Invention for Detection and Precise Quantification of Molecules

Researchers at The Molecular Sciences Institute revealed means for sensitive detection and precise quantification of arbitrarily designated molecules. The work is published in the current issue of *Nature Methods*.

The Cover Article, entitled "Using protein-DNA chimeras to detect and count small numbers of molecules," describes "tadpole" molecules, and their use to detect and count small numbers of proteins and other molecules.

Detection and quantification methods based on these molecules have exquisite sensitivity, immense dynamic range, and unprecedented quantitative precision. These attributes should make the molecules useful for applications from diagnosis and assessment of human disease, to environmental monitoring, to detection of pathogens during an emerging infectious disease or a deliberate biological attack.

Methods based on these molecules are designed to work with the existing infrastructure of PCR machines, which are widely deployed and found most county public health departments in the United States.

According to Dr. Roger Brent, MSI Director and senior member of the team, "We called the molecules tadpoles because they consist of a protein head coupled to a DNA tail. The head binds the specific target molecule, while the DNA tail lets us count the number of target molecules."

Dr. Ian Burbulis, a researcher at MSI, devised the tadpole molecules and is the first author of the paper. According to Dr. Burbulis, "If you want to understand the mechanistic operation of biological systems, you need to know the precise numbers of each component part found in individual cells. Tadpoles and methods based on them should make that possible."

To count molecules so precisely, the researchers resorted to statistical methods sometimes used in high energy physics. The improved statistical techniques may be useful in other applications, such as management of therapy for HIV.

The work is funded by MSI's Alpha Project, its flagship effort to predict the future behavior of a prototype cellular system. The Alpha project is funded by the National Institutes of Health's National Human Genome Research Institute. In 2002, NHGRI named MSI a "Center of Excellence in Genomic Science," an acknowledgement of MSI's past and future research contributions in the field.

"This invention is almost a textbook example of how research into fundamental biology can spin off applications that might impact human health and safety in fairly short order," said Dr. Brent.

The invention is also described in an accompanying Nature Methods "News and Views" article by Stanford researcher Dr. Garry Nolan, who wrote that tadpoles may be an "appealing system for researchers wanting a standardized, high-throughput, and accurate detection system for... just about anything."

The Molecular Sciences Institute is an independent nonprofit research laboratory that combines genomic experimentation with computer modeling. Work at MSI aims to weave biology together with physics, engineering, computer science, and mathematics to enable precise, quantitative, prediction of the future behaviors of biological systems.

Nature Methods is a first-tier journal for new methods and significant improvements in life sciences and

chemistry.

Source: Molecular Sciences Institute