WUSTL professor testifies on helium shortage

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The sudden shortage of a nuclear weapons production byproduct that is critical to industries such as nuclear detection, oil and gas, and medical diagnostics was the focus as a House Science and Technology panel heard testimony today from a professor at Washington University in St. Louis.

Jason C. Woods, PhD, an assistant professor of radiology and physics and assistant dean of Arts & Sciences, testified April 22 as the Investigations and Oversight Subcommittee opened a formal probe of the nation's looming helium-3 supply crisis. The hearings, held at the Rayburn House Office Building in D.C., are investigating how the supply crunch affects certain industries and why the nation missed the warning signs.

Helium-3 is a nontoxic byproduct of producing nuclear weapons. It is a stable isotope with two protons and one neutron in its nucleus, one fewer neutron than the more common form of helium. And that missing neutron gives it special physical properties that have made it essential in cryogenics, medical diagnostics, oil and gas operations and nuclear radiation detection.

Woods, an assistant professor of radiology at the Mallinckrodt Institute of Radiology's Biomedical MR Laboratory, also serves as program director of the Hyperpolarized Media MR Study Group at the International Society for Magnetic Resonance in Medicine (ISMRM).

His testimony broadcast live on the C-SPAN cable news channel, described how helium 3 plays a critical role in his lung research. Woods uses helium to determine which portion of the lung functions and which does not, research that's been instrumental in developing new and important procedures for safe lung testing.

The helium 3 isotope is relatively rare on Earth, so it is manufactured instead of recovered from natural deposits. It is formed when tritium, a radioactive form of hydrogen, decays. Only the United States and Russia produce significant amounts of tritium gas. Current supplies of helium-3 are sourced from the refurbishment and dismantlement of the nuclear stockpile.

Supplies have dwindled because U.S. nuclear weapons production has come to a virtual halt with the end of the Cold War. But since the Sept. 11, 2001, attacks, demand has increased for helium-3 because of its use as a neutron detector in radiation monitors for national security, nonproliferation and homeland security applications.

"The failure to identify this situation in a more timely fashion as well as an apparent failure to alert users who rely on helium-3 that a shortage was imminent, has created a national crisis forcing the nation to launch a crash research program to identify substitute materials for use in radiation detection," subcommittee Chairman Brad Miller (D-N.C.) wrote last month in a letter to Energy Secretary Steven Chu.

According to DOE, projected demand for helium-3 is about 65,000 liters per year through 2013, but domestic production is expected to be only a small fraction of that.

The issue came to the Science Committee's attention during a series of hearings last year about ongoing problems with the next generation of radiation monitors that use helium-3 as a neutron detector.

The subcommittee has commissioned the Government Accountability Office to conduct a study into the causes and effects of the looming supply crisis. The preliminary results of that study were expected to be discussed during Thursday's hearing.

But the results may not be all bad.

DOE, DHS, the Defense Department and other government agencies have formed a group to address the decreasing supply of helium-3.

Discussions include the pursuit of alternative technologies for neutron detection, finding alternative methods to produce helium-3 and better allocation of the existing supply.

“It appears that one or more substitutes hold promise as an effective replacement for helium-3 in radiation detection,” Miller wrote in a separate letter last month to Homeland Security Secretary Janet Napolitano. “However, this crash program was probably avoidable with a more prudent approach to managing the helium-3 stockpile.”

Other witnesses at the hearing include Tom Anderson, product manager, GE Energy; Richard Arsenault, director of Health, Safety, Security and Environment, ThruBit LLC; William Halperin, physics professor, Northwestern University; William Hagan, acting director, Domestic Nuclear Detection Office, Department of Homeland Security; and William Brinkman, director, Office of Science, Energy Department.

Woods received his bachelor’s degree in physics from Rhodes College in Memphis, Tennessee; his undergraduate work was on tunable, liquid crystal optical filters and the solar chromosphere. He graduated from Washington University in 2002 with a doctoral degree focused on hyperpolarization and applications of noble gases with nuclear magnetic moments far from Boltzmann equilibrium.

His research is now on the development of hyperpolarization techniques, the development and refinement of new pulmonary imaging techniques, the application of these techniques to specific studies of the lung and pulmonary diseases (COPD in particular), discovery and study of relevant biomolecular signaling pathways, and the translation of imaging techniques to guide new therapeutic or surgical remedies.

Provided by Washington University in St. Louis