Taking on Ovarian Cancer with Teamwork

By Eric Swedlund

As a renowned biomedical engineer and research administrator, Jennifer Barton knows that scientific breakthroughs come from bringing the right team together.

In her own laboratory and as interim director of the University of Arizona's BIOS Institute, Barton exemplifies the principle that the best outcomes come from aligning the strengths of many.

Barton's approach earned her team a four-year, $1.1 million grant from the National Institutes of Health that will allow her to build on her work over the last decade developing a life-saving approach to early detection of ovarian cancer.

"Effective screening for early detection is a compelling problem and a fantastic technical challenge because there's no perfect solution today," Barton said. "This is a new way of thinking about accessing the ovary in a minimally invasive way."

The work is especially challenging because although ovarian cancer is not a very common cancer, it is the fifth-leading cancer killer among women, largely because most cases aren't detected until the disease is widespread. Early detection, when the cancer is still confined to the ovary, occurs in just 15 percent of cases, but dramatically improves the prognosis.

The overall five-year survival rate for ovarian cancer patients is only 40 percent, but the survival rate jumps to more than 90 percent in those early detection cases.

"We have a dual-faced problem," Barton said. "We haven't had the technology or the scientific understanding of how ovarian cancer develops."

With the new grant, Barton and her research collaborators, Kishan Karia, assistant professor of optical sciences, and Dr. Kenneth Hatch, professor of obstetrics and gynecology, will move forward in developing and improving the device, a millimeter-scale endoscope called a salpingoscope. Used under local anesthesia in an office setting, the salpingoscope would enable high-sensitivity, high-resolution imaging of the fallopian tube, ovaries and uterine wall.

Concurrent to advancing the basic biology research on ovarian cancer development and improving the device's imaging capabilities is a search for an outside commercial partner to provide engineering and manufacturing. Barton said, "Universities are great at building prototypes, but we don't do manufacturing." Barton said. "We have a patent and are actively seeking a licensee."

About Jennifer Barton

Jennifer Barton completed her bachelor's and master's in electrical engineering from the University of Texas at Austin and University of California Irvine, respectively. She worked for McDonnell Douglas (now Boeing) on the International Space Station program before returning to UT Austin to obtain a doctorate in biomedical engineering in 1998.

That same year she came to the University of Arizona. She is a professor in four specialties—biomedical engineering, electrical and computer engineering, optical sciences and imaging and biosystems engineering. Each of her funded projects has included co-investigators from other departments, universities and/or industry. She recently was named co-leader of the Cancer Imaging Program at the UA Cancer Center. She also serves as the interim director of the BIOS Institute. She is a fellow of SPIE, the international society for optics and photonics, and of the American Institute for Medical and Biological Engineering.

Jennifer Barton is researching ovarian cancer to develop an effective screening method for the disease. (Photo courtesy of the National Cancer Institute)
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In her own laboratory and as interim director of the University of Arizona's BIOS Institute, Barton exemplifies the principle that the best outcomes come from aligning the strengths of many.

Barton's approach earned her team a four-year, $1.3 million grant from the National Institutes of Health that will allow her to build on her work over the last decade developing a life-saving approach to early detection of ovarian cancer.

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The work is especially challenging because although ovarian cancer is not a very common cancer, it is the fifth-leading cancer killer among women, largely because most cases aren't detected until the disease is widespread. Early detection, when the cancer is still confined to the ovary, occurs in just 15 percent of cases, but dramatically improves the prognosis.

The overall five-year survival rate for ovarian cancer patients is only 46 percent, but the survival rate jumps to more than 90 percent in those early detection cases.

"We have a dual-focused problem," Barton said. "We haven't had the technology or the scientific understanding of how ovarian cancer develops."

With the new grant, Barton and her research collaborators, Khush Ku, assistant professor of optical sciences, and Dr. Kenneth Hatch, professor of obstetrics and gynecology, will move forward in developing and improving the device, a millimeter-scale endoscope called a salpingoscope. Used under local anesthesia in an office setting, the salpingoscope would enable high-sensitivity, high-resolution imaging of the fallopian tube, ovaries and uterine wall.

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- Jennifer Barton, Interim Director, University of Arizona BIO5 Institute

If it becomes the first acceptable screening method for ovarian cancer, the salpingoscope would be a breakthrough for those at high risk of developing ovarian cancer. Currently, women over 35 who are in the high-risk pool, as determined by their family medical history, have a single effective prevention measure: the removal of their ovaries and fallopian tubes. About 50 percent of women in the high-risk pool develop ovarian cancer, and ovary removal surgery has its own health risks and consequences. Early tests that don’t detect the onset of ovarian cancer can render the surgery unnecessary.

“We know now this would be really great for women who are at high risk of developing ovarian cancer,” Barton said. “If we show we’re successful, we can expand that out to those with an elevated risk.”

Scientists have an incomplete picture of just how aggressive ovarian cancer can be, and as other research into genetics and biomarkers related to cancer improves, the detection itself can become easier.

The current consensus, Barton said, is that ovarian cancer starts in the fallopian tubes as pre-cancerous lesions. Eventually, the salpingoscope could be incorporated into an annual screening protocol and Barton’s goal is to incorporate biopsy capabilities under the device itself.

Barton’s research is exemplary of how BIO5 was designed to facilitate cross-disciplinary collaborations and combine different areas of expertise in innovative ways.

“I’ve had people here at BIO5 help me most collaborators and that’s been crucial,” Barton said. “One of the best things is having this building right in between the health science campus and the main campus. Everybody on campus feel like they own this building.”

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Starting in 2001, the BIO5 Institute has brought together top researchers in agriculture, engineering, medicine, pharmacy and basic science under a collaborative umbrella, encouraging creative solutions with small and great. Strategically aligning areas of specific strengths across campus has directly led to biomedical engineering breakthroughs like Barton’s.

“These are areas we’re great at on campus and what BIO5 can do is facilitate those ties,” she said. “We work with our strengths here at the UA and help connect them in new ways. That’s where the exciting developments are happening.”

Barton’s interest in science was sparked during America’s Bicentennial celebrations, watching on television as laser beams bashed off the Washington Monument.

“I was fascinated,” Barton said. “And when I discovered that lasers could be used for medical purposes, that’s when I knew what I wanted to do with my life.”

Rather than medicine, Barton settled on engineering for her path, first with electrical engineering, then shifting to biomedical engineering as it emerged as its own field. And that childhood fascination came full circle when Barton began her dissertation research, working on using lasers to treat people.

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Arizona Oncology, one of the largest medical groups in Arizona, has more than 70 physicians devoted exclusively to providing comprehensive, compassionate and high-quality cancer care. We specialize in Medical, Gynecologic and Radiation Oncology, Hematology, Stem Cell Transplant, Research and Clinical Trials, Genetic Risk Assessment and patient ancillary programs.

Arizona Oncology believes it is beneficial to provide cancer therapies in a community setting, close to patients’ homes and support systems. We embrace and are committed to providing compassionate care that includes chemotherapy, radiation therapy, cancer surgery, stereotactic radiosurgery, immunotherapy and biologic and targeted therapies.

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Ovarian Cancer Survivor Shares Her Story With Medical Students
The Centers for Disease Control and Prevention report that about 20,000 U.S. women are diagnosed each year with ovarian cancer and 14,000 die from the disease.

Tucsonan Meredith Miftahar is one of the lucky ones. And University of Arizona medical students have heard her story.

At 30, while visiting a fertility specialist, she had an ultrasound test that revealed a large mass in her left ovary. A few weeks later, preparing for surgery, she learned she was pregnant. She had the diseased ovary removed and biopsy, confirming early stage ovarian cancer. She went on to give birth to a boy, Ryan, who is now a healthy teenager.

Miftahar is a clinical psychologist for the Federal Bureau of Prisons and has her own private practice. She is approaching her 14th year with no evidence of the disease. She serves on the board of the National Ovarian Cancer Coalition. She also has participated in Survivors Teaching Students: Saving Women's Lives, an Ovarian Cancer National Alliance program in conjunction with the UA in which ovarian cancer survivors share their stories with medical students.

"I've lost many friends to this awful disease, and have many other friends who are dying from it," she said. "Many of them desperately want to see advances in diagnosis and treatment and, ultimately, a cure, so their own children won't have to go through what they have. An effective screening process would be a great start."

By Jil Goetz, UA College of Engineering

help connect them in new ways. That's where the exciting developments are happening. BICO and Tech Launch Arizona have enabled me to do this in a way that doesn't happen at other universities."

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