretical systematization.
- 3) Evolution of the novel academic field via systematic research activities that cover interaction studies and experiments on animals, evaluation of side effects (toxicity), and establishment of international guidelines to assure safety as medical treatments.

Systematization as the plasma medical science shall be attained via collaborative studies in 1) and 2). Furthermore, innovative medical technologies with novel plasma sources and diagnostic systems shall be developed through systematic research activities via 3) together with 1) and 2).

【Expected Research Achievements and Scientific Significance】

The achievement of our goal is expected to contribute significantly to a) enhancement and promotion of academic level of our nation and moreover b) substantial promotion of “the life innovation” through medical innovations and evolutions that are attained via development of the novel medical technologies alternative to the conventional ones.

【Key Words】

plasma medicine, molecular biology, plasma interactions with living body, life innovation

【Term of Project】 FY2012-2016

【Budget Allocation】 1,131,800 Thousand Yen

【Homepage Address and Other Contact Information】

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