THE Research FACTOR

By Leah Caldwell
Illustrations by Susan Keeter

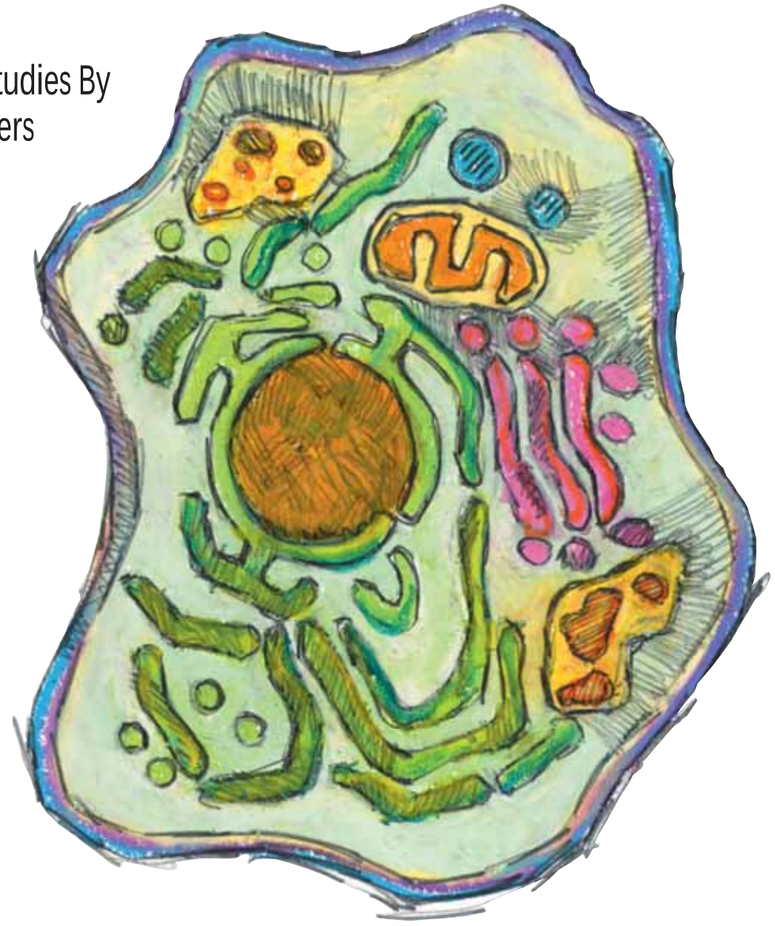
SUNY Upstate Medical University is the only institution in Central New York dedicated to large-scale research based solely on understanding the human condition. Thousands of hospitals treat patients and hundreds of universities teach students. But add biomedical research to these two components and you have a medical university, of which we are one of only 125 in the nation and the only one in the region.

At Upstate Medical University, there are scores of original research projects in progress right now. Upstate scientists are probing questions related to cancer, blindness, heart disease, AIDS, brain chemistry, human performance, and more. Clinicians and scientists also investigate health care questions outside the lab and conduct clinical trials with the latest disease-fighting protocols.

To place the current impact of research in context, here is a fact to ponder: an investigator in New York City estimates that 85 percent of all the scientists who ever lived are alive today. And those scientists are unlocking mysteries at an unprecedented pace. Each day, they publish tens of thousands of observations that help us better understand life. Most of us will never hear of these discoveries, yet they chip away at solving problems that can affect us all.

The image of the scientist is as prone to clichés as any other profession, and "exciting" may not leap immediately to mind. But perhaps it should. Scientists have creative jobs in which they ask their most intriguing questions and then embark on a quest to find the answers. Sometimes the quest takes them to colleagues in other countries, other times to the microscopic reaches of the human body. Investigators must also approach their work with the enthusiasm that transcends the frustration of blind alleys and the insecurities of funding. Not every experiment leads directly to a cure, but byproducts from funded research include the education of scientists and the continuing expansion of our scientific knowledge base.

Selected NIH-Funded Studies By SUNY Upstate Researchers



Huang Ying, PhD

The body's production of cancer cells is a multi-step process that involves activation of protooncogenes—which are normal genes that can turn deadly—and inactivation of genes that suppress tumors. One part of our research is to investigate what cellular signals are responsible for this gene transformation.

Mark Schmitt, PhD

Understanding how nucleic acids are imported into mitochondria—the cell's power producers—will help us design methods for gene therapy on patients with mitochondrially inherited diseases. Another study aims to identify the role of mRNA degradation in the pathways controlling when cells divide. It is control of cell division that goes bad in all cancers. Better understanding the mechanism of regulatory controls will allow us to identify new targets for cancer drugs.

David Gilbert, PhD

How cells duplicate their genetic material (DNA) is arguably the major remaining mystery of molecular biology. Yet this poorly understood process is central to cellular proliferation, which happens uncontrollably in all cancers. Finding the "off switch" for cell growth would be a key to developing cancer treatments.

Richard Cross, PhD

The ATP synthase, which provides most of the energy your cells need to stay alive, is a tiny molecular motor. Instead of running on a current of electrons, the synthase runs on a current of protons using the energy available to produce an energy rich molecule called ATP. This research studies the mechanical properties and regulation of the synthase. The results will provide a better understanding of an important biological process and may lead to the use of this rotary motor in developing nanotechnology.

Richard Wojcikiewicz, PhD

Our work is designed to investigate how mammalian cells adapt when activated, and in particular how the ubiquitin-proteasome pathway (which plays important roles in a broad array of basic cellular processes) mediates this adaptation. This will lead to a deeper understanding of how cells work and ultimately to better therapies for cancer and neurodegeneration.

Christopher E. Turner, PhD

Cell adhesion is fundamental to a variety of biological processes including embryonic development, metastasis of cancer cells and the targeting of immune cells to sites of injury. This research aims to determine the molecular organization of the proteins that are enriched at cell adhesion sites and understand their roles in a cell's ability to respond to its external environment. By identifying these interactions, small molecule inhibitors may be able to modify cell behaviors—perhaps to promote wound healing or suppress metastasis.

David Amberg, PhD

The actin cytoskeleton is a central player in regulating cell growth as well as cell and tissue shape changes. These complex processes require well-coordinated changes in the architecture of the actin cytoskeleton, which is under the control of a large battery of actin binding proteins. This lab has identified several new actin binding proteins that employ novel mechanisms to regulate the dynamics of actin-containing networks. Since alterations in the actin cytoskeleton are associated with many disease states, it is expected that this research will have broad relevance—most notably in the areas of growth control and spread of tumor cells, and in the prevention of crisis in sickle cell patients.

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Funded research at SUNY Upstate has tripled in the past decade, and committed funds currently hover at $40 million. Granting institutions include the Centers for Disease Control, the National Science Foundation, the American Heart Association, and the American Cancer Society, to name a few. Perhaps the most recognized source of research funds is the National Institutes of Health (NIH), which is a standard by which research institutions measure themselves. Of the hundreds of current investigations underway at Upstate, here are some currently funded through NIH grants.

1 BRAIN
Michael Miller, PhD

This research has documented that alcohol affects brain cell growth and movement and has identified critical periods for brain development and vulnerability to alcohol. This helps shed insight on the causes of developmental disorders such as mental retardation, fetal alcohol syndrome and autism.

2 BRAIN
Wendy Kates, PhD

This project is aimed at identifying risk factors for psychiatric disorders among children with velocardiofacial syndrome —a genetic disorder marked by heart defects, cleft palate, significant learning problems and behavioral disorders. Another funded project is investigating the relationship between learning difficulties and brain structure in children with this disorder.

3 CHICKEN POX
Jennifer Moffat, PhD

Most people in the U.S. have had chicken pox, caused by the varicella zoster virus, or have received the vaccine. This virus remains latent in the body for life and can reactivate as the disease called shingles. Learning how this virus interacts with human cells is the major goal of this research, which will hopefully be used to help develop new drug treatments and to improve the vaccine.

4 JOINTS
Tamara Scerpella, MD

This study evaluates the role of impact activity (using gymnastics as a model) on building stronger bones during childhood and adolescence. This information will aid in creating exercise recommendations that will increase bone health and decrease the risk of osteoporosis later in life.

5 KIDNEYS
Steven Scheinman, MD

Hypercalciuria is the major risk factor for kidney stones in humans. After finding the genes for hypercalciuria in an animal model, the human counterparts to those genes will be studied in order to better understand the genetic basis of human kidney stone disease.

6 LONG BONES
Timothy Damron, MD

Children who are exposed to radiation therapy may experience damage to the growth plates of their long bones. The goal of this research is to develop strategies that will protect the growth plates of children undergoing cancer therapy–while still effectively treating their tumors.

7 BRAIN
Charles Hodge, MD

Brain plasticity refers to the remarkable ability of the brain to change in response to things that affect it. This research is investigating mechanisms involved in cortical plasticity and the impact that various commonly used medications have on the biological processes involved in plasticity. The ultimate goal is to improve patient care by better understanding the response of the brain.

8 EYE
Robert Barlow, PhD

This investigation is exploring what information the eye sends to the brain when an animal sees. It is also studying how the brain processes the neural codes it receives from the eye. Another study explores how glucose, a major energy source for brain and eye function, modulates human visual sensitivity. Our goal is to understand if metabolic stress from low glucose has a role in age-related macular degeneration.

9 MOUTH
Edward Shillitoe, PhD

This research is making modifications to viruses, with the goal of developing strains that would infect cancers and kill the abnormal cells. This could lead to improved treatment for cancers, such as cancer of the mouth, which have not been completely eliminated by standard treatments.

10 STOMACH
Michael Meguid MD, PhD

Understanding the factors that regulate appetite is critical in illness and disease. In many acute illnesses, such as cancer, loss of appetite leads to inability to adequately tolerate medical and surgical treatment. Using models in the lab, which include measures of brain and blood chemistry, both the decrease in food intake caused by illness as well as the increase of appetite suffered by the morbidly obese patient are studied. Understanding these processes will allow for the development of dietary strategies for patients.

11 THROAT
Leslie Malmgren, PhD

The elderly often suffer from age-related swallowing and voice disorders. This project is providing the first data concerning the disease-causing mechanisms underlying age-related laryngeal dysfunction and will contribute to improved methods of prevention, diagnosis and treatment of these conditions.

12 WRIST
Walter Short, MD

This research is examining the function of various ligaments in the wrist that are prone to soft tissue injuries, especially sports injuries. The research studies the effect of cut ligaments on carpal bone motion by using three dimensional animation techniques. This will help determine the role of specific ligaments in preventing wrist instability.

13 HEART
José Jalife, MD

Every year, approximately 500,000 people die from sudden cardiac death. The most common cause is a change in the heartbeat from a steady, powerful rhythm to an ineffective quiver known as ventricular fibrillation. This research shows that such a lethal arrhythmia is the result of abnormal electrical impulses that rotate in the heart muscle at exceedingly high speeds and form eddies that behave like tornadoes. This research aims at understanding the molecular mechanisms of ventricular fibrillation in an effort to improve prevention of sudden cardiac death.

14 LIVER
Steven Batki, MD

Hepatitis C is a serious, chronic liver disease that affects nearly five million people in the U.S. Drug injection is the chief mode of transmission. This five-year project tests the effectiveness of providing medical treatment for hepatitis C on-site in a substance abuse treatment setting versus providing such care in the usual clinic setting.

15 SPINE
Blair Calancie, PhD

This research is examining the extent to which persons with 'incomplete' spinal cord injury can show improvements in walking and balance. Two novel therapies involving partial body weight support are being compared against traditional physical therapy. Functional improvements have been observed in subjects within all groups, suggesting there is significant 'untapped' potential in many of these subjects.

16 HIP
Kenneth Mann, PhD

This research is focused on understanding how joint replacements loosen and fail over time. The long-term goal is to modify implant designs, materials and surgical techniques so that joint replacements last longer and can be used in younger/more active patients.

17 COLON
Eileen Friedman, PhD

Mirk is a serine/threonine kinase which functions as a stress-activated transcriptional activator and is highly expressed in some cancers. Over-expressed Mirk enables some cancers to survive under certain stress conditions, and elimination of Mirk blocks survival, so Mirk may present a novel therapeutic target.

18 PROSTATE
Gabriel Haas, MD

Prostate cancer is the second leading cause of cancer death in men, exceeded only by lung cancer, and approximately 29,000 men will die of this disease this year. This research analyzes samples from patients who died from causes unrelated to prostate cancer. If prostate cancer is then found, PSA levels are compared to detect the smallest and earliest tumors.