HITACHI

Joint Research by Hitachi and Hitachi Plant Services Wins the Technology Award of the Japanese Association for Animal Cell Technology

Tokyo, October 16, 2026, Hitachi, Ltd. (TSE:6501, "Hitachi") and Hitachi Plant Services Co., Ltd. ("Hitachi Plant Services") announce that the results of their joint research (hereinafter "this research") with the research group of Associate Professor Masayoshi Onitsuka at Tokushima University have received the Technology Award of the Japanese Association for Animal Cell Technology (JAACT).

The outcome of this research is a technology that improves the efficiency of biopharmaceutical culture process development through AI-based culture-condition optimization technology and simulation technology for cellular behavior (hereinafter “this technology”). It was recognized as an advanced approach that shortens development periods and achieves high productivity while maintaining quality.

By integrating experiments and simulations, this technology improves the efficiency of culture process development and enables more sophisticated investigation of culture conditions, thereby contributing to shorter development periods and lower development costs in biopharmaceutical development. This technology is also one of the technologies that constitute “HMAX for Biopharma,” which Hitachi is promoting with the aim of advancing biopharmaceutical processes from research and development to manufacturing. With support from Hitachi’s Strategic SIB Business Unit, it is positioned as an important foundational technology for realizing “Lab to Fab,” which Hitachi and Hitachi Plant Services are promoting.

About the JAACT Technology Award
The JAACT Technology Award is presented to recognize outstanding technological development and industrial application achievements in the field of animal cell technology. In addition to academic value, research achievements with excellent potential impact on industry, practicality, and novelty are eligible for the award.

About the Award-Winning Technology
In the development of biopharmaceuticals, including antibody therapeutics, optimization of culture conditions and improvements in productivity and quality are important. At the same time, the need to conduct numerous culture experiments creates challenges such as longer development periods and increased development costs. In this research, the team developed a culture-condition optimization technology using Sequential Model-Based Optimization (SMBO)[*1]. With this technology, AI uses a small amount of experimental data to sequentially update a learning model while proposing the optimal experimental conditions to be tested next. Compared with conventional trial-and-error experimentation, this makes it possible to search efficiently for optimal conditions with fewer experiments, contributing to shorter culture process development periods and lower development costs.

Furthermore, in addition to single-objective optimization targeting productivity alone, the technology achieves multi-objective optimization that simultaneously considers productivity and

quality. A glycan profile*2, which indicates antibody quality, is used as a quality index. By quantitatively evaluating the trade-off between productivity and quality, the technology enables the search for culture conditions that achieve maximum productivity while maintaining quality. In this way, it supports the efficient development of high-quality biopharmaceuticals.

The team also constructed a hybrid simulation model combining a mechanistic model of phenomena such as cell proliferation with AI, using culture data obtained from perfusion culture*3. The team confirmed that this model can predict with high accuracy the time courses of glucose concentration, lactate concentration, ammonia concentration, and viable cell density during fed-batch culture*4. In addition, culture conditions expected to improve productivity were identified by using this simulation. Culture experiments conducted under those conditions confirmed that the observed improvement in productivity and the predicted results were in good agreement.

*1 A technology in which AI (artificial intelligence) learns from past experimental results and predicts the "optimal conditions to test next." This makes it possible to find the optimal solution efficiently with dramatically fewer experiments than before, thereby shortening development periods and reducing costs.
*2 The structural pattern of the "sugar chains" attached to proteins, which influences the quality of biopharmaceuticals. Because these glycan patterns directly affect the efficacy and safety of a drug, they are an important indicator for evaluating pharmaceutical quality and uniformity.
*3 A method of growing cells while continuously supplying fresh nutrients (culture medium) and discharging spent medium containing waste products. By continuously maintaining an optimal environment for cells, it enables cells to grow and be maintained stably at high density over long periods.
*4 A culture method in which necessary nutrients are added in stages according to cell growth and the intended purpose. A distinguishing feature is that spent medium is not removed. It is a well-established, standard method widely used in the commercial manufacture of many biopharmaceuticals.

Reasons for the Award

JAACT highly regarded this research for proposing an AI-driven optimization technology that sequentially updates a model while using a small amount of experimental data and efficiently searches for optimal culture conditions. The technical advancement of the research was also recognized for achieving, in addition to single-objective optimization targeting productivity alone, multi-objective optimization that simultaneously considers productivity and quality, and for demonstrating that a Pareto front*5 visualizing the trade-off between quality and productivity can be identified.

JAACT also commended the research for constructing a hybrid simulation that integrates a mechanistic model and a data-driven model by using perfusion-culture data, and for demonstrating in fed-batch culture that the simulation results were in good agreement with measured values. These achievements represent an advanced approach that contributes to improvements in "speed, quality, and cost," which are important challenges in biopharmaceutical development. They were recognized as pioneering achievements with potential for future industrial applications.

*5 A graph showing candidates for the "optimal choices" with the best balance in a trade-off relationship, such as between "quality" and "productivity," where improving one causes the other to deteriorate. The graph is used to determine the best manufacturing conditions for a given objective.

Future Development
Hitachi and Hitachi Plant Services are continuing their joint research this fiscal year with the research group of Associate Professor Masayoshi Onitsuka at Tokushima University, together with Hitachi High-Tech Corporation, which provides new measurement instruments. Under the concept of “HMAX for Biopharma,” the companies will use the results of this research to improve the efficiency of culture process development and will also work to advance the entire biopharmaceutical development process, including scale-up and technology transfer, by linking the results with other digital and engineering technologies.

Going forward, the companies will further advance culture process development support technology that integrates AI and simulation technologies. By expanding its application beyond antibody therapeutics to regenerative medicine products, cell and gene therapy, nucleic acid therapeutics, and industrial biomanufacturing, the companies will contribute to greater efficiency and higher quality in research, development, and manufacturing across the bioindustry.

At Hitachi’s Connective Industries (CI) Sector, we provide industrial solutions that maximize lifetime value for customers and transform industries globally, contributing to a prosperous society. Aiming to become a leading company in Physical AI, we achieve this through the combination of strong products and HMAX Industry, a next-generation suite of solutions that combines data from an extensive installed base of digitalized assets with domain knowledge and advanced AI.

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