REBELS
# REVIEW

Summer 2016

Lawrence J. Ellison Institute *for* Transformative Medicine of USC
USC Center *for* Applied Molecular Medicine
USC Norris Westside Cancer Center

## Doctor's Notes

*From the Desk of David B. Agus, MD*

*Photo Credit: Bryce Duffy*

These past few months have marked an exciting time for the USC Center for Applied Molecular Medicine (CAMM) and the USC Westside Cancer Center (WCC). Our recent Rebels With a Cause gala in Santa Monica was a tremendous success. Nearly 600 supporters attended the gala, and many more donated to benefit our research. The distinguished honorees, Haim and Cheryl Saban, our generous hosts, Sandy and David Ellison, some of our patients and numerous talented artists offered their incredible gifts to the event because the fight against cancer is deeply personal to each of them. Their passion created a warm and intimate atmosphere which honored those battling against cancer while raising awareness that we still have much more to accomplish.

Larry Ellison's big announcement, pledging $200 million to establish the Lawrence J. Ellison Institute for Transformative Medicine of USC, stunned the room. This was an amazing moment! This Institute will create a new paradigm in cancer research and fulfill a long time dream of mine. It will be a place where researchers, doctors and scientists from diverse spheres can apply their specialized expertise in a team environment and study a full continuum from health and wellness to cancer – an Institute which has the ability to embrace community involvement, research, and the greatest technological advances available which can help us know and treat disease. Progressive clinics which are sensitive to patients' needs, care and comfort and state-of-the-art laboratories will be at its core. The Institute will play a crucial role in educating and influencing the next generation of researchers and clinicians. (See page 3 for more details on the new Institute.)

Both Los Angeles and patients need an Institute like this, the first of its kind in the world. I believe our job at CAMM and WCC isn't just to treat cancer, but to change how we treat cancer. I am honored and privileged to team up with Larry in the fight against this disease, and I will keep pushing forward until we finally win the war on cancer. Thank you for being a part of this mission and sharing the vision that together we can make a difference!

REBELS WITH A CAUSE
VISIONARIES AND REVOLUTIONARIES TRANSFORMING CANCER RESEARCH


*Pictured at the Rebels With a Cause Gala, Left to Right (top): Leona Lewis, Sandy & David Ellison, Lorna Luft, Cheryl & Haim Saban; (bottom): Christina Aguilera, Larry Ellison & David Agus, Kristin Chenoweth, James Corden*
*Photo Credit: Alex Berliner/ABImages*

# Bringing Basic Science to the Clinic with Patient-Derived Models *by Erin Spiller*

Scientists have conducted research on cancer cell lines - cells derived from a single tumor that have been cultured over and over again throughout the world - for decades. Although these cell lines are useful, research in the last few years has revealed that they may not be the best model on which to test new therapies. To solve this problem scientists have begun using "patient-derived cancer models" which more closely resemble the original tumor from a patient, maintaining key aspects of the genetic and microenvironmental diversity of individual tumors. Here at CAMM, I investigate the effect cancer treatments have by using this novel approach. Because the makeup of tumors varies tremendously from one patient to another, this new methodology offers more personalized insight into how a specific patient may respond to treatment.

I was invited this February to attend the first ever American Association for Cancer Research Patient-Derived Cancer Models conference, which drew people from across the world to New Orleans. Top scientists from the US, Canada, Israel and Europe gathered to discuss this emerging platform. A portion of the conference was devoted to examining how the field can evolve existing technology and push boundaries as a worldwide community. One of the most interesting developments has been the construction of biobanks, a collection of patient material, as a global resource. A biobank could be thought of as a library of patient samples that researchers around the world could "check out" to utilize in their experiments. At CAMM we are already constructing a unique biobank of patient tumors donated by those undergoing treatment for prostate, breast and colorectal cancers.

Most researchers at the conference presented data from various patient-derived xenograft models, where tumor cells and their surrounding microenvironment are extracted from patients and subsequently grown in mice. I work with a newer patient-derived technology which involves organoids- micro-tumors grown in a gel similar in texture to the human body. Organoids allow for the expansion of patient tumor tissue without requiring an animal host and can scale significantly beyond other systems. Previously, researchers would be limited by the small amount of tissue in a patient sample to try to study it in a laboratory setting. The rise of expanding samples via patient-derived model systems, such as organoids, greatly increases the research possibilities.

I presented my research *High Content 3D Image Analysis of Patient-Derived Organoids* at a poster session. My poster highlighted our ongoing research to develop a novel high-throughput imaging method to study treatment response of patient-specific organoids. I received great feedback on my poster and was excited to be approached by top scientists in the field to discuss future collaborations. I returned to LA with new ideas and a greater drive to push forward to solve more of the mysteries of cancer.

Erin Spiller is a dedicated biologist who was born in Boston, MA. She joined the CAMM team shortly after receiving her Master's of Liberal Arts in Biotechnology from Harvard University. In her free time, Erin enjoys Irish Step Dancing with the Cleary Irish Dance school.

# Trends in Clinical Research *by Brandi Scott*

As a clinical research coordinator, I help guide patients through clinical trials at the WCC while gathering and compiling data from those trials. In late March, I attended the Society of Clinical Research Associates Oncology Clinical Trials conference held in Miami, Florida to deepen my experience and understanding of the many complexities involved in designing and maintaining clinical studies. I joined research professionals from across North America to discuss trends, challenges and complex issues facing scientists in clinical oncology research.

Brandi Scott is a passionate clinical research coordinator. She was born and raised in Atlanta, GA. Graduating from Georgia State University with a BS in biology, she knew she had to pursue a career in healthcare. Shortly after college she moved to Los Angeles with her adorable dog, Hemi, and joined the wonderful research team at the WCC.

Immunotherapy is a current trend in oncology treatment which has received considerable attention in recent years. This is an emerging class of cancer therapy which uses the body's own immune system to help fight cancer cells. The immune system's natural ability to detect and destroy abnormal cells prevents the development of many cancers. Under certain circumstances, cancerous cells begin to grow when they evolve methods to either avoid detection or suppress the immune system's natural response. Doctors and researchers hope to discover ways to restore or boost

*(Continued on pg. 3)*

# *$200 million gift launches the Lawrence J. Ellison Institute for Transformative Medicine of USC*

*Photo Credit: Alex Berliner/ ABImages*

We are excited to announce that technology entrepreneur Larry Ellison has donated $200 million to establish the Lawrence J. Ellison Institute for Transformative Medicine of USC, a new center in Los Angeles that will combine interdisciplinary research with the prevention and treatment of cancer. Our own Dr. David Agus will lead the Institute.

Ellison's gift is among the largest made to cancer research and treatment in recent years. The donation was announced at our Rebels with a Cause fundraising gala for CAMM on May 11.

"Tonight I'm announcing a gift of $200 million to the University of Southern California to build an interdisciplinary center for cancer research headed by Dr. David Agus. The new Institute will invite mathematicians, physicists and other scientists to collaborate with cancer researchers from the traditional disciplines of medicine and biology. We believe the interdisciplinary approach will yield up new insights currently hidden in existing patient data."

Ellison's gift will provide the lead investment for a state-of-the-art facility in West Los Angeles that will serve as the Ellison Institute's home. The building will house interdisciplinary cancer research laboratories focused on scientific discovery and innovation. Clinical advances will focus on transforming cancer treatment through technology and an interactive clinic that offers patients world-class healthcare. The Institute's collaborative environment will include a think tank, education and outreach, and a wellness program. The Institute will feature community spaces built around encouraging a healthful lifestyle, including a library and gardens. The center will be open to the community for lectures and wellness classes on nutrition and similar topics.

*"Larry understands the need for transformation in cancer care. His gift will enable us to change our very approach to cancer research, treatment and prevention."*

The Ellison Institute will draw collaborators from across conventional health and wellness fields, as well as from a broad range of other disciplines such as physics, biology, math and engineering to study cancer and potential ways to prevent, detect and treat the disease. The Institute will complement and integrate cancer research being conducted by faculty physicians and scientists across the university.

"It is an honor and a privilege to team up with Larry Ellison in the fight against cancer," said Dr. Agus. "Larry understands the need for transformation in cancer care. His gift will enable us to change our very approach to cancer research, treatment and prevention. We will create a new paradigm, where patients and researchers have the opportunity to interact, and where research is not taking place in an isolated silo. I believe with Larry's support, we can advance our research to the next level, allowing the most effective treatments to benefit patients who are in urgent need of new therapies – today."

## *Trends in Clinical Research* *(continued from pg. 2)*

the body's existing immune system to trigger an attack on a cancer that was previously able to avoid the immune response, thus restoring the patient to a state of health. At the conference, I was exposed to the many different approaches to immunotherapy that are currently under investigation.

In addition to learning about recent advances in immunotherapy, I was able to expand my knowledge of clinical research in Phase I patient trials. These trials are the first step to bring newly developed investigational drugs to patients and help determine drug safety, side effects, tolerance and effective dosage. Furthermore, the speakers discussed the process of designing Phase I clinical trials and how to overcome the everyday challenges that arise within a study. This topic was of particular interest to me because we are considering a Phase I trial for metastatic castrate-resistant prostate cancer patients which combines an existing therapy with a novel drug treatment.

This conference allowed me to gain further perspective and understanding of the importance of the research study coordinator's role in bringing new therapies to patients. Not only did the meeting provide me with a vast array of educational tools to strengthen my role as a research coordinator, but it also allowed me to share similar experiences and make strong connections with other members of the clinical research community who share my drive to find new ways to combat cancer. I am honored to be part of this vital field of study where I can help both patients and doctors in their search to end this horrible disease.

*Prostate cell from CAMM labs displaying a cluster of androgen receptors (in green). Photo by Chi-li Chiu, PhD*

# The Future of Cancer Care: How Novel Imaging Technology Could Mean a Brighter Tomorrow

*by Chi-li Chiu, PhD*

The cell is the fundamental unit of life. Normal cells in our body perform well-defined functions which sustain regulated growth and death rhythms. Cancer occurs when cells go awry, proliferating without stopping and taking away resources and space from other healthy cells.

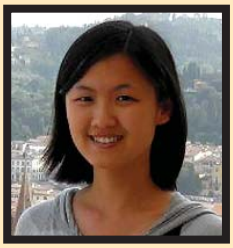
So how do cells decide what they should be doing? What are the mechanisms that turn a good cell bad, and how can we target these mechanisms effectively to combat cancer? This past December, I attended the American Society of Cell Biology (ASCB) conference in San Diego, joining several thousand scientists from around the globe who work on these fundamental questions. In those five days, biologists joined forces with physicists, chemists, and computer scientists to discuss the latest developments in our understanding of cells as well as new technologies to help us investigate the workings of a cell.

A major focus of the conference was on novel microscopy imaging tools that help us delve into smaller, faster and deeper parts of the cellular world. In 2014, the Nobel Prize in Chemistry was awarded to three scientists who defied the limits of light microscopes to reveal sharp images of molecular-scale structures in living cells. Two of these Nobel Laureates, Dr. Eric Betzig and Dr. William Moerner, attended ASCB to share the latest development from their labs and how these techniques have begun to transform cell biology research.

Biologists can now see, in real time, how DNA, RNA and proteins are distributed and how they interact with each other. Up until now, scientists believed that all these molecules were randomly distributed in a cell. With the new technology, we have begun to understand the rules of their organization and movement. We can now appreciate how these molecular-scale changes which happen in a fraction of a second can lead to big decisions, like a cell's life and death.

My work at CAMM involves applying and developing new imaging techniques to interrogate the potential mechanisms of cancer drugs, such as docetaxel, on prostate cancer. How does the drug alter a cell at the molecular level? What are some possible mechanisms that cause a cell (or a patient) to develop drug resistance? With ever-evolving technology, we will elucidate more and more answers to these pressing questions, which in turn will guide us to design more effective treatments in the future.

Observing the increasingly cross-disciplinary nature in the field of cell biology is exciting. The complexity of this field pushes technological development, which in turn leads to a deeper understanding of many diseases, including cancer. Basic cell biological research has the opportunity to profoundly contribute to cancer prevention, treatment and cure.



Dr. Chiu is an inquisitive scientist, restless learner and spoiled foodie. Her research revolves around developing and applying technologies to tackle complex biomedical systems. She is married to another scientist and has lived/worked in eight cities across Asia, Australia and America.

## Let's Defeat Cancer Together!

Our cross-disciplinary approach enables us to integrate principals from physics, biology, math and engineering into new ways of managing and treating cancer. While some may call it visionary, for us, there is simply no better way to help us succeed in our fight.

Your support will dramatically advance our research to the next level, allowing the most effective treatments to benefit patients who are in urgent need of new therapies—today. Simply fill out the enclosed envelope to donate to the Lawrence J. Ellison Institute for Transformative Medicine, USC Center for Applied Molecular Medicine and USC Norris Westside Cancer Center or visit our website now!

**http://keck.usc.edu/donateWCC**
**or text REBELS to 9-1999**