

CONTACT: Jennifer Wakefield, 407.617.0476 cell, Jennifer.Wakefield@OrlandoEDC.com

Research and Development at UCF

The University of Central Florida (UCF) – located in Orlando, Fla. – is the nation's 5th largest university and one of the top research universities in the areas of cancer, cellular and molecular, disease and optics and photonics research. Below is a small sample of some of the current research at UCF.

Cancer research and studies:

- Dr. James Turkson's lab has discovered **two compounds that appear to help eliminate breast cancer tumors**. The compounds disrupt the formation and spread of breast cancer tumors in test mice. The compounds, S3I-201 and S3I-M2001, break up a cancer-causing protein called STAT3, and researchers have observed no negative side effects so far. He is working on a similar compound that appears to destroy prostate cancer.
- A 10-member lab at UCF is working with **stem cells** and their ability to potentially regenerate damaged hearts. Under the guidance of Dr. Dinender Singla, the team is exploring how stem cells work and their **ability to regenerate heart tissue**. The goal is to find a way to use stem cells to create therapies or as a preventative measure when it comes to hearts damaged by a heart attack or a blockage. Singla has been studying stem cells since the early 1990s and worked with James Thompson group of the University of Wisconsin. This group's work led to the derivation of human stem cells in the late 1990s.
- Finding ways to deliver cancer-fighting drugs to the right place without destroying healthy cells, tissue and organs is a vibrant area of research. Dr. J. Manuel Perez's lab focuses on the development of **nanoparticle technologies and their application in nanomedicine, molecular imaging and molecular diagnostics**. Perez is working on designing **novel and target-specific magnetic nanoparticle conjugates** with potential imaging and **therapeutic applications in cancer and atherosclerosis**. The nanoparticles could **target specific protein receptors on the surface of cancer cells** or vulnerable plaque and serve as molecular imaging agents in magnetic resonance imaging (MRI).
- A team of chemist and optics experts is working on expanding **photodynamic therapy to battle cancer**. This is the use of light-sensitive cancer-fighting drugs. The chemicals are dispersed through a patient's entire body. The chemicals stay inactive until they encounter a special light, which the physician focuses only on the tumor. When the chemical hits the light, it activates thus limiting its destructive powers on the unhealthy cells. Photodynamic Cancer Therapy is already used, but is limited to tumors that are close the surface of the skin. But the **multi-photon technique** developed in Dr. Kevin Belfield's lab **can penetrate deeper into tissue, which means deeper cancers like colon cancer may some day be treatable with this light therapy**.
- Research in Dr. Karl X. Chai's laboratory led to the discovery of a **protein that limits the invasion of prostate and breast cancer cells**. His research team is currently assessing the protein's ability to stop metastasis in animal models. This team is also investigating how the protein functions. Some of their findings are being patented and may provide the basis for a new method to detect and treat invasive cancers.

- Dr. Ratna Chakrabarti's research team is **identifying genes responsible for two distinct forms of prostate cancer: slow growing and rapidly progressing**. The group is using human genome microarray technology to identify candidate genes. Determining the genes that cause the two cancer types will greatly enhance our ability to diagnose the disease and design new drugs for treatment.
- Dr. Annette Khaled studies programmed cell death, a biological process that eliminates abnormal cells in healthy tissue. When this process is disrupted, abnormal cells proliferate and result in cancer. The Khaled team is trying to understand how changes in cell signals cause this disruption. Her research is expanding our **understanding of the origins of cancer** and may lead to novel treatments and methods for early detection.
- Dr. Mark Muller's research focuses on enzymes called topoisomerases, nuclear proteins that participate in most if not all DNA transactions. His interest is in understanding the physiological function of these enzymes in chromosomes and in the lab deals with topoisomerases and cancer chemotherapy. Certain drugs interfere with the action of topoisomerases on DNA. Such drugs are effective in treating cancer and many topoisomerase active agents are used clinically to kill tumor cells. There is **significant potential for new, anticancer drugs** that target these enzymes.
- Dr. Thomas Selby is developing **ways to use structure- based drug design targeted at cancer**.
- Dr. Laurence vonKalm, Department of Biology, uses **fruit fly genetics to discover genes whose human counterparts are involved in prostate, ovarian and kidney cancers**. The power of the fly genetics is likely to enhance our understanding of the basic signaling process that may be involved in certain cancers.

Cellular and molecular research and studies:

- Dr. Ella Bossy-Wetzel is studying the **critical events that cause neurodegeneration**. The goal is to develop effective treatments that can cure or prevent neurodegenerative diseases such as **Parkinson's, Huntington's diseases** and Dominant Optic Atrophy among others. The lab focuses on mitochondria primarily because its injury is an early and central event to such diseases. Bossy-Wetzel's team has **developed sophisticated, quantative time-lapse imaging techniques and new software algorithms** to accomplish its work.
- Research in Dr. Cristina Fernandez-Valle's laboratory includes studies on Schwann cells, whose membranes wrap around peripheral nerves to form an insulating layer of myelin. Her laboratory is investigating growth and adhesion. Its findings will increase our understanding of the critical role these cells play during development and repair of nerves following injury and disease. Dr. Fernandez-Valle serves on the board of the Children's Tumor Foundation, Florida Chapter, which seeks to end neurofibromatosis through research. Work by Dr. Cristina Fernandez-Valle and her team is **increasing our understanding of hereditary tumors in the nervous system**. They are studying ways in which cells communicate with each other to regulate cell growth, attachment and movement. By identifying the proteins involved in these activities, the researchers will contribute to the development of new cancer therapies.

- Dr. YouMing Lu's work is determining the molecular basis of brain injury and repair in some neurological disorders. His lab is using cellular and molecular biological tools to identify certain intracellular molecules in vulnerable neurons in the adult brain. They are also using electrophysiological approaches and behavioral analysis in rat models of ischemic stroke to deliver transcriptional activators to **stimulate endogenous stem cell production for repairing the brain after injury.**
- Dr. Otto Phanstiel is overseeing the **development of a unique drug complex that enters a cell, binds to DNA, prevents the DNA molecule from participating in critical cell functions and ultimately causes cell death.**
- Dr. Kiminobu Sugaya's main research focus is to **develop stem cell therapies for neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease and ALS.** He believes investigations of stem cell biology under the pathological conditions may give us a clue for causes of the diseases as well.
- Dr. Suren Tatulian and his colleagues are using state-of-the-art molecular biological and biophysical approaches to reveal potent molecules that play a key role in the development of inflammation. Their findings will help **guide the design of improved anti-inflammatory therapies.** Evidence suggests that inflammation of the brain may contribute to damage caused by Alzheimer's disease. Dr. Suren Tatulian's research on key events that lead to inflammation will provide valuable information about this component of the disease.
- Dr. Ken Teter's research interests lie in the field of cellular microbiology. The long-term goal of his research program is to **understand the molecular events that allow cholera toxin and other bacterial toxins to enter the host cell.** Elucidation of this process will identify cellular targets for therapeutic intervention.

Disease research and studies:

- Dr. Debopam Chakrabarti oversees **research on the parasite that causes malaria** — a disease that kills 2.7 million people each year. An urgent need for new drug targets has developed with the spread of drug-resistant strains of malaria. Members of the Chakrabarti laboratory are focusing on complex changes that occur in the parasite's life cycle. By analyzing molecules that regulate the cycle, they have identified potential targets for anti-malarial drugs. Clinical trials using a drug developed in the lab are currently under way.
- Research by Dr. Alexander Cole **focuses on the innate ability of humans to resist diseases caused by pathogenic bacteria and viruses that are constantly present.** His laboratory has found that individuals who are unable to resist nasal Staphylococcus infections have a defect in their nasal fluid. The lab is conducting studies to identify proteins associated with the defect. In another study, Cole's lab is analyzing the function of a primate peptide (protein fragment) with intriguing anti-viral activity. So far his research shows promise in finding ways to **resist HIV infection** among others.
- **Large amounts of vaccines for serious, often fatal, infectious diseases such as anthrax, plague and cholera are being developed** using an innovative technology developed by Dr. Henry Daniell. His laboratory uses "chloroplast genetic engineering" to modify the genetic makeup of plants. Tobacco plants

modified using this technology can produce large quantities of a desired protein, which can be used as therapeutic agents and vaccines, at low cost.

- Scientists working with Dr. Pappachan Kolattukudy use gene chip technology to **identify the genes involved in the inflammatory process associated with the development of human ischemic heart disease**. They have developed a transgenic animal model that mimics all aspects of the human disease, which they are currently using to discover

Other researchers at UCF are **seeking new drug targets for the microbe that causes tuberculosis**. This microbe, which is present in one-third of the world's population, causes more than one-quarter of all preventable adult deaths, has developed resistance to multiple drug treatments. The pathogen's ability to go into dormancy until a person's immune system is weakened makes it impossible to eliminate from infected people.

Optics and laser research and development:

- Peter Delfyett, a professor of Optics, Physics and Electrical and Computer Engineering, and his research team are **working to increase the speed at which data can be transmitted through semiconductor chips** like the ones found in computers. Improving that speed would help computers download information from the Internet much faster and make computer networks faster. His technical accomplishments have included the development of the world's fastest, most powerful mode-locked semiconductor laser diode, the demonstration of an optically distributed clocking network for high speed digital switches and supercomputer applications, and the first observation of the optical nonlinearity induced by the cooling of highly excited electron-hole pairs in semiconductor optical amplifiers.

Delfyett serves as president of the National Society of Black Physicists, which promotes the professional development of African-American physicists within the international science community and in society. He has published more than 400 articles and been awarded 22 U.S. patents.

- Professor Aristide Dogariu focuses on optical physics, waves propagation and scattering, electromagnetism, and random media characterization. Dr. Dogariu's Laboratory for Photonic Diagnostics of Random Media is **exploring optical principles for sensing, metrology, diagnostics and various applications of optical wave propagation** in random media.
- Professor Martin Richardson directs the University of Central Florida's Townes Laser Institute. He oversees a research program on the development of new high power lasers, and their applications to dense laser plasma studies and x-ray generation in the Laser Plasma Laboratory at the Center for Research & Education in Optics & Lasers (CREOL). The Townes Laser Institute is **focused on the next generation of laser technologies for medicine, advanced manufacturing tools and defense**.