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Department of Chemistry Professors Min-Gon Kim and Chin-Ju Park's joint-research team develops high-sensitivity analysis for murder mites

- GIST (President Kiseon Kim) Department of Chemistry Professors Min-Gon Kim and Chin-Ju Park's joint-research team discovered an aptamer * that interconnections with the nuclear protein that protects the severe heat-resistant microplatelet syndrome virus (murderer's mites) RNA, and developed a method for the analysis of trace amounts.

* aptamer: oligonucleotides that bind very selectively to specific target molecules

- The application of liposomes *, which can be used universally in assays using aptamers, greatly improves diagnostic signals. The developed technique is expected to be used for early diagnosis of severe febrile thrombocytopenia syndrome.

* liposomes: this refers to a structure that is formed when phospholipid is put into aqueous solution and is also used in hollow structures with a number of substances, such as enzyme proteins

- Severe febrile thrombocytopenia syndrome was first reported in China in 2009, and initial diagnosis is very important because there are no commercially available preventive vaccines or treatments.
- Viral nucleoproteins are proteins that enhance the stability of viruses by protecting their viral genes. Even in viruses with high genetic variation,

nuclear proteins are less detectable than other proteins, making them a representative detection material used for virus diagnosis.

- The research team presented a new colorimetric assay that can detect trace levels of nuclear proteins in samples by combining aptamers and liposomes specific to the nuclear proteins of the severe thrombocytopenia syndrome virus. In addition, the developed assay was used to detect nuclear proteins of the influenza virus type A to confirm its versatility.
 - To determine the detection sensitivity and the quantitative range, the team immobilized various concentrations of the nuclear protein for the antibody, measured the absorbance through the color reaction, and observed the change in color. As a result, it was found that the femtomol (1 femto is 10⁻¹⁵) level of nuclear protein was successfully detected, and the detection of nuclear protein contained in human serum as well as buffer solution was confirmed.
 - To check the specificity of the analysis method developed, the analysis method was conducted after preparing samples mixed with nuclear protein from other viruses with similar structures, and it was confirmed that only nuclear proteins of severe thrombocytopenia syndrome virus were specially detected.
- Professor Min-Gon Kim said, "Severe febrile thrombocytopenia syndrome, which is transmitted by mites, has a mortality rate of up to 30% and early diagnosis is very important because there are no commercialized treatments and preventive vaccines. In the future, if the technology is applied in real life, it is expected that early diagnosis will be possible, which will reduce the possibility of transmission and reduce the mortality rate through rapid treatment.
- This research was led by Department of Chemistry Professors Min-Gon Kim and Chin-Ju Park and conducted by Ph.D. students Gyuhoo Yeom and Juyoung Kang with support from the GIST Technology Institute Practical Research and Development support program, the Mid-career Researcher Program, and the National Research Foundation and was published in *Analytical Chemistry*, the most prestigious journal in the field of chemistry, on October 11, 2019.

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