USC University of Southern California

USC Center for Applied Molecular Medicine and USC Norris Westside Cancer Center

Dear Friends and Supporters,


©Phil Channing

This has been an exciting year for the USC Westside Cancer Center (WCC) and the Center for Applied Molecular Medicine (CAMM). The successes make us feel proud that we are moving the needle against this horrible disease. However, seeing patients struggle daily with cancer makes us aware that we have a long way to go. One of the drugs we helped develop entered the market to treat breast cancer and other cancers. We began work with this novel compound in collaboration with Genentech over 15 years ago. The slow pace of cancer drug development is clearly evident! This drug, called Perjeta (Pertuzumab) is now helping people with advanced cancer and it is rewarding to see it being used.

This year, our work with the National Cancer Institute has begun to bear fruit. Four years ago they awarded us a $16.1 million dollar grant to lead a consortium of research teams to create a multi-scale model of cancer. After lots of data generation the team finally has developed a beginning model. The word "multi-scale" refers to the models we have created for the cancer cell, the tumor as a whole, the person with the cancer, and most importantly all of these components combined. Over the next year, we will continue to improve the model and test it with patient data as well as laboratory data.

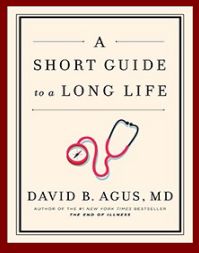
Along these lines, CAMM was awarded a grant from the Breast Cancer Research Foundation to create a home for models across the world here at USC. The long term vision is that physicians would be able to enter the patient data into many models and have predictions returned on clinical outcome of the patient. Each model would be improved as the true clinical outcome of the patient was ascertained. This would be much like climate modeling where you see the TV weather forecaster showing three different routes for a hurricane. After the hurricane path is known, each model is improved by identifying what it got right and wrong and changing the model for the next hurricane.

There is much more happening at WCC and CAMM and I look forward to describing it to you over the next year. As always, I ask that you consider helping to fund progress and speed the development at CAMM so that our patients and patients across the world can benefit soon.

Happy holidays and to your health!

With respect,

David

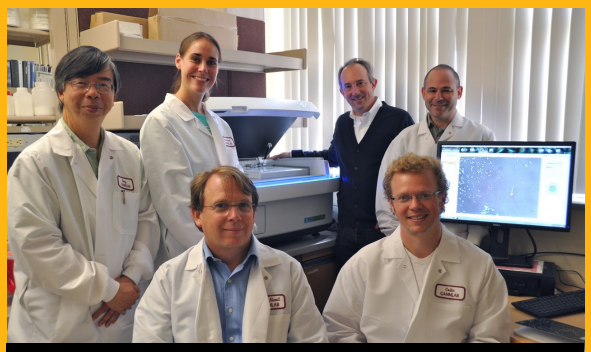


Check out my new book available January 7, 2014. Visit www.davidagus.com for more details.

CAMM

CAMM is very grateful for a recent donation of the Operetta instrument by Emmet and Toni Stephenson. Donated to support our ongoing lymphoma research, the Operetta, dubbed a "high content imaging system" is an automated high throughput microscopy platform capable of monitoring many physiological parameters of thousands of cells in hundreds of conditions. As part of a nationally funded grant awarded to CAMM, we are actively investigating the behavior of lymphoma cells in response to chemotherapy agents to better understand why drug resistance occurs and how to fight it.

Our goal is to combine experiments and mathematics to design highly optimized treatment strategies for individual lymphoma patients. Receiving the gift of the Operetta has truly changed our experimental capabilities and has enabled investigations that we have long been hoping to pursue. The exciting features of this instrument allow us to study thousands of lymphoma cells at high-resolution and watch their individual behavior (e.g. grow, die, move) in real time in response to therapy and other environmental changes. These dynamic measurements enable us to capture the emergence of drug resistance and design alternative treatment strategies to prevent it. The Operetta's versatility also benefits research at CAMM that spans different cancer types (e.g. lung, breast, prostate) and treatment options (e.g. targeted therapies). It has rapidly become the most popular instrument in the lab!


Dr. Agus with CAMM's research team and the new Operetta

Thank you again to the Stephensons for advancing our research in ways that we had never imagined possible. The encouragement and support we receive from patients truly makes our research rewarding.

YOU CAN HELP! This Holiday, support CAMM's cutting edge research and WCC's advanced patient care by giving a gift. Make a difference and stand with us as we attack this terrible disease. Simply call us for gift purchasing information, use the enclosed envelope to send in a contribution, or visit our website to donate online. Thank you in advance for your gift, we greatly appreciate it. http://keck.usc.edu/donateWCC

To be removed from future CAMM/WCC mailings, please email: wcc@med.usc.edu

Keck School of Medicine of USC

Winter 2013

Spotlight on Dr. Dan Ruderman

We use over half of our brain to see, so it's no surprise our comprehension is largely visual in nature. This is especially true for scientists who must find ways to conceptualize increasingly complex real world data, which include the "big data" of social networks, electronic health records, and the genetic and proteomic roots of cancer. Great power to generate new ideas about how these complex systems work comes from being able to see data in simple visualizations.

Images are central to my research. My experience ranges from my physics graduate work on the natural visual images our brains process to consulting at Disney Animation to capture images of an actor's face and map his performance to animated characters. So when I began collaborating with Dr. Agus and his team in 2005 to assess their many terabytes of mass spectrometry data of blood proteins in cancer patients, the first order of business was to turn the complex data into visual images. A sample is shown in Fig 1, which displays the signatures of two blood proteins, labeled P1 and P2. This is a small piece of the vast proteomic image we derive from one drop of a patient's blood. We employed these kinds of images to visually inspect data and compare patient samples in ways previously not possible. Clues as to which proteins act as cancer markers can be discovered in such images. Our initial work contributed to Dr. Agus co-founding Applied Proteomics with computer scientist Danny Hillis, where I served as founding scientist until joining CAMM in 2011.

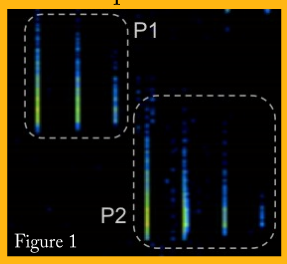


Figure 1

At CAMM, images continue to drive my research. The postdoctoral fellow working alongside me, Katherin Patsch, faculty member Shannon Mumenthaler, and I are investigating how growth signals reach their targets within prostate cancer cells. We use time lapse microscopy to create movies of this signaling within individual cancer cells and measure how it impacts chemotherapy response. To build scientific intuition we first rely on our own eyes while simply viewing these movies. In doing so we can notice how the cells behave and then determine which cellular properties are the best to measure scientifically. An example image of this signaling is shown in Fig 2. Two prostate cancer cells are shown before (left) and after (right) 15 minutes exposure to testosterone. This exposure causes signaling molecules (green) to move into the cell's nucleus (arrows). This mechanism is an essential part of how testosterone promotes prostate cancer growth. We hope these investigations reveal new ways to target chemotherapy resistance in prostate cancer and other cancers.

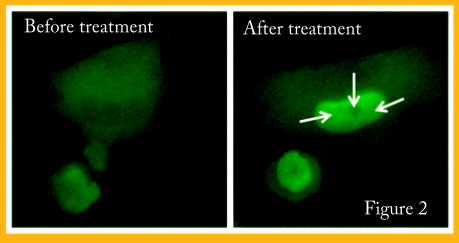


Figure 2

We are also exploring the possibility that images relevant to cancer research go well beyond the scale of tumor cells and extend to the patient as a whole. In an exciting new collaboration with Professor Hao Li (USC Viterbi School of Engineering, Computer Science), we will test whether image-based measurements of patients' facial expressions and body movements reflect their well being and early response to cancer therapy. Such technology will enable oncologists to quickly adjust therapies to achieve the goal of optimum patient response. Making an impact on cancer today requires new approaches. I am excited to collaborate with my many dedicated colleagues at CAMM, the WCC, and the wider USC community to cross traditional scientific boundaries in fighting cancer. I look forward to showing my work to many of you soon!

Dan Ruderman lives in Los Feliz with his wife and 10 year old son. He enjoys photography, hiking, and tireless exploration of LA's widely varied culinary offerings.

Future Rock Stars of Science


Dr. Agus and the 2013 Jr. Fellow Graduates

Over the past four years, CAMM has recruited talented and motivated high school students to partake in our Junior Fellows program. The goal of the program is to immerse Jr. Fellows in an intellectually rich environment that highlights the challenges facing medical oncologists and researchers today. This year, seven outstanding Fellows spent three weeks at the CAMM laboratories learning various techniques and experimental strategies. Their assignment was to develop a treatment strategy for their mock patient based on genetic disposition to treatment response. The Jr. Fellows were given a tour of the Westside Cancer Center where they discussed various aspects of medicine with nurses, clinical coordinators, staff, and Drs. Agus and Gross. Graduates of this program have successfully transitioned to USC, University of St. Andrews, and the combined Bac-M.D. program at Pitzer College. We are very proud of their accomplishments.

The Jr. Fellows program will begin accepting applications in February 2014, with a tentative start date of July 1, 2014. For more information and application details email Dr. Kani. kani@usc.edu

Dr. Mitchell Gross continues connecting laboratory science with exceptional clinical care for prostate cancer patients. A new clinical trial examines how a blood test can be used to personalize therapy for metastatic prostate cancer involving a well-tolerated hormone blocking therapy (orteronel, TAK-700). Other research projects focus on understanding how targeting the normal cells surrounding cancer may represent a new treatment model and in exploring how an electronic device may be able to treat metastatic cancer cells. To support Dr. Gross and his ongoing efforts please use the enclosed envelope or visit http://keck.usc.edu/donateWCC

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