Contributing to Society through Science and Technology

Key Strategy: Advanced Healthcare

Combining Analytical and Medical Technologies to Develop New Diagnostic and Treatment Systems

Shimadzu is promoting advanced healthcare as solutions that are based on using a combination of Shimadzu analytical and medical technologies for research and development at every stage of healthcare, including early diagnosis, treatment, and prevention, for the purpose of overcoming cancer and lifestyle diseases, and other disorders, and achieving a healthy life cycle.

Biomarkers are substances useful for determining the presence or progression of diseases. In 2018, Shimadzu collaborated with the National Center for Geriatrics and Gerontology to jointly develop a method for detecting Alzheimer’s disease from a few drops of blood based on estimating the amyloid-beta accumulation levels in the brain. Amyloid-beta is considered a possible cause of Alzheimer’s. The Shimadzu Group has continued to research the prevention, diagnosis, and treatment of dementia.

Amyloid MS CL Approved as Medical Device for Reducing the Burden on Patients

The Shimadzu Amyloid MS CL system for measuring amyloid peptides in blood received approval as a “controlled medical device” (Class II) in December 2020 and was released in June 2021. The Amyloid MS CL system is a product configured with a Shimadzu AXIMA Performance CL mass spectrometer, data analysis software, and other portions of the mass spectrometry technology used for the Alzheimer’s disease detection method developed in joint research work with the National Center for Geriatrics and Gerontology.

Amyloid peptides are a key component of the amyloid plaques that are characteristic of the Alzheimer’s disease. This product measures the concentration of amyloid peptides in blood and outputs a biomarker value that correlates to the quantity of amyloid-beta, a possible cause of Alzheimer’s disease. Consequently, it is attracting interest as a new examination method that is easier on patients than conventional PET scanning and cerebrospinal fluid analysis methods.

Release of BresTome, World’s First TOF-PET System Dedicated for Heads and Breasts

Released in March 2021, the BresTome is the world’s first TOF-PET system that can examine both head and breast areas, by button-operated reconfiguration of the detector position.

Designed with state-of-the-art Shimadzu semiconductor detectors and TOF technology, it provides high-definition PET images. Due to the small 30-cm diameter detector hole, the detectors can be positioned much closer to the target area being examined, which means the BresTome offers about double the resolution of conventional whole body PET systems (which have a hole diameter of about 80 cm). For breast examinations, it can acquire images without any breast compression or associated pain.

It also opens up a broad range of new potential applications for PET imaging, not only for clinical treatment of brain tumors, epilepsy, and breast cancer, but also to contribute to brain research, such as for researching Alzheimer’s or other dementias.

Measure 02: Cancer

In recent years, there has been a global increase in the number of people diagnosed with or who have died from cancer. In Japan, cancer has been the number one cause of death since 1981, with cancer causing over 300,000 deaths per year. Therefore, Shimadzu has actively provided support for developing ultra-early diagnosis methods and new detection and treatment methods.

Photoimmunotherapy

Photoimmunotherapy has been attracting attention as a new cancer treatment that can selectively target and destroy cancer cells by administering a drug that selectively binds to cancer cells and then irradiating the drug/cancer with light (near-infrared light). The method was developed by Dr. Hisataka Kobayashi, a Senior Investigator working at the National Cancer Institute in the United States, a department in the U.S. National Institutes of Health.

Examples of R&D for Advanced Healthcare

- **Biomarker Discovery Using a Mass Spectrometer and Support for Clinical Application Research**
  - Biomarker measurement results provide important information for identifying cancers or other specific disorders and judging how far they have advanced. Therefore, discovery research intended to search for new biomarkers that are effective in indicating the status of a disease or the therapeutic effects of treatment has been a very active field of research in recent years. Due to the superior quantitative ability of mass spectrometry technology, it has served an important role in various types of clinical application research work and is expected to help result in developing in-vitro diagnostic methods and prevention and treatment methods.

- **Significance of Measuring Brain Function and Applicable Fields**
  - Given the ongoing advancements in brain science research, functional near-infrared spectroscopy (fNIRS) has been attracting attention as a new technique for measuring brain activity under conditions that more closely approximate daily life. Because patients can be measured in a safe and natural state without restricting their movement, optical imaging has expanded the scope of potential applications for brain function research, such as for drug discovery and medical research fields, including rehabilitation research and the study of neonatal brain function, psychology, and neuroscience.

- **Diagnosis and Treatment of Primary Aldosteronism**
  - One effective way to determine a treatment plan for primary aldosteronism is to acquire samples from the adrenal vein, however it can take several days to obtain results.

Since FY2020, Shimadzu has been involved in new joint research with the National Cancer Center Japan aimed at developing clinical applications for photoimmunotherapy. In June 2021, Shimadzu signed an agreement with Rakuten Medical to jointly develop and commercialize medical devices based on photoimmunotherapy to be used with the Umino™ platform. The Shimadzu Group is using near-infrared image processing technology and mass spectrometry technology to visualize and record the reaction of the drug to photoradiation in real time, which will hopefully promote the widespread use of photoimmunotherapy not only for supporting clinical treatment but also for satisfying clinical application needs.
Overview

In an effort to implement infectious disease countermeasures, the Shimadzu Group has strengthened its measures for offering viral, bacterial, and other pathogenic testing solutions. Within those measures, in addition to offering new infectious disease testing-related products, we have also been working with universities and healthcare institutions to jointly develop solutions for society's challenges with the pandemic, in the form of systems intended to help society control infections.

Measures in FY 2020

AutoAmp DNA Sequencer Released for Fully Automatic PCR Testing

Released in November 2020, the system can be used to achieve rapid and easy testing for obtaining consistent data by simply placing specimen vials containing a nose swab or saliva in the system. Due to the compact size and affordable price, the fully automatic PCR testing system is widely used at healthcare facilities such as clinics, small/medium hospitals, and urgent care providers, regional public health research centers, and testing laboratories.

By offering the PCR testing system and a broad line of other products and reagents, Shimadzu is contributing to expanding/improving testing capabilities for preventing the spread of novel coronaviruses.