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High Stakes Science Pays Off

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Whether caring for Ebola patients, chasing neutrinos deep underground, synthesizing the poliovirus or downgrading weapon-grade uranium, scientists often face high stakes. Yet, despite the risks, they keep working for the greater good.

"At first we didn't know what to expect, but we decided the risk was worth taking," said Cynthia Boggs, program manager of the 20-year Highly Enriched Uranium Transparency Program under the National Nuclear Security Administration. Boggs is also an engineer at Argonne National Laboratory, and was a panelist at "High Stakes Science: Pushing the Boundaries," the 10th in a series of Joint Speaker events for faculty, researchers and engineers at the University of Chicago, Argonne and Fermi National Accelerator Laboratory.

The Highly Enriched Uranium Transparency Program grew out of the collapse of the U.S.S.R. in the early 1990s, which left Russia with a huge stockpile of highly enriched uranium. After much prodding by the U.S. government, Russia agreed to sell 500 metric tons to the United States, but not until it blended the uranium down to low enriched uranium.

The blending was done at four Russian plants, and Boggs was in charge of making sure the work as well as the delivered product conformed to the agreement. “At that time, there was not a lot of trust between the Americans and the Russians,” she said. “Meanwhile, we had no idea what conditions we would have to work under in the Russian facilities or how the work would be handled. We brought our own dosimeters and medical supplies, everything from syringes to a bone saw.”

Clearly, the risks paid off. During the course of the program, the purchased uranium supplied 10 percent of the United States’ generated electrical power, and in the early years of the program the income from the uranium sales represented 30 percent of Russia’s Gross National Product. Now the Russians are allowed to sell lightly enriched uranium on the open market. “Simply put, this was the most successful nonproliferation program that we’ve ever had with Russia,” Boggs said.

Dual use research

Another panelist was Joseph Kanabrocki, associate vice president for research safety at the University. He discussed the risks of dual use research, the results of which could be used malevolently. Synthesizing the 1918 Spanish flu virus and engineering antibacterial resistance would fit this definition. On the other hand, publishing maps locating plague-infested rodents in the Southwest is less clear. “This was done innocently…to benefit campers,” Kanabrocki said. “Nevertheless, it was criticized as ‘giving the enemy a roadmap of where to find the plague.’”

Another research project to draw criticism was work begun two years ago to determine the mutations that would be needed to make the avian flu virus communicable between mammals. “It was publicly funded research with a mandate to publish,” Kanabrocki said. “Ultimately, the results were published, but not before considerable controversy.”

As a result, “a new government policy will soon require institutions that work with certain human pathogens to examine all their research involving those pathogens for dual use potential,” he added.

Panelist Richard Tesarek, a physicist and NOvA deputy project manager at Fermilab, does not face such questions in his research, but he does have to consider the inherent risks of the work.

NOvA is an experiment to study the properties of neutrinos. Recently, Tesarek managed the construction of NOvA’s 14,000-ton detector in Minnesota that included layering and gluing 200 tons of detector modules. “There were a slew of potential risks in construction,” he said. “In addition, we had to build enough secondary containment to make sure none of the oil [used by the detector] would escape from the building.”

Aaron Freeman, comedian, author, teacher and well-known radio commentator, moderated the panel, which was held in Fermilab’s Wilson Hall. He kept everyone entertained with his quick wit, all the while demonstrating a deep understanding of science.

Ebola fears were real

The remaining panelist was Assoc. Prof. Juliane Bubeck Wardenburg, chief of critical care for the Departments of Pediatrics and Microbiology at the University. She led the University’s response to the threat of Ebola for pediatrics. Due to her research in microbiology and immunology, Wardenburg is used to working in bio-contained laboratories. Yet this was different, she said: “Athough the environment was as controlled as we could make it, there are uncontrollable elements when you’re caring for a living, moving child.”

Realizing that caregivers were at risk at many levels—their health and that of their families, their finances, insurability and even their lives—Wardenburg had to reassure her staff that the equipment and procedures they had developed would protect them. Still, she operated the hospital's stand-up Ebola unit on a volunteer basis.

"Practitioners have the responsibility to care for patients, irrespective of the disease that brings those patients in," Wardenburg said. "Doctors feel compelled to provide care, even when that compulsion wrestles with the sense of self preservation."