

The abstracts of the recent research information appearing in Vol.9 No.4-6 of "AIST TODAY" are introduced here, classified by research area. For inquiry about the full article, please contact the author via e-mail.

Life Science and Biotechnology

### Turning on a gene switch in a single cell using an infrared laser Development of a new microscopic technology for single-cell gene induction *in vivo*

We have developed infrared laser evoked gene operator (IR-LEGO), a microscope system optimized for heating cells without photochemical damage. Infrared irradiation causes reproducible temperature shifts of the *in vitro* micro-environment in a power-dependent manner. We applied the technology to a living organism, nematode (*C. elegans*), that is a widely used model animal in developmental biology and differentiation studies. We succeeded in single-cell gene expression and in manipulating cell behavior. The new microscopic technology has possibilities of application to many species (e.g. medaka, zebrafish and plant) and a target gene expression in a desired single cell will reveal gene functions *in vivo*.

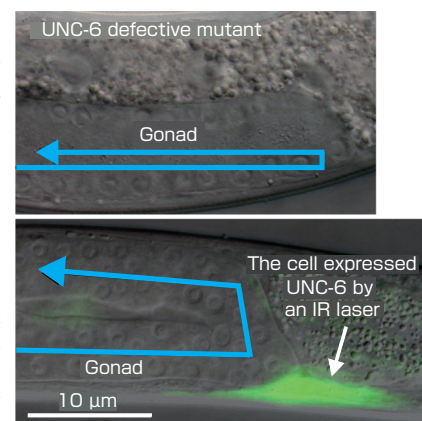
**Tomonori Deguchi**

Research Institute for Cell Engineering

tomonori-deguchi@aist.go.jp

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A physiological demonstration of single-cell gene induction using IR-LEGO. The UNC-6 defective mutant (upper). The target cell was irradiated by an Infrared (IR) laser using IR-LEGO system. By the irradiation, the cell expressed UNC-6 and GFP (arrow), and a gonad was normally formed (bottom).



Life Science and Biotechnology

### Molecular mechanism of Ashwagandha (Queen of Indian herb) effects From Indian traditional medicine to scientific facts

Ayurveda is one of the ancient systems of health care of Indian origin. Roughly translated into "Knowledge of life", it is based on the use of natural herbs and herb products for therapeutic measures to boost physical, mental, and social harmony and improve quality of life. Although sheltered with long history and high trust, Ayurveda principles have not entered laboratories and only a handful of studies have identified pure components and molecular pathways for its effects. Ashwagandha is an Ayurvedic shrub that forms a common ingredient of health supplements, tonics and Indian home remedies. In our efforts to characterize Ashwagandha activities and their molecular mechanisms, we discovered selective *in vitro* cancer cell killing activity in the leaf extract (i-Extract) that operates through activation of tumor suppressor p53 pathway in cancer cells. We have also found that the i-Extract and its component i-Factor (Withanone) enhance health spectrum of normal human cells in culture. We provide the first example of phytochemicals that have both anti-cancer and anti-aging activities.

**Renu Wadhwa**

Research Institute for Cell Engineering

renu-wadhwa@aist.go.jp

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Chemical composition of the leaf extract of Ashwagandha made from i-factor rich Ashwagandha leaf powder (i-FALP) (A), its cancer cell killing activity *in vitro* and *in vivo* (B and C) and induction of p21 in cancer cells is shown in D. Protection against withaferin A-induced toxicity to normal cells is shown in D and E.

