KOREA INSTITUTE OF MACHINERY & MATERIALS	PRESS RELEASE	Research institute to bring a better future based on innovation in mechanical technology

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Conducting sample collection and diagnosis together in public health and medical settings through non-face-to-face methods

- KIMM develops a rapid, automated molecular diagnosis system integrated with a non-face-to-face specimen collection robot -

- The system can complete the process of sample collection and molecular diagnosis within 40 minutes on site -

☐ A system has been developed that can quickly and precisely perform sample collection and diagnosis in public health and medical settings in light of new and variant infectious diseases, such as COVID-19.

☐ The Korea Institute of Machinery and Materials, an institution under the jurisdiction of the Ministry of Science and ICT (President Sang Jin Park, hereafter referred to KIMM), has developed the first integrated system in Korea that can collect specimens at the medical sites using a specimen collection robot in a non-face-to-face manner to prevent the spread of infectious

diseases such as COVID-19, and can automatically complete high-speed molecular diagnosis in 40 minutes. This newly developed system is expected to lay the foundation for preventing the spread of new and variant infectious diseases in advance and strengthening the competitiveness of K-Bio diagnostics technology.

□ To develop this system, the KIMM research team led by Dr. Dongkyu Lee, a principal researcher from the Department of Medical Devices at the Daegu Research Center for Medical Devices and Green Energy, and Dr. Joonho Seo, head of the Department of Medical Robotics (of the same Center), improved upon the sample collection technology of non-face-to-face samplings robot previously developed by KIMM. In addition to the existing sampling robot, by integrating rapid molecular diagnostic equipment, sample preparation technology of collected samples, and fast real-time PCR technology based on the rapid thermocycles, this system can now quickly and precisely conduct non-face-to-face procedures from sample collection to molecular diagnosis on site.

□ The whole world experienced the collapse of the medical system due to the continuous outbreak of new and variant infectious diseases, such as monkeypox and COVID-19, over the past three years. In order to respond to new and variant infectious diseases that are highly contagious, rapid and precise molecular diagnosis is required in public health and medical settings. However, through traditional methods, it takes approximately 6 to 12 hours to complete the process of face-to-face sample collection, transfer, and molecular diagnosis.

□ One problem with traditional molecular diagnostic equipment is that it takes 1 to 2 hours or more to obtain analysis results. To solve this problem, attempts have been made to utilize photothermal-based and microfluidics-based rapid thermocycle technology*. However, it is difficult to manufacture at low cost and quantitatively analyze in real time, thus limiting their on-site applications.

* Rapid thermocycle technology: a technology that rapidly performs repeated heating and cooling cycles

□ On the other hand, the KIMM research team's newly developed rapid, automatic molecular diagnostic system, integrated with a sample collection robot, can obtain real-time PCR analysis

results within 9 to 20 minutes at a speed 4.2 times faster than existing molecular diagnostic equipment. This is achieved by using a customized thermocycler that uses preset heating and cooling blocks in turn.

□ The KIMM research team performed validation tests using this new system by conducting diagnosis of pathogenic bacteria and infectious coronavirus. From sample collection to molecular diagnosis, bacterial DNA analysis was completed within 25 minutes and coronavirus RNA within 40 minutes. The molecular diagnosis results obtained using this new system were similar to those obtained when using commercial molecular diagnosis equipment.

□ KIMM's newly developed system is a non-face-to-face system that applies automatic diagnostic technology throughout the entire process of sample dispensing, sample preparation processing, and rapid molecular diagnostics after sample collection, so that even unskilled users can quickly conduct diagnostics on site. When used in public health and medical settings such as screening clinics, airports, and emergency environments, the spread of new and variant infectious diseases can be quickly and accurately prevented in advance.

□ Dr. Dongkyu Lee said, "The rapid, automatic molecular diagnosis system integrated with a non-face-to-face sample collection robot will prevent the continuous spread of new and mutated infectious diseases, while also protecting medical staff and the health of the general public." He added, "KIMM will work with medical institutions and industries to globalize K-Bio technology, prevent the spread of new and mutated infectious diseases, and strive for R&D efforts with the goal of protecting the healthy lives of everyone in Korea."

[List of Attachments]

- Attachment 1: A Photo of the Newly Developed System (Photo)
- Attachment 2: Photo/Video of System Operation (Photo/Video)
- Attachment 3: A Photo of the Research Team (Photo)

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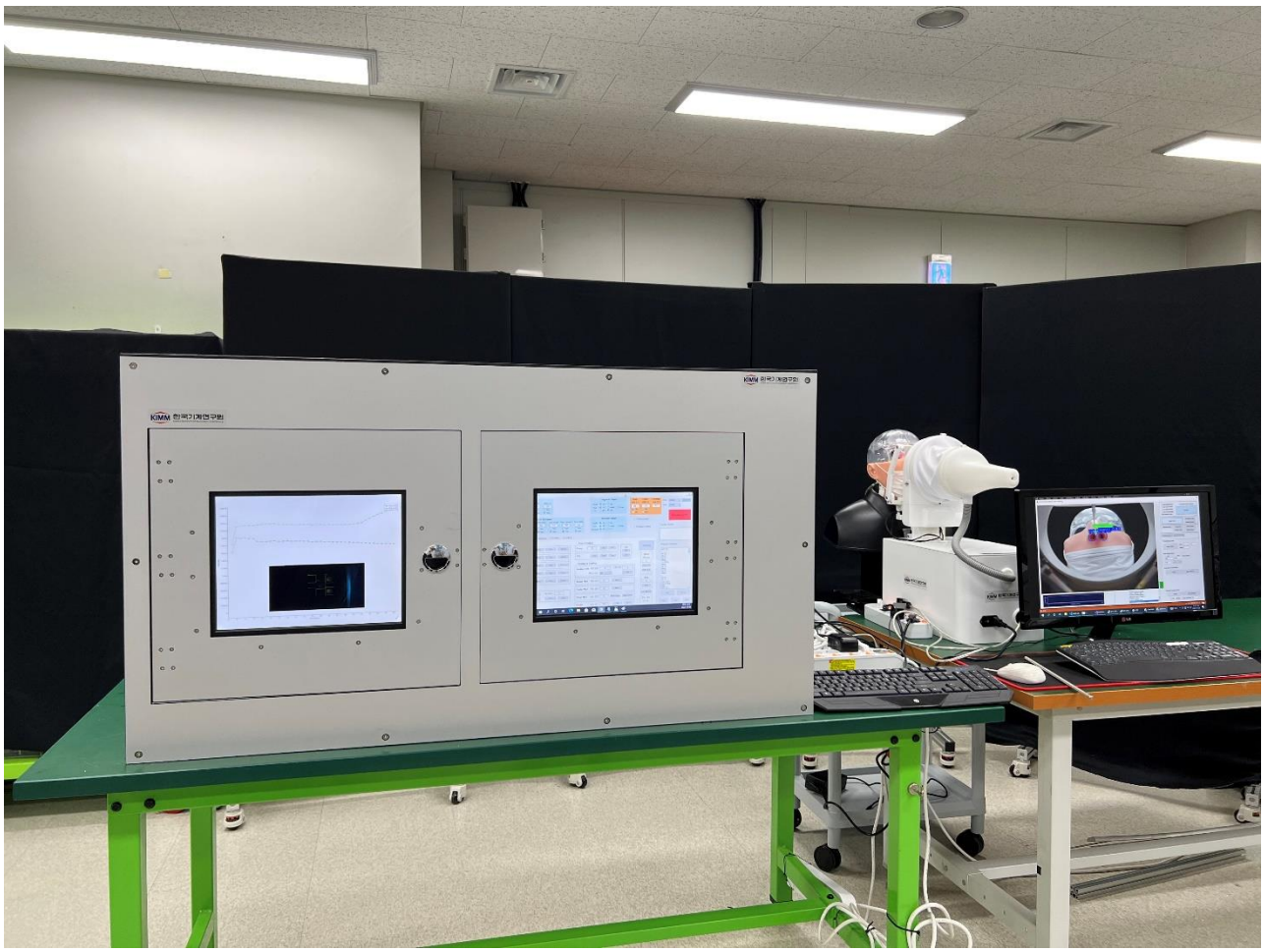
The Korea Institute of Machinery and Materials (KIMM) is a non-profit government-funded research institute under the Ministry of Science and ICT. Since its foundation in 1976, KIMM is contributing to economic growth of the nation by performing R&D on key technologies in machinery and materials, conducting reliability test evaluation, and commercializing the developed products and technologies.

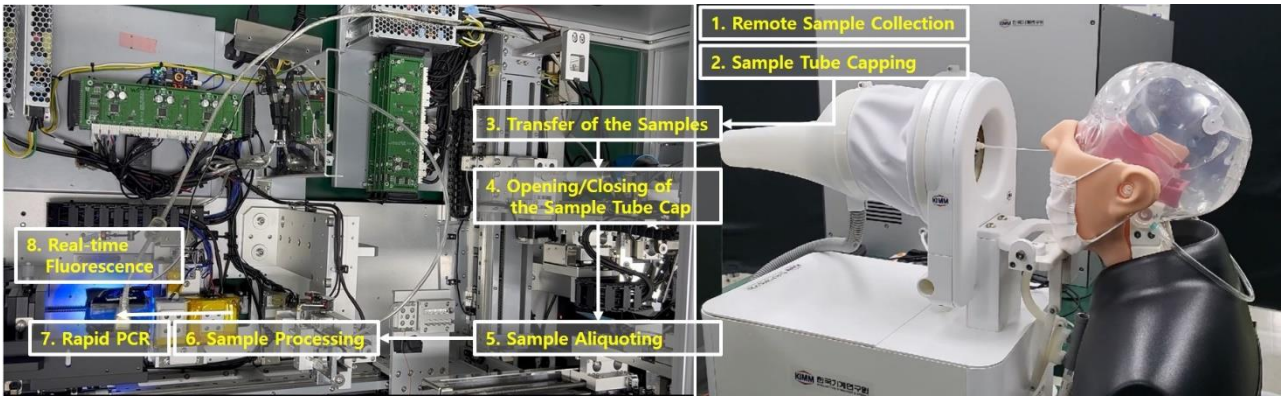
These research efforts were carried out by KIMM and Biot Korea, Inc., with the support of the Korean Health Industry Development Institute as part of the “Development of a rapid, automatic molecular diagnostic field-type system and POC (proof-of concept) verification with a sample collection robot” project.

- Attachment 1: A Photo of the Newly Developed System (Photo)



Description: A photo of the rapid, automated molecular diagnosis system integrated with a sample collection robot.

- Attachment 2: Photo/Video of System Operation (Photo/Video) (Video attached separately)



Description: Operation procedure of the rapid, automated molecular diagnosis system with a sample collection robot.

- Attachment 3: A Photo of the Research Team

Description: A photo of the research team, Dr. Dongkyu Lee (fourth from the left) and Dr. Joonho Seo (third from the right).