A modern elixir of life

Scientists at Tokyo University of Technology are searching for foodstuffs that can slow the aging process. Focusing on mitochondrial regulation, researchers from the university's School of Bioscience and Biotechnology are using cell-based assays to help identify food components with anti-aging properties.

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Since time immemorial, people have dreamt of discovering ways of holding back the aging process. A group of researchers in Japan are seeking to turn this long-held dream into reality, looking at the anti-aging properties of specific foodstuffs. This research focuses on the effect of various food components on mitochondria, which are believed to play an important role in determining the survival or death of the cells and are more strongly influenced by reactive oxygen species (ROS) than other organelles. Professor Takumi Satoh, Head of the Anti-aging Food Laboratory, Advanced Food Course at Tokyo University of Technology's School of Bioscience and Biotechnology, explained: "I believe that the ability of food components to activate mitochondria is important for anti-aging. Consequently, we are searching for compounds in food that can enter and stimulate mitochondria directly. We are currently investigating various organic acids, such as 3-hydroxybutyric acid, which is from a group of compounds known as ketone bodies that have been reported to prolong the lifespan of *C. elegans*. These are relatively small compounds and, unlike compounds such as glucose, some can enter the mitochondria directly without the need for prior catalysis in the cytoplasm. This results in very efficient energy production, reducing the amount of food required and limiting the stress on the body. As many foods contain these organic acids, it is possible to consume them as part of a normal diet."

Professor Satoh and his team are screening for compounds that are able to promote mitochondrial activity using microplate-based cellular assays, aided by a Spark® 10M multimode microplate reader. He continued: "We culture adherent cells in microplates and, using a fluorescent dye, we can visualize changes in mitochondrial membrane potential and monitor intracellular ROS levels caused by test compounds. We have initially been working on the establishment of this method using the Spark reader, and have already started to see some exciting results."

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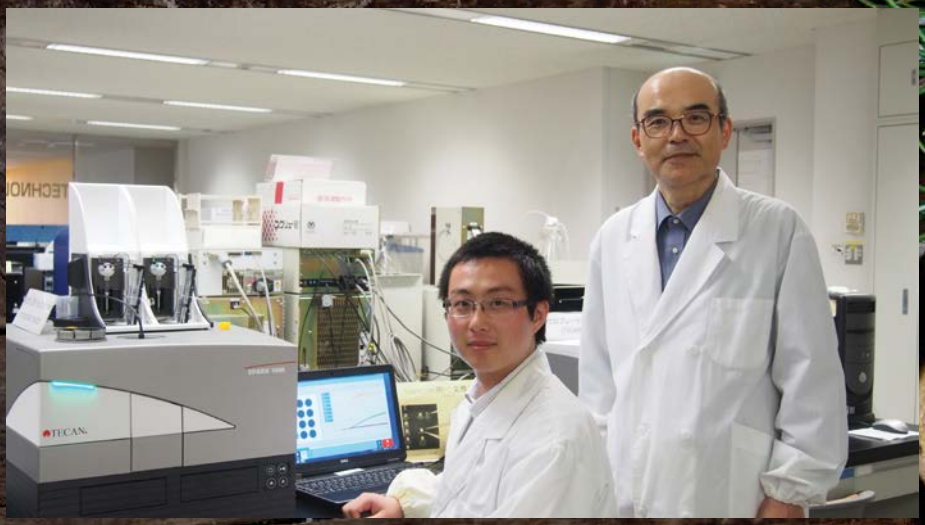
The Spark reader's integrated Gas Control Module (GCM™) is capable of precise regulation of temperature and carbon dioxide concentration, which maintains cell health and allows researchers to perform longer time-course assays. "The ability to perform measurements that are both quantitative and time-based is a great advantage. Previously, it was not possible to satisfy both needs simultaneously; it had to be one or the other. Quantitative fluorescence measurements made using a conventional microplate reader give satisfactory one-off readings, but there is no capability to make repeat measurements over time for cell-based assays. Conversely, fluorescence microscopy is well suited to measurements over extended time periods, but this method can only collect data from a single cell. The Spark 10M was therefore an important breakthrough for our work. We now have a microplate reader that makes it possible to simultaneously assay a population of cells – measuring ROS concentrations or mitochondrial membrane potentials – both quantitatively and temporally, allowing us to determine everything in one go. We can also run multiple experiments at once, usually in 24-well microplates."

"It is a great benefit for our work to be able to ensure that the cells are alive and healthy for the duration of the assay. Both the temperature and the carbon dioxide concentration can be tightly controlled, allowing complete assays to be carried out under the same conditions as within a cell culture incubator. Until now, this combination of features was not available, so the length of time during which measurements could be taken was very limited."

"Another really good thing is that we can run assays continuously for many hours. A common problem with fluorescence microscopy is the non-specific background effect, which increases with prolonged exposure time. However, with the Spark 10M, the measurements are made very quickly, minimizing background interference and allowing us to collect data over much longer periods. Having this quality and breadth of data makes a real difference when preparing manuscripts for publication. Moreover, its operation is simple, making it very easy to use, especially when compared to some other instruments I have seen. It is very good for our experiments," Dr Satoh concluded.



Professor Satoh and student Zhang Jian with the Spark reader

To find out more about Tecan's Spark 10M reader, visit www.tecan.com/spark10m

To learn more about the Tokyo University of Technology's School of Bioscience and Biotechnology, visit www.teu.ac.jp/english/departments/010614.html