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Researchers Awarded $3.2M from NIH to Pioneer Advanced Biomolecule Discovery Technology

A team of researchers is designing a way to generate nucleic acid molecules that will revolutionize medical diagnostics and drug delivery

NEWS RELEASE

James Thomson (left) and Tom Soh

(Santa Barbara, Calif.) ? The National Institutes of Health (NIH) have awarded $3.2 million to a team of prominent engineering, chemistry, and biology researchers to develop a highly efficient system of generating nucleic acid molecules, called aptamers. The technology provides an entirely new method of discovering and mass producing new high-performance aptamers for a broad range of applications, including next-generation disease diagnosis at the point of care.

Their system, called Quantitative Parallel Aptamer Selection System (QPASS), is a highly efficient process that will pave the way to develop ?instant diagnosis? devices, such as those that detect infectious disease or gene tically test a person?s response to cancer drugs.

?Our technology is the first step toward devices that could instantly test for HIV or H1N1 in the field or at the be dside, instead of wasting critical time and money waiting for results,? said Tom Soh , professor of mechanical engineering and materials, and Co-Director of the Center for Stem Cell Biology and Engineering at UC Santa Barbara. Earlier this year, Soh and his colleagues at UCSB announced the design of a disposable chip that rapidly detects microbes, called a MIMED device. This new aptamer synthesis technology aims to make devices like MIMED chips ready for widespread clinical use.

According to the research team, QPASS solves aptamer discovery problems that have plagued the field for more than 20 years, such as an expensive and lengthy process, and stability of the molecules at room temperature.

?We are developing innovative new technologies that make each step of our process several orders of ma gnitude more efficient,? added Soh. ?QPASS will generate high-performance synthetic affinity reagents in a mass ively parallel manner to meet a growing need in labs and clinics.?

Renowned biomedical researchers James Thomson and Lloyd Smith are collaborating with Soh to develop the three novel technologies that comprise QPASS ? aptamer selection, sequencing, and validation.

Soh is engineering a screening tool that uses microfluidics technology to find the best aptamer sequences among trillions. Thomson, who is world-renowned for his stem cell research, has designed a way to integrate sequencing with selection, using computer algorithms to quickly identify the most promising sequences. Smith?s microarray research uses an innovative imaging technology ? called Surface Plasmon Resonance Imag ing or SPRi ? in combination with a microscopic DNA chip that can validate 10,000 times more sequences than cu rrent practices, identifying the most effective aptamers instantly.

?I am delighted to have the opportunity to work with this outstanding team of scientists,? said James Thomson, Co-Director of the Center for Stem Cell Biology and Engineering at UCSB, and Director of Regenerative Biology at the Morgridge Institute for Research in Wisconsin. "This grant will strengthen the continuing collaborative efforts between UC Santa Barbara, the Morgridge Institute, and University of Wisconsin-Madison, bringing together leading edge technologies and experts from different disciplines."

?This is an exciting project to address a major barrier to progress in biological research: the lack of effective reagents to specifically bind to target proteins that play central roles in cell biology,? said Lloyd Smith, professor of chemistry at University of Wisconsin, Madison, and Director of the Genome Center of Wisconsin.

?There is a new paradigm in medicine called theranostics, or point-of-care testing of a patient?s reaction to a medication,? explained Soh. ?They?ve just started doing this in larger research hospitals, and to great effect. I believe our integrated technology will someday allow a technician in a small clinic to make a quick diagnosis. Making it affordable for everyone to use is really the value that engineers can provide.?

Their research is supported by the Institute of Collaborative Biotechnologies at UCSB.

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Images

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