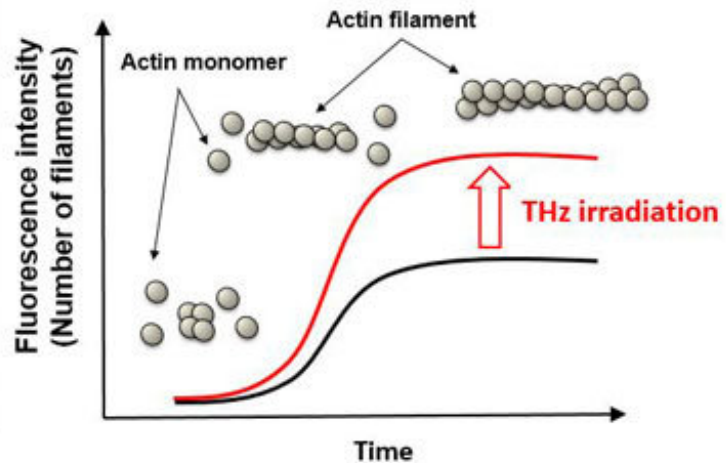
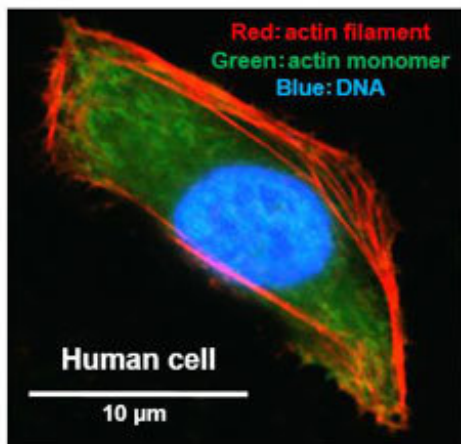


# Terahertz wave activates filamentation of actin: A novel possibility of manipulating cellular functions

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Credit: Tohoku University

A team of researchers has discovered that terahertz (THz) wave irradiation activates the filamentation of actin protein. Drs. Shota Yamazaki and Masahiko Harata (Graduate School of Agricultural Science, Tohoku University); Dr. Yuichi Ogawa (Graduate School of Agriculture, Kyoto University); Dr. Hiromichi Hoshina (THz imaging and the sensing team at RIKEN); and Dr. Toshitaka Idehara (FIR-UF at University of Fukui) have made this important discovery, which offers a new possibility for the manipulation of cellular functions.

Due to the recent development of high power THz (10<sup>12</sup> Hz) wave sources, many researchers have begun to explore its application for material manipulation. One of the advantages of THz wave [irradiation](#) is its lower photon energy as compared to visible light. Therefore, THz wave prevents the ionization of molecules. THz wave enables "soft" manipulation of macromolecules such as proteins, enabling changes to their higher-order structure without damaging the samples.

Actin forms filaments through its polymerization in cells, and functions as a major component of cellular architecture. Actin plays a central role in various cellular functions, including wound healing and the metastasis of cancer cells. In addition, a portion of actin exists in the cell nucleus and regulates gene regulation. For example, actin is required for gene reprogramming, which is required for establishing iPS (induced pluripotent) cells. In this research, the polymerization reaction of purified actin protein was monitored under irradiation of THz wave, and it was found that the THz wave activates the filamentation of actin.

Actin governs various functions of cells. Therefore, a variety of drugs have been developed for controlling actin filamentation, and applications of these drugs for medical purposes have been explored. However, these drugs are inefficient in their delivery into, and clearance from, cells. THz irradiation is a non-invasive method and could overcome these identified problems in drugs. THz wave is expected to become a novel tool for the manipulation of [cellular functions](#) through modifying [actin](#) filamentation. This research team is now trying to understand the basic mechanism of the THz assisting filamentation to extend this technology to various proteins so that THz irradiation can be widely applied to various biological technologies.

**More information:** Shota Yamazaki et al. Actin polymerization is activated by terahertz irradiation, *Scientific Reports* (2018). [DOI: 10.1038/s41598-018-28245-9](#)

Provided by Tohoku University

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