

# Accelerating the pace of medical discovery

*University medical researchers make life-changing breakthroughs*

If the heart of the medical academic enterprise is research, the lifeblood is the answer that solves the challenges of disease and offers the promise of new cures and therapies. The School of Medicine's research ranges from treating anthrax victims to helping the 76 million Americans afflicted by gastrointestinal diseases, from fighting heart disease at the cellular level to giving those wounded in combat a better chance to live. The following vignettes describe medical breakthroughs that are changing lives. No matter where you live on this earth your life will be affected by research being done at the University of Nevada, Reno School of Medicine.

## Anthrax research

When you think about conducting research to help wage the war against terror, Reno seems an unlikely place. However, that's exactly the type of research taking place in the school's Department of Microbiology and Immunology. Thomas Kozel, department chair, is pioneering methods to prevent and treat anthrax and quicker, more accurate means of diagnosing the disease.

In addition to significant bio-defense research, Kozel is well known for his ability to obtain research funding. One of his National Institutes of Health grants is now in its 29<sup>th</sup> year, making it the longest standing NIH grant in Nevada.

## Digestive diseases

More than 70 million Americans suffer from some type of gastrointestinal disease. Kent Sanders, who heads the physiology and cell biology department, is helping lead the effort to give patients much needed relief.

Sanders is one of a select group of researchers named to the National Institutes of Health Commission on Digestive Diseases. Sanders is world-renowned for his research on smooth muscle plasticity—that is, what happens to smooth muscles in diseases such as atherosclerosis, diabetes, asthma and digestive disorders.



Photo by Edgar Antonio Núñez

*Dr. Iain Buxton, professor of pharmacology and obstetrics, and his team of scientists have discovered compounds that may prevent the spread of cancer cells, as well as a uterine gene that may be linked to preterm labor.*

## Heart attack

It comes as no surprise that heart disease is the leading cause of death both in Nevada and the country. What may be surprising is that research being conducted by Joseph Hume, chair of pharmacology, is helping to reduce that statistic. For the past 20 years, Hume's research has focused on an electrophysiological study of how the cardiovascular system functions.

Hume's work focuses on heart disease at the cellular level, since it is electrical disorders in the heart after cardiac arrest that kill. The goal is to gain a better understanding of the electrical properties of the heart and how these can be modified with drugs. He is also investigating the electrical activity of smooth muscle

cells and the regulation of calcium channels in these cells, as well as the relationship of smooth muscle cells to cardiovascular disease.

## Brain

Are you quick on your feet? Good at Jeopardy? Can you name that tune in less than a second? Are you good at making intuitive decisions?

Pondering these questions is the life work of Phil Goodman. The internal medicine professor wants to know how your brain works, how it responds to sight, sound and touch, and how it improves with learning.

According to Goodman, the next challenge is to decipher the brain's neural code. "This may result in breakthroughs in technology—



Photo by Jean Dixon

*Dr. Kent Sanders is world-renowned for his research on smooth muscle plasticity, which impacts diseases such as atherosclerosis, diabetes, asthma and digestive disorders.*

like speech recognition that actually works—and biology, such as replacing damaged brain regions.

### Premature birth and breast cancer

Each year more than 40,000 women in the United States die of breast cancer and more than half a million babies are born prematurely. What do these two troubling statistics have in common? They are both subjects of intense research and study in the lab of Iain Buxton, professor of pharmacology and obstetrics. His lab is vigorously engaged in two major investigations—how breast cancer cells travel to distant parts of the body and why babies are born too soon.

*Mark Levine is senior director of health sciences communication, and Emily Wofford Cobb is communications manager for the School of Medicine.*

feeding metastatic tumors and how this can be prevented.

Buxton and his team of scientists are also studying the regulation of the forceful contractions of the human uterus that, if prevented, could provide new treatments for pre-

term labor. With funding from the March of Dimes and the National Institutes of Health, Buxton's team has discovered a uterine gene that may be linked to preterm labor. Understanding how the gene is regulated is likely to offer new ways to prevent premature birth.

### Bone marrow

The School of Medicine is home to one of the state's leading cancer researchers. William Murphy, professor of microbiology and immunology, is working with department colleagues to increase the effectiveness of immunotherapy in treating cancer, particularly bone marrow transplantation.

Murphy and his team have focused their investigation on the role of natural killer cells, which can kill tumor cells directly, and using them in bone marrow transplantation. His laboratory recently received a \$1.5 million grant from the National Institutes of Health to examine these cells. His team is also part of a multi-million dollar Program Project Grant with M.D. Anderson Cancer Center in Texas, which is conducting clinical trials on the approaches developed in Murphy's laboratory.

### Herpes

Bet you didn't know that chances are pretty good you're infected with a herpes virus.

Greg Pari, professor of microbiology and immunology, says, "Most people are carriers of latent human cytomegalovirus, or HCMV. It's unlikely they would know it unless tested for it."

The microbiology and immunology professor warns that for individuals with compromised immune systems like AIDS or bone marrow and organ transplant patients, HCMV can be deadly, causing retinitis, pneumonia and other dangerous conditions.

Pari is working on the molecular mechanism of herpes virus DNA replication. HCMV is a large DNA virus with the potential to encode more than 200 proteins. Pari and his team hope to disrupt key proteins involved in its DNA replication and use the new "mutant"

virus to infect human cells in the laboratory. "Observing the behavior of the virus with the replication gene missing will give us a better understanding of how we can combat HCMV," Pari says.

### Blood

Very often wounded soldiers fall prey to hypothermia on the battlefield. The School of Medicine and Rocky Research, an engineering firm, have partnered to develop a unique fluid-heating technology. The project brought together Nevada's top trauma experts and one of the most advanced thermal engineering firms in the country.

Without a dependable, reliable source of electrical power, the job of medical specialists in battlefield conditions is made more difficult. Developing thermal battery technology is critical in the race against time to treat injured soldiers experiencing significant blood loss and in need of rapid replenishment. "Blood and blood-related fluids require

refrigerated storage at about 34 degrees Fahrenheit, but need to be induced into the body at or close to 98.6 degrees to avoid hypothermia," G. Tom Shires, professor of surgery, says. "The speed at which fluids and blood can be pumped into the body is often limited by the temperature conditioning capabilities of the fluid."

The partnership is developing a fluid-heating device that can operate with or without electricity, allowing combat medics to make faster blood infusions and transfusions. "The uniqueness of the thermal battery technology of this device allows for mobile flow-through heating, a life-saving tool for battleground and frontline medical unit use in war scenarios," Uwe Rockenfeller, chief executive officer at Rocky Research, adds.

"This technology will help deliver blood faster and more reliably to troops who are injured on the battlefield," Sen. Harry Reid notes. "Once again, the School of Medicine is leading the way in medical research." **N**

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