OAK CREST INSTITUTE OF SCIENCE
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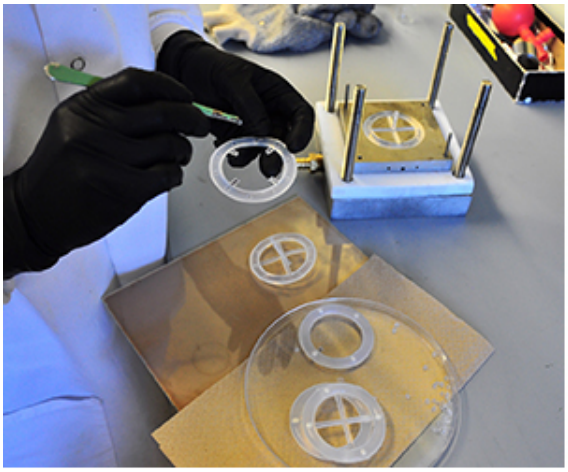
Oak Crest Receives $20 Million NIH Grant



Scientists at the Oak Crest Institute of Science have been awarded a $20 million grant from the National Institutes of Health (NIH) to systematically develop an intravaginal ring capable of delivering powerful antiretroviral (ARV) drugs to prevent the spread of sexually transmitted HIV in women.

After more than 40 years of research, prevention of HIV infection continues to be a critical global health priority. According to the World Health Organization, there are some 35 million people living with HIV in the world today. Approximately 70 percent of all people living with HIV are from Sub-Saharan Africa.

Intravaginal rings, currently available commercially for contraception and hormone replacement therapy, have shown promise as a drug delivery system to prevent HIV infection. However, most designs currently under investigation cannot deliver multiple-drug combinations of the many available antiretroviral drugs developed to combat HIV infection. While combinations of three antiretroviral drugs are highly successful in treatment of HIV infection, their use in an intravaginal ring platform has not been possible until now. Furthermore, the best combination of drugs to prevent sexual HIV infection is not known.

“This Program will allow us, for the first time, to rigorously test a large group of antiretroviral drugs in a systematic fashion so that we can determine what combination is best for preventing sexual HIV via vaginal delivery,” says principal investigator, Marc Baum, Ph.D., president and senior faculty at Oak Crest. “This project is, in large part, enabled by our pod-intravaginal ring (pod-IVR) platform. We have shown that the platform can deliver five different drugs simultaneously and at independently controlled dosages, which is unlike any other device under development today. In addition, the modular design of our pod-IVRs allows us to accelerate the development of prototypes, a critical element to testing many combinations as part of this Program,” he adds.

"Our technology platform also has the crucial advantage of scalability in manufacturing as the majority of the fabrication steps are identical regardless of the drug substances in the combination. This scalability and potential for economical manufacture will be crucial for any product to be used in the developing world," says Dr. Baum.

This five-year grant is funded under the NIH U19 Program, a mechanism that funds collaborative projects involving multiple institutions. Oak Crest is the lead institution in this collaboration that also includes teams of researchers from the Centers for Disease Control and Prevention (CDC), the University of Texas Medical Branch, Johns Hopkins Medical Institutions, the University of Colorado, Boulder, Scripps Research Institute, University of California, Los Angeles, Vanderbilt University, Miriam Hospital and Auritec Pharmaceuticals. "We are fortunate to be part of a stellar team of investigators from all over the country. Through this partnership, I feel confident that we will meet our goal of using a novel screening process to scientifically determine the best-performing candidates in order to advance them rapidly into clinical trials," says Dr. Baum. Oak Crest has already reached significant milestones in this scientific arena by becoming the first to successfully administer Truvada, the only FDA approved regimen for HIV prevention, from an IVR. This milestone was accomplished in collaboration with the CDC where the novel pod-IVRs were evaluated in pig-tailed macaques over a 28-day period.

Sustained release approaches to drug delivery for the prevention of HIV infection, such as the pod-IVR, is especially appealing for use in the developing world, in contrast to daily therapies, where adherence is often an issue. Such devices are less expensive on a per-patient, per-day basis, they are capable of both rapid and sustained drug delivery for at least a month, and they sustain their effectiveness without refrigeration, an important consideration for use in resource-limited settings.

"The significance of this research is profound. Our goal is to empower women to protect themselves from HIV infection with the best biomedical solution," comments Dr. Baum. "The foundation we have already laid, coupled with the results from this innovative study, will help us accelerate the development of this pre-exposure prophylactic device," says Dr. Baum. "This process is especially important when considering that for each year we delay, close to a million women in sub-Saharan Africa alone could become infected," he adds.

First Student Cohort Completes Fellowships Supported by The Rose Hills Foundation

Eight Pasadena City College students are one step closer to achieving their dream of becoming the next generation of scientists dedicated to uncovering the secrets of many of today's toughest environmental challenges. This select group recently completed six months of rigorous hands-on scientific studies at the Oak Crest Institute of Science as part of The Rose Hills Foundation Research Fellows Program.

The Rose Hills Research Fellows pose with Dr. Marc Baum after making their research presentations at The Huntington Library, Art Collections, and Botanical Gardens.

The first cohort of Rose Hills Research Fellows selected their projects from three broad subject areas: microbial ecology, natural products research and atmospheric chemistry, all topics that are actively being researched by Oak Crest scientists. For the duration of the program the students worked on their research projects 20 hours a week in teams of two while receiving individualized mentoring from an Oak Crest scientist. Funding for the research Fellowships was provided by The Rose Hills Foundation as part of three-year environmental science research grant awarded to Oak Crest.

"It has been our experience that participation in rigorous, original research provides students with a realistic sense of how exciting a career in science can be, and builds self-confidence while offering strong motivation to continue and excel in their studies," says Dr. Marc Baum, Oak Crest president and senior faculty.

At the end of their Fellowship program the group presented their research findings to an audience of approximately 50 community leaders, researchers, educators and staff from several Pasadena area nonprofit organizations. The Seminar Day event was held Tuesday, July 15, 2014, at The Huntington Library, Art Collections, and Botanical Gardens.

Seminar Day presentations included:

- **Roadside Sampling of Auto Exhaust from Medium to Light Duty Vehicles Off the Northbound 110 Freeway**, presented by *Vincent Aguirre, Jr., Ingrid Medina and Andrew Rocha*.
- **Carbonyl Compounds in Vehicle Exhaust**, presented by *Amalia Castonguay and Paul Priego*.
- **The Unmasking of Nature's Hidden Remedies**, presented by *Alexander Montes and Paul Priego.*
- **Metagenomic Analysis of Asphalt**, presented by *Taylor LaVal and Terra Sztain.*

The presentations not only provided the audience with interesting facts and data relating to environmental science, they also provided the interns real-life practice in presenting research findings before a live audience, just as they will at future scientific meetings and professional conferences.

"The value of this program is immeasurable," adds Dr. Baum. "Participants have the benefit of conducting mentored research on projects that are relevant and address important environmental problems confronting society today. In addition, they gain an academic edge over others who desire a career in the scientific field."

The Rose Hills Foundation Research Fellowships are available exclusively to community college students from Pasadena City College and other San Gabriel Valley area community colleges. The Fellowships are based on 20 hours per week and provide compensation to cover a portion of the associated supply costs, travel costs to one conference per year, and the time dedicated to the project by Oak Crest faculty. These funds not only allow the students to do what they love, but also enables them to be concurrently enrolled in classes at their home institutions without having to seek outside employment.

Two tiers of Fellowships are offered at Oak Crest: (1) for students who plan to transfer to 4-year colleges and pursue STEM majors; and (2) for students who plan to enter the workforce after obtaining their associate degree.

Recruitment for The Rose Hills Foundation Research Fellows Program occurs twice annually, in September and March. Interested, eligible students are encouraged to apply via e-mail.

Student Profile: VINCENT AGUIRRE, JR.

Vincent (Vince) Aguirre, Jr. is part of a select group of community college students who recently completed their environmental science research projects at Oak Crest as part of The Rose Hills Research Fellowship Program. Vince learned about the Oak Crest almost by accident when he came across a flier posted in the Chemistry Department at Pasadena City College (PCC) promoting volunteer opportunities at Oak Crest.

Majoring in chemical engineering at PCC, Vince says he was especially excited when he learned about Oak Crest because he was interested in finding a lab where he could volunteer, gain actual lab experience and learn to perform relevant research with real-life applications.

At first, Vince volunteered 10 hours a week at Oak Crest. He and fellow PCC student John Mansell were working on a project involving the validation of methods for scrubbing hydrogen cyanide from ambient air and subsequent analysis techniques. Background concentration measurements then would be contrasted with freeway field samples to determine the contribution from light duty motor vehicles.

"Volunteering and doing the research was a little tough at first," says Vince. "I had to work around the other people's schedules in the lab. And, to top it off, my volunteer partner left Oak Crest and transferred to another college," adds Vince.

Because his experience at Oak Crest had been so positive up to that point, Vince emailed Marc Baum and John Moss asking if he could continue to work on his research project without his former volunteer partner. Their answer, of course, was yes. “Working here you feel like you are really a part of the groups that have come before you,” says Vince. “You are moving their research forward and that’s why I wanted to continue with my project.”

During the time that Vince was completing his work on the cyanide project an additional door opened for him that he could not resist. Oak Crest received grant funding from The Rose Hills Foundation for a fellowship program allowing interns to work at Oak Crest part-time and get paid while attending their university classes. “I had a part-time job at the time that was not related to my major so when I found out about the Rose Hills Fellowships I was very excited,” says Vince. “I applied and was chosen as one of the eight to begin the fellowship in December 2013.”

Vince’s research of auto exhaust pollutants directly ties into his career goal of becoming what he calls an “environmental politician.” “I’m very interested in doing research regarding things that make us ill as well as what makes us healthy,” says Vince. “Food, air, water all play a part in our overall health. I want to be part of the group of people in the world who provide answers to pressing environmental issues that impact our health and the sustainability of our natural resources.”

Vince’s ultimate goal is to work at the Environmental Protection Agency where he can take his research findings directly to policy makers to show them ways in which to improve the environment. “Cities can use the information that scientists come up with to stop pollution, clean up the environment and save lives. To me, that’s very exciting,” he adds.

In preparation for this career Vince says he would like to attend UC Berkeley to pursue his bachelor’s degree. In the meantime he is enjoying his learning experience at Oak Crest. “I’m learning how to do science the right way at Oak Crest. It’s a collaborative effort that often involves five or six different scientists in order to come up with the correct outcome,” says Vince. “What I like best is that at the end of the day my mind is still rolling, planning, it feels good to know that you just spent five or six hours of the day solving a problem that I was forced to think through from beginning to end. I’m doing what I love to do on a daily basis. And I’m constantly thinking of what I can do tomorrow that will be of some value to a process,” he adds.

Vince admits that being at Oak Crest has changed his life. “My mentors told me they would support me and show me how to conduct cutting-edge research and that’s exactly what I’m doing,” he says. “Everyone at Oak Crest is so willing to share their knowledge and experience with you. It’s just a matter of how much you want to learn!”.

Our mailing address is:
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ANNOUNCEMENTS

RESEARCH, PUBLICATIONS AND SPECIAL EVENTS

Congratulations to the following Oak Crest faculty for the recent publication of their scientific papers:

Aschbacher, P.R., Ing, M., Tsai, S.M. *Is Science Me? Exploring Middle School Students’ STE-M Career Aspirations*. Journal of Science Education, July 2014.

Aschbacher, P.R., Ing, M., Tsai, S.M. *Gender Differences in the Consistency of Middle School Students’ Interest in Engineering and Science Careers.* Journal of Pre-College Engineering Education Research, July 2014.

Wu, S.; Li, X.; Gunawardana, M.; Maguire, K.; Guerrero-Given, D.; Schaudinn, C.; Wang, C.; Baum, M. M.; Webster, P., *Beta-lactam Antibiotics Stimulate Biofilm Formation in Non-Typeable Haemophilus Influenzae by Up-regulating Carbohydrate Metabolism*. PLoS One 2014, *9* (7), e99204.

Moss, J. A.; Srinivasan, P.; Smith, T. J.; Butkyavichene, I.; Lopez, G.; Brooks, A. A.;

Martin, A.; Dinh, C. T.; Smith, J. M.; Baum, M. M. *Pharmacokinetics and Preliminary Safety Study of Pod-Intravaginal Rings Delivering Antiretroviral Combinations for HIV Prophylaxis in a Macaque Model*. Antimicrob. Agents Chemother. 2012, 58 (9), 5125.