

## RESEARCH BRIEF

# MICROSYSTEM PLATFORM FOR 'LAB-ON-A-CHIP' DRUG DEVELOPMENT

### The challenge

Antibiotic resistance has been an increasing public health concern. However, few new drugs for bacterial pathogenesis have been obtained without addressing this resistance.

### The potential

One target to solve the arduous problem is “quorum sensing” (QS), a newly-discovered communication system among bacterial cells. In QS, bacterial cell communication is mediated by chemical signals that, when the number of cells reaches a “quorum” level, coordinate changes in gene regulation.

The capability to intercept and rewire the biosynthesis of signal molecules, and not kill the bacteria directly, opens the door to discover novel antimicrobial drugs that are able to bypass antibiotic resistance.

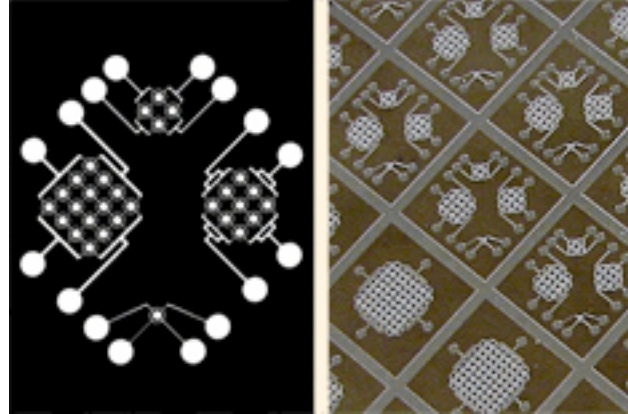
### The research

Professor Gary Rubloff (MSE/ISR) and his Ph.D. student Xiaolong Luo (Bioengineering) are developing a micro research platform, or “lab-on-a-chip” for drug development that could lead to a new strategy for antibiotic therapy.

The chips contain tiny channels, into which are placed enzymes that serve as catalysts. The reactions that occur on the chips simulate the creation of cell signal molecules in living organisms.

By placing QS enzymes in this well-controlled microsystem, the communication signal molecules are reproduced and can be further interrogated. Enzymes placed in site-specific locations in the microsystem have shown normal activity. The microscopic platform can be used to screen efficient inhibitors, ultimately the antimicrobial drug candidates, to knock down the production of signal molecules for bacterial communication.

The unique platform integrates biologically active enzymes with microfabricated devices. The enabling capability comes from the biological substance chitosan. Chitosan can be deposited onto the inorganic surface



Left, a design for a microsystem chip developed in the Nano-Bio Systems Laboratory. Right, a biodevice mold that uses the design.

of microdevices per electrical signal, while retaining reactivity to biological components. The platform is an important step in progress toward a “lab-on-a-chip” technology suitable to support drug development and metabolic engineering research.

### Link

**Nano-Bio Systems Laboratory:** [www.rubloffgroup.umd.edu/facilities/facilities.php#NBSL](http://www.rubloffgroup.umd.edu/facilities/facilities.php#NBSL)

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