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UNIVERSITY OF CALIFORNIA, IRVINE

SUE AND BILL GROSS STEM CELL RESEARCH CENTER

STEM CELL RESEARCH DISCOVERIES AT UCI

UCI researchers in the biological and health sciences use stem cells in a number of disease-focused research projects, ranging from basic genetic studies to targeted investigations focused on improving human health.

OVERVIEW

UCI began its stem cell research program in the 1970s and moved into human stem cell research in 2000. Today, UCI stem cell researchers use both adult and embryonic stem cells from either human or rodent sources.

UCI researchers believe in pursuing further research on stem cells because of the hope that these cells offer for future medical cures. Stem cells have the potential to help remedy or alleviate many ailments, including Alzheimer's disease, Parkinson's disease, multiple sclerosis, diabetes, cancer and spinal cord injuries.

UCI STEM CELL RESEARCHERS

Over 60 scientists at UCI use stem cells in their studies, or are about to integrate stem cells into their research. The following is a partial accounting of stem cell activity at UCI:

Spinal Cord Injury and Central Nervous System Diseases

- **Aileen Anderson** and **Hans Keirstead** at the Reeve-Irvine Research Center in the School of Medicine are pioneering the use of both adult and human embryonic stem cells (hESCs) to discover treatments for people with spinal cord injury and central nervous system diseases like multiple sclerosis and ALS (also called Lou Gehrig's Disease).

Brain Injury and Neural Diseases

- Neuroanatomist **James Fallon** was one of the first researchers in the world to study adult stem cells in the brain. **Carl Cotman**, Professor and Director of the UCI Institute for Brain Aging and Dementia, studies methods by which stem cells resident within the brain might be stimulated to slow the decline into Alzheimer's - or stop it altogether.

Basic Research

- Geneticist **Doug Wallace**, a member of the National Academy of Sciences, uses embryonic stem from mice to study human genetic diseases that are associated with mutations in the DNA of mitochondria. Mitochondria generate the chemical energy that powers all mammalian cells.
- Geneticist **Arthur Lander** uses embryonic stem cells from mice to help create genetically modified mice for studies on gene function.

- Neuroscientist **Anne Calof** uses neural stem cells from mice to understand stem cell function and the potential use of stem cells in fighting neurological disease.
- Biomedical engineer **Abraham Lee** uses neural stem cells from mice and humans to develop micro-devices that help researchers understand the factors dictating stem cell differentiation.
- **Ping Wang**, Director of the UCI Center for Diabetes Research and Treatment, and colleagues are trying to understand how stem cell therapies can aid treatments for diabetes.
- Neuroscientist **Phil Schwartz**, who also is affiliated with the Children's Hospital of Orange County, teaches a course showing researchers how to grow both neural and human embryonic stem cells.

SUSAN BRYANT AND OSWALD STEWARD – LEADING STEM RESEARCH AT UCI AND IN CALIFORNIA...

Two UCI faculty researchers have been selected to serve on the Independent Citizens Oversight Committee (ICOC) that oversees the California Institute for Regenerative Medicine, which came into existence when California voters approved Proposition 71 in the November 2004 .election.

Susan Bryant, Dean of the School of Biological Sciences, was appointed to the ICOC in November 2004 by former UCI Chancellor Ralph J. Cicerone. Bryant is a developmental biologist who researches the mechanisms by which some adult animals can regenerate lost limbs.

Oswald Steward, Director of the Reeve-Irvine Research Center, was appointed to the ICOC by Governor Arnold Schwarzenegger in December 2004. Dr. Steward's research focuses on how nerve cells create and maintain their connections with each other and how these "synapses" are modified after injuries. He has conducted research on the genes influencing nerve cell regeneration, growth and function,; and how physiological activity - including injury - affects nerve cell connections.

Groundwork for Future Treatments

- Naturally-occurring brain chemicals may help prepare human embryonic stem cells for transplant therapies, a finding by Bill and Sue Gross Stem Cell Center's Co-Director Dr. **Peter Donovan**.

PROGRESS

UCI's stem cell research activities have already yielded the following breakthroughs:

- **James Fallon (Parkinson's Disease):** In 1997 and again in 2000, Fallon was the first to demonstrate how significant numbers of rodent adult stem cells and progenitors can be mobilized to help repair an injured brain. These results point the way toward potential new treatments that harness stem cells within the brain to reverse damage done by stroke, Parkinson's, Alzheimer's and other neurodegenerative conditions.

- **Ken Cho and Ping Wang (Diabetes):** Ken Cho, Professor of Developmental and Cell Biology, identified over 50 genes affecting the transformation of mouse embryonic stem cells into insulin-producing cells, perhaps pointing the way toward a means of expanding the supply of transplantable insulin-producing cells. Ping Wang, Associate Professor in the School of Medicine, has identified internal cellular processes that promote the growth and survival of cells affected by diabetes.

- **Hans Keirstead and Aileen Anderson (Spinal Cord Injury):** Hans Keirstead has injected hESCs into paralyzed rats and significantly increased their mobility, work expected to result in the first clinical trial using human embryonic stem cells in 2006. Keirstead was also the first to develop a high-purity line of

functional nerve tissue cell progenitors from hESCs. Anderson investigates the role of inflammation following spinal cord injury.

UCI'S ADVANTAGE

What makes UCI well-positioned to accelerate stem cell research?

The creation of the California Institute of Regenerative Medicine by Proposition 71, and its attendant $3 billion funding program, presents an opportunity for the university. Other strengths and advantages include:

- **Basic Research**. UCI human embryonic stem cell research is already in progress, using both Federally-approved lines and lines that are ineligible for Federal funding. Also, UCI has several active research programs using adult stem cells that complement its hESC research efforts.
- **World-Renowned Faculty**. UCI has world-renowned research faculty in the neurosciences, developmental biology, chemistry and pharmacology whose work can serve as a cornerstone for the translation of stem cell research to therapies for neurological and other disorders.
- **Reeve-Irvine Center**. UCI is the home of the Reeve-Irvine Research Center, one of the world's top spinal cord injury research facilities.
- **Affiliations**. UCI has strong connections with Children's Hospital of Orange County, which supports an annual course for researchers to learn about human embryonic and neural stem cell culture and characterization.
- **Research Funding**. UCI stem cell research is currently well supported by Federal grants, private funding, and research agreements with industrial partners including Geron Corporation, Stem Cells Inc., and Genzyme Corporation.
- **Generous Support**. UCI is extraordinarily thankful for the support of the Gross Family, who pledged $10 million to this critical stem cell research effort in July 2006.
- **A High Purity Population of Embryonic Stem Cells**. UCI research has resulted in the first ever derivation of a high purity population of clinically relevant cells from human embryonic stem cells under FDA compliance. In most research laboratories, the purity of human stem cells hovers around 2 to 30 percent. UCI scientists have managed to obtain a purity of 98 percent.
- **Clinical Trial Readiness**. UCI stem research has led to the development of a spinal cord clinical trial planned for 2006, which may take place at the UCI Medical Center. It is anticipated to be the first hESC clinical trial in North America.
- **Ethics and Public Policy Expertise**. UCI has an active group of faculty with expertise on ethical and public policy issues pertaining to stem cell research and therapies.
- **Public Outreach and Education**. The UCI Interdisciplinary Center for the Scientific Study of Ethics and Morality and the UCI School of Biological Sciences, along with co-sponsors, host meetings, lectures and seminars on stem cells.
- **Already Expanding**. UCI has hired faculty leaders in stem cell research and is recruiting several more at both junior and senior levels. In addition, UCI's administration has provided interim, dedicated lab space for several faculty members, and is planning for a stem cell core facility and permanent lab space for about 20 faculty.