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A Matter of Perspective

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A matter of perspective

Three doctoral students look to new methods and technologies to improve health

A hot topic: Lasers and molecular fingerprinting



Andrew Jones, physics doctoral candidate, Lawrence, Kan., is refining and testing a mid-infrared laser he helped build with Kristan Corwin and Brian Washburn, associate professors of physics.

The laser, the first of its kind, is made from a hollow-core photonic crystal fiber that's about half the width of a human hair. This optical fiber is filled with hydrogen cyanide or acetylene – both molecular gases – and then excited with another laser. One molecule of the excited gas spontaneously emits light, and many others follow suit, resulting in a laser.

"Mid-infrared lasers are pretty hot right now because of all of their applications for molecular fingerprinting – where you want to perform accurate spectroscopic measurements on low concentrations of molecules," Jones said. "For example, for analysis you could breathe into an apparatus and the laser would map out the amount of specific molecules in your breath – useful for diagnosing illness in your body."

A patent application has been filed.

Please check the URL below to watch the video about the laser:
www.ou.ly/9YTYm



For better health: Rats, beetroot juice and fish oil

Steven Copp, doctoral candidate in anatomy and physiology, Manhattan, Kan., and David Poole and Tim Musch, professors of kinesiology and anatomy and physiology, are researching treatments to combat the onset of diabetes, heart

failure and aging by studying rats, beetroot juice and fish oil.

Rats share a similar physiology to humans. The team is observing the treadmill workouts of older rodents with diabetes or heart failure to study the delivery and use of oxygen within the skeletal muscle microvasculature. They are looking at what is responsible for the increases of oxygen delivery and its use in these contracting muscles, as well as how those processes become distorted through diabetes, heart failure and aging.

The rats have an altered nitric oxide function. Nitric oxide is necessary for the function of healthy blood vessels in humans. Researchers are working to correct this altered function through a combination of beetroot juice and fish oil. If successful it would have enormous benefits for humans.

"The overall goal is to be able to take someone who's exhausted from doing things in daily life, like walking across a room, and allow that person to take a walk or play nine holes of golf – just have a dramatically improved quality of life," Copp said.

The eyes have it: Protein may slow tumor growth



Samuel Molina, a doctoral candidate in biochemistry, Mount Pleasant, Mich., is studying the expression of Connexin 46, a protein in the lens of the eye, and how it's regulated by hypoxia, a low oxygen level in tissue that often kills tissue-forming cells.

"The lens is naturally hypoxic and does not have blood vessels. A lot of solid tumors start as hypoxic tumors, meaning they also don't have blood vessels," Molina said. The intent is to find why Connexin 46 provides both lens and tumor cells resistance to hypoxia, which allows them to live longer during hypoxic conditions. By doing so, the growth of tumors could be stopped.

Currently, Molina has found that in samples of breast and retinal tumors in which the Connexin 46 was depleted, the tumor growth and size were reduced. These findings could reduce tumors in the colon and prostate.

Molina's research began under Dolores Takemoto, professor emeritus of biochemistry.

— Greg Tammen

