INVENTIONS

JHM Alliance provides first two grants for tech development

By Gary Stephenson

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An innovative method for diagnosing bacterial infections and a new MRI-compatible air motor are the first projects to receive grant funding from the Johns Hopkins Medicine Alliance for Science and Technology Development Industry Committee.

The Alliance, a group of high-level business executives that assists School of Medicine faculty in facilitating commercialization of their inventions, awarded $50,000 each to faculty members Martin G. Pomper, associate professor of radiology, pharmacology and molecular sciences, and oncology; and Dan Stoianovici, associate professor of urology and mechanical engineering. The grants are intended to provide bridge financing during development of new technology.

Pomper, collaborating with Bert Vogelstein, of Hopkins' Sidney Kimmel Cancer Center, has developed a new method to image bacteria that has been effective in identifying organisms including E. coli in a mouse model.

First, Pomper and colleagues inject a radioactive agent, thymidine kinase (TK) substrate 2'-deoxy-1-*-D-arabinofuranosyl-5-[124I]iodouracil (FIAU), which is trapped by bacteria inside the body. Then they use the noninvasive imaging technique positron emission tomography, combined with computed tomography for anatomic detail, to identify the site of the infection.

Traditionally, bacterial infections are diagnosed through blood culture, though those tests don't reveal the location of the infection, Pomper says. In some cases, doctors can take blood samples from patients, tag the white blood cells with a radioactive molecule that will show up on medical imaging tests and re-inject them into the patients to identify the source of infection. But "it's very cumbersome," he says, "and you don't always get great results."

Pomper plans to first evaluate the new method in people with orthopedic infections, starting with patients with acute inflammation, particularly those with prosthetic joints.

"These patients sometimes complain of pain in the joint, but we don't know if the joint is infected or if the prosthesis has become loose," he says. "This test promises greater accuracy and safety than current techniques. If it is proved feasible, it could have a significant impact on the way that infection is diagnosed."

Stoianovici has created what he describes as "the first pneumatic step motor that is precisely controlled."

"Pneumatic motors generally are very fast and powerful," he says, "but not precise." With his new type of pneumatic motor, "you command how many steps you want to take, and which direction, and the motor responds."

Stoianovici developed the motor for medical applications as part of a project creating a robot that can operate precisely within the closed tube of high-intensity magnetic resonance imaging equipment to perform remote interventional procedures.

To be MRI-compatible, the motor was designed of nonmagnetic materials that do not conduct electricity, such as plastics, ceramics and rubbers. It also is encoded with fiber optics so that it is electricity-free, exclusively operated through pressure and light. This allowed for the development of the first fully MRI-compatible robot, which is being tested at Johns Hopkins for fully automated prostate brachytherapy, or radioactive seed injection, under direct MRI guidance.

Stoianovici says the motor has other applications in medicine and industry. Presently, pneumatics is limited to unregulated motion, such as in air drills, cylinders, linear and rotary grippers, and pick-and-place automation slides. With the new motor, pneumatics also could be used for precise motion in robots, microprocessor fabrication, operating in explosive environments and other electricity-free applications. "It's a very basic building block," he says.

Approximately 130 Hopkins faculty members are part of the Technology Opportunities Program that works with the Alliance, comprising 18 executives from a range of disciplines, including the pharmaceutical, investment banking and medical device industries. Twice each year, some 20 faculty present their inventions to the members and receive immediate feedback.

The Alliance is building a fund of up to $5 million from which members hope to award up to three grants per year for Hopkins faculty members.