Healthcare

1 Hitachi's First Proton Therapy System in Europe Opens at Clínica Universidad de Navarra in Spain

1 Treatment room of proton therapy system at Clínica Universidad de Navarra

Hitachi has supplied its proton therapy system to Clínica Universidad de Navarra in Madrid, Spain and treatment started on April 17, 2020. Clínica Universidad de Navarra is the first hospital in Europe to which Hitachi has delivered the proton therapy system. With sites in both Navarra and Madrid, Clínica Universidad de Navarra is a private hospital that combines medical research and education with the provision of clinical care. It is recognized as a world-leading medical institution and was listed among the top 50 world hospitals in the 2020 Newsweek magazine rankings*1.

The supplied system has a treatment room and is equipped with leading-edge technologies, including spot scanning to precisely target the proton beam based on the shape of the tumor, a 360-degree rotating gantry with cone beam computed tomography (CT), and real-time image gated proton therapy (RGPT)*2. Furthermore, this system has the option to add an additional gantry treatment room in the existing building without interrupting treatment.

*1 The World's Best Hospitals: A ranking list published annually by the US magazine Newsweek.
*2 RGPT allows real-time beam irradiation to the tumor while compensating for movement associated with respiration. The technology was collaboratively developed between Hokkaido University and Hitachi, supported by the Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST) of Japan Society for the Promotion of Science.

2 Supply of Large Superconducting Magnet with Conduction Cooling to University of Tsukuba

Hitachi has manufactured two large conduction-cooled superconducting magnets made of niobium-titanium (NbTi) superconductor and supplied them to the Plasma Research Center at the University of Tsukuba. The magnets are a key component of the center's plasma research, which is part of development work for future nuclear fusion reactors.

The magnets use conduction cooling, which is achieved by means of a single cryogenic refrigeration system without the need for coolants such as liquid helium. When operating at rated capacity, they can generate a field of 1.5 T at the magnet center. Moreover, with a bore of 900 mm, they are among the largest conduction-cooled magnets to use a small refrigeration system. Although this causes difficulties with achieving uniform cooling throughout the magnets and protection for when superconduction is lost, the selection of appropriate heat conducting material, modifications to the excitation circuit, and other such measures ensure excellent cooling performance and magnet stability. Operation will commence following the completion of installation work scheduled for FY2020.

Hitachi is looking to further develop the technology, recognizing that the expertise it acquired from these large conduction-cooled superconducting magnets has potential uses beyond superconducting magnets used in research, such as in medical equipment.

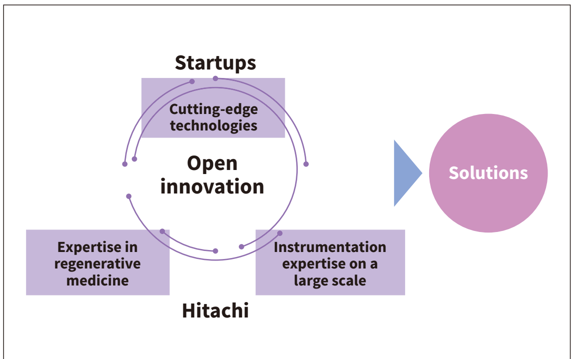
2 Two large conduction-cooled superconducting magnets after completion of manufacturing

3 Cell Production Solution Set to Accelerate Commercialization of Regenerative Medicine

Recognized for its potential to provide new therapies, practical applications for regenerative and cell-based therapies are growing at an increasing rate with four regenerative medicine products including chimeric antigen receptor (CAR)-T cells having been granted approval in Japan since 2019. However, a number of commercialization issues still remain, including the securing of reliable supplies of high-quality cells.

Hitachi has already supplied its iACE2 automated cell culture system for the large-scale culturing of induced pluripotent stem (iPS) cells to major pharmaceutical manufacturers and this equipment is capable of the large-volume production of cells required for regenerative medicine. Progress is also being made on solving the challenges of regenerative medicine by combining knowledge gained from the development of the iACE2 with leading-edge technologies from startups.

A large-volume culturing technique that uses the iACE2 and is not limited by culture method has been developed through joint research with Myoridge Co. Ltd., a company with expertise in culturing cardiomyocytes derived from iPS cells. Joint research aimed at commercialization of cell analysis and sorting systems is also underway with ThinkCyte, Inc., a company with expertise in the application of artificial intelligence (AI)-driven system to this field. Hitachi's systems feature reliable operation and excellent repeatability. The aim is to combine technologies developed for these systems with ThinkCyte's high-throughput and precise cell analysis and sorting techniques to supply cells stably in large quantities and at a low cost.



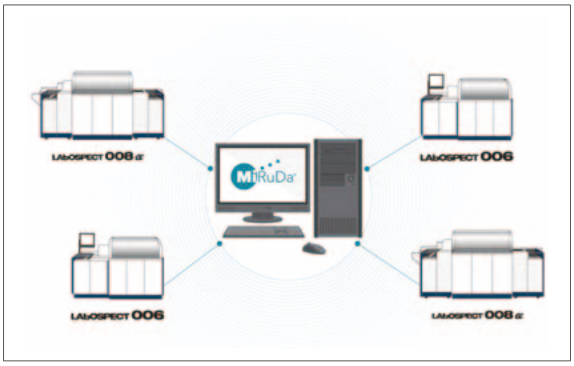
3 Business Development for Startups through Open Innovation

4 MiRuDa Analysis Tool for Reaction Process Approximation with Applications in Clinical Laboratory Accuracy and Quality Assurance

The requirements of the International Organization for Standardization (ISO) standard for the quality and competence in clinical laboratories (ISO-15189) and revisions to Japan's Medical Care Act both require measures to ensure the accuracy and quality of laboratory tests. While past test data quality control methods have involved conducting measurements on samples of known concentration at regular intervals to verify the reliability of laboratory results, it was more difficult to find direct ways of guaranteeing the accuracy and quality of patient sample analyses.

The automatic analyzers used for clinical laboratory tests work by calculating the concentration of particular components in a sample from reaction process data (specifically, the change in optical absorbance over the time course of a 10-minute chemical reaction between the sample and reagents). The MiRuDa analysis tool for reaction process approximation is invoked after a reaction is complete to perform curve or line fitting on all of the reaction process data measured by a LABOSPECT 008 α/006 automatic analyzer, also performing a detailed analysis of the distribution of the resulting coefficients. This allows it to identify anomalous data that indicates a divergence from the normal reaction pattern. Data that shows a normal reaction process, on the other hand, could be used as a tool for assuring the accuracy and quality of the associated test data.

MiRuDa makes the task of test data approval at clinical laboratories more efficient while also helping provide a next-generation test data quality management technique that is directly based on the measurement data from the patient's sample.



4 System diagram of MiRuDa analysis tool for reaction process approximation

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