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Other Voices: U-M can take the lead in combating disease with technology

by John Prensner, Maggie Kober and Adam Castano.

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In November, Brandon McNaughton and Paivo Kinnunen, two University of Michigan physics researchers working with Raoul Kopelman, joined a small group of other young inventors from across America at the Collegiate Inventors Competition. Like the other participants, they were there to showcase their invention: a novel diagnostic for bacterial infections.

McNaughton and Kinnunen's technology embodies the growing trend for medically relevant discoveries to come from all areas of academia. Their system starts by attaching bacteria to microscopic rotating magnetic spheres. This, in turn, alters the sphere's rotation by introducing a new source of drag. Using inexpensive, low-power lasers - similar to those in household CD players - they can measure these changes, allowing single bacterium detection and growth dynamics monitoring. By adding antibiotics, they can also rapidly determine antibiotic resistance patterns.

Each detection system is inexpensive, compact, reliable, and easily manufactured. It is intended to generate conclusive results within eight hours - or within the span of a hospital worker's shift - making it ideal both for detection of bacterial infections and determining how to treat antibiotic-resistant "superbugs." Current diagnostics require days to weeks, encouraging doctors to treat patients with non-specific antibiotics empirically-a practice that may jeopardize patient safety and contribute to antibiotic resistance.

The implications of this technology are profound. The problem of antibiotic resistance has grown from disparate, localized outbreaks to a global pandemic: multidrug resistant (MDR) tuberculosis in Africa, typhoid from MDR salmonella in India and methicillin-resistant Staph. aureus (MRSA) in the developed world. Michigan itself has been at the forefront of this pandemic. Five of eight U.S. cases of vancomycin-resistant Staph. aureus (VRSA) - a more deadly sibling of MRSA - have been in Michigan.

The emergence of these bacterial strains draws from many origins - improper antibiotic prescriptions, antibiotics in animal feed and rapid urbanization in developing countries, among others. Together they have radically altered the landscape of medicine globally.

Research universities such as U-M have an important role in this arena. First, we must continue to ensure the highest standards of patient safety in our own hospital systems. Hand hygiene, good oversight of antibiotic use and sound institutional guidelines are a sine quo non. At U-M Health System, the VA Ann Arbor Healthcare System and Saint Joseph Mercy Health System, pharmaceutical and therapy committees establish a high standard of practice in this regard.

Second, we need to address the need for globally accessible rapid diagnostic technologies. McNaughton and Kinnunen's technology is ideal for both the developed and the developing world, but many obstacles threaten its accessibility globally. Currently, an intricate schema of disclosures, patents and licenses bring university-discovered inventions into the marketplace as industry-developed products. U-M has facilitated this process for McNaughton and Kinnunen with a Michigan Universities Commercialization Initiative grant (<http://www.muci.org>). U-M must continue to identify innovations relevant to disadvantaged populations and develop them in a manner that acknowledges their global importance.

Fortunately, movement in this direction is under way. U-M has signed a multi-institutional document that encourages universities to "address unmet needs, such as those of neglected patient populations or geographic areas." These are important first steps.

The university's next step should be to allocate facilities - such as the former Pfizer complex recently acquired by U-M - and incentives to spur research and development of technologies that address global health. The Pfizer complex purchase represents an unparalleled opportunity for U-M to advance its research programs and the commercialization of its products. Stephen Forrest, U-M vice president for research, called the Pfizer purchase a "tremendous opportunity to work even more closely with the private sector." To direct these energies to global needs, U-M should provide research facilities and funding incentives to faculty focusing on diseases of the developing world. Hiring faculty pursuing such research would also bolster these programs.

The ties between health care and technology are vast and complex. As health care is increasingly integrated globally, universities should take concrete efforts to ensure that innovations - especially those with lifesaving potential - are made accessible in the developing world as well as the developed one. As a leading academic hospital system, U-M needs to shape our programs into paradigms of responsibility, by reducing practices that encourage antibiotic resistance, creating incentives for research that tackles global issues and managing the commercialization of novel technologies in a globally conscious manner.

Note: McNaughton and Kinnunen's work is also in conjunction with Roy Clarke, Alan Hunt, and Duane Newton at U-M.

Notes from the web editor:

Maggie Kober is now a 2nd year medical student at UofM and is a former undergrad in MNiMBS for 3.5 years.

The students are stated to be "physics" student when in fact they are "applied physics" students.

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