Radiological engineer and alumnus works to protect astronauts, and the rest of us, from radiation

By Marcia Locke

Astronauts face a lot of radiation in space. The rest of us encounter radiation in a variety of settings as well.

Ionizing radiation — the kind faced by astronauts and victims of nuclear weapons and used to create medical X-rays and CT scans — can cause molecular changes in the body that can lead to cancer. So, scientists are working to better understand it and protect us from it.

Amir Bahadori, assistant professor of mechanical and nuclear engineering at Kansas State University, studies ways to evaluate and reduce the risk of developing cancer due to radiation exposure.

"We use computational tools to determine how much radiation the body receives in various exposure scenarios and to explore ways to reduce the resulting cancer risk," Bahadori said.

According to Bahadori, better tools are needed to characterize radiation exposure and estimate biological damage and probabilities of developing cancer.

In 2017, the Johnson Cancer Research Center provided Bahadori's team a $20,000 Innovative Research Award to create an improved, miniaturized neutron spectrometer, which is an important tool for detecting and monitoring radiation.

"Current neutron detectors tend to be massive and involve complex signal processing," Bahadori said.

With the JCRC award, Bahadori's team created a neutron spectrometer that fits in the palm of the hand. It recently earned a provisional patent.

Bahadori has some other cancer-fighting projects going on as well. He is working with NASA to develop active-radiation shielding technology that uses electromagnetic fields to deflect space radiation before it ever reaches astronauts.

He has teamed up with Steve Eckels, professor of mechanical and nuclear engineering, to improve the technology used for modeling the human body's response to nonionizing radiation, and with Punit Prakash, associate professor of electrical and computer engineering, to improve cancer therapy outcomes by using both ionizing and nonionizing radiation.

In the future, Bahadori would like to develop better radiation risk models than are currently available. He plans to investigate the biological processes that happen immediately upon radiation exposure as well as over the years — sometimes decades — that it takes for cancer to develop.

Bahadori appreciates student involvement in his research and serves as a mentor for the JCRC's undergraduate Cancer Research Award program.

"The CRAs are helpful for both me and the students because they allow me to bring in undergraduates who have an interest in research, put them on a topic and mold them into future researchers," Bahadori said.

He knows firsthand how important such experiences can be for students. While earning his Bachelor of Science in math and mechanical engineering with the nuclear engineering option at K-State, he said he had the "opportunity of a lifetime" to work at the university's nuclear reactor. This experience and his mentor Ken Shultis, professor of mechanical and nuclear engineering, inspired him to go further.

After graduating from K-State in 2008, Bahadori went to the University of Florida to pursue a doctorate in medical physics. He had a full-time job with NASA before he finished his degree.

Staying true to his K-State upbringing, the Kansas City, Kansas, native returned to his alma mater in 2015 to join the Carl R. Ice College of Engineering faculty and continue his work to protect humankind from radiation.

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