Developing a new diagnostic test for TB

Roodgar shares his research with Congress

S
peaking to the US Congress about the science conducted at the CNPRC is a unique and rare opportunity. In May 2013, Morteza Roodgar, DVM, PhD student under Dr. David Glenn Smith in the CNPRC Genetics / Molecular Anthropology Lab, met with US House Representatives John Garamendi, Doris Matsui, and Ami Bera, as well as US Senator Dianne Feinstein in Washington DC. He was able to discuss the high-impact implications of his research, and how well positioned UC Davis is for translational research. “Having a medical school, veterinary school, primate research center and the important connecting role that the UC Davis Clinical and Translational Science Center (CTSC) provides cannot be understated,” Dr. Roodgar said. “That combination provides a unique opportunity for conducting translational biomedical research.”

Dr. Roodgar was chosen to represent UC Davis as part of the annual UC Day in DC, a government advocacy program sponsored by the UC Office of the President. Working in collaboration with the CTSC, David Glenn Smith, PhD, CNPRC Core Scientist, and the CNPRC, Dr. Roodgar is developing a more efficient means of diagnosis for tuberculosis (TB), a crucial problem in human health that affects more than 2 billion people. “One-third of the world’s population is infected with tuberculosis (TB), a crucial problem in human health that affects more than 2 billion people. “One-third of the world’s population is infected with tuberculosis,” Dr. Roodgar said. “Having a medical school, veterinary school, primate research center and the important connecting role that the UC Davis Clinical and Translational Science Center (CTSC) provides cannot be understated.” Morteza Roodgar

Dr. Roodgar decided on TB as the focus of his graduate work after a search for an infectious disease that was complex, afflicted humans with a variety of clinical presentations, and had the potential for animal-to-human transmission. His work focuses on identifying and exploiting genetic biomarkers that might correlate with susceptibility to tuberculosis, using an important animal model of human TB, the nonhuman primate. A subsequent test of these biomarkers in rhesus macaques has shown promise, and Dr. Roodgar hopes to study human subjects eventually. These biomarkers ultimately could be used to develop a new diagnostic test for TB – one that is more sensitive than the current Mantoux test (which was developed a century ago and is only 59.7 percent accurate in identifying TB-positive cases), and also able to identify latent infections. Latent TB infection is particularly problematic for people who become infected with HIV, because they will develop active tuberculosis due to the immuno-suppressive effects of HIV. Under these circumstances, treatment becomes more complicated.

With the goal of translating his research into a product with the potential of saving many lives, human and nonhuman alike, Dr. Roodgar recently completed a business fellowship with the UC Davis Graduate School of Management. In this program he gained insight about translational and commercialization prospects for the new TB test – yet another demonstration of Dr. Roodgar’s ability to parlay his research into a new field.

In further progress towards making the TB test available to healthcare providers worldwide, the UC Davis Office of Research has taken the important step of filing a patent on the approach that Dr. Roodgar is using.

Wildfire Smoke and Lowered Immune Function

W
ildfires in Northern California led to a natural experiment with monkeys living outdoors at the CNPRC, showing for the first time that exposure to high levels of fine particle pollution in infancy adversely influences both development of the immune system and lung function.

During June and July 2008, almost 2,000 wildfires ignited in Northern California, leading to high levels of inhalable particulate matter (PM) in the Sacramento Valley that lasted for almost two weeks. PM2.5 (inhalable particles smaller than 2.5 microns) at the UC Davis campus were recorded at 50 to 60 micrograms per cubic meter. Some readings reached as high as nearly 80 micrograms per cubic meter, well over the federal standard of 35 micrograms per cubic meter.

Numerous scientific studies have previously linked exposure to PM2.5, which can be deeply inhaled into the airways and lungs, to a variety of problems, including premature death, especially in people with pre-existing heart disease. Additionally, wildfire smoke also causes higher ozone levels, which are linked to asthma, lower birth weights and heart problems. PM is also found in smog.

The CNPRC has a large population of rhesus monkeys living as extended family groups in outdoor field corrals, where they, along with the local human population, were exposed to these elevated PM levels during the wildfires. The fires occurred near the end of the season when the monkey’s typically born, and thus there were a significant number of animals in the colony that were between one and three months of age at the time of the fires.

New Respiratory Disease Center will provide extraordinary opportunities for teamwork

T
he CNPRC has been a leader in understanding primate lung development and function for more than 30 years. It has the distinction of being the only National Primate Research Center (NPRC) with an Inhalation Exposure Facility, with abilities to study airway biology and immunity, environmental air pollutants, pediatric pulmonary disease, and asthma. The CNPRC developed the first rhesus monkey model of adult and childhood asthma using a human allergen, which has given researchers the ability to test numerous biological mechanisms and new therapies.

More recently, the CNPRC has conducted research projects that include a diversity of cross-disciplinary and collaborative topics: experimentally establishing an association between early life exposure to air pollutants and long-term airway disease; discovering a link between temperament and asthma; and developing new links between environmental tobacco smoke and adverse effects on prenatal and neonatal lung development, cognitive function, and brain development.

Ongoing research includes: critical and current research into the effects of Bisphenol A on lung development; working to identify mechanisms that limit pediatric defenses against viruses and bacteria in the lung; and developing pediatric influenza vaccines.

The newly completed Respiratory Disease Center (RDC) at the CNPRC will further expand these capabilities and develop the scope of collaborative research projects that can be conducted at the Center. Researchers from the UC Davis School of Veterinary Medicine, UC Davis School of Medicine, the College of Engineering, and other NPRCs, as well as national and international investigators, will be able to take advantage of the advanced capabilities at the new RDC.

For information about conducting research at the CNPRC or the RDC, please contact Jennifer Short at jshort@ucdavis.edu.

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Wildfire Smoke and Lowered Immune Function

Study shows long-term effects on infant immunity and lung function

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Employees of the Quarter Awards  

Crystal Stone, EOQ, Summer 2013  

Crystal Stone, Programmer in Information Technology (IT), was named EOQ Summer 2013. She has shown outstanding contributions to assist, collaborate, educate, and support the IT needs of all employees at the Primate Center. Co-workers note that she is unfailingly cheerful and positive even when dealing with several demands at one time. In addition to a great attitude, Crystal is efficient, quick to respond to issues, highly organized, and works hard. It is impressive how much she accomplishes in a day, but not surprising given her willingness to stay as late as needed to get a task completed. Crystal's skills and knowledge in IT business information and in her extra efforts to provide excellent customer service at the Center are noteworthy. For those of us that are not as 'tech savvy', Crystal always understands our question, gives great advice on options, and explains the technology, leaving us with a sense of knowledge and better understanding.

Lindsay Tatum, Staff Research Associate in the Brain, Mind, and Behavior Unit, has received special recognition for her outstanding work being named EOQ for Fall 2013. She frequently takes time out of her very busy schedule to cheerfully and enthusiastically give visitors a thorough, accurate, and entertaining tour of the center. Her presentations are knowledgeable and engaging, always striving the right balance of science and personal stories about the animals, and visitors come away with a very positive view of the CNPRC. Lindsay provides high school and college visitors with interesting insights into animal care, management, training methods, research projects, and careers. She has a special talent of being great with people and animals alike – knowledgeable and friendly with the people, and upbeat and calm in working with the animals.

“Lindsay adds a whole new and exciting dimension to tours for our visitors. She has been an invaluable help to introducing more people to the work we do here at the CNPRC.”  Kathy West

Wildfire, cont’d from page 1  

Numerous human studies have shown that when children are exposed to PM early in life, there is a persistent negative effect on lung function that is retained at maturity. The biologic mechanism of this effect, however, is not known. There is also no data available on the impact of air pollutant exposures on the functional status of immunity in human infants and school-age children. To address these gaps in our understanding of the effects of air pollutant exposure during early life, Lisa Miller, PhD, CNPRC Respiratory Diseases (RD) Unit, led a research project entitled “Persistent Immune Effects of Wildfire PM Exposure During Childhood” that was funded by the California Air Resources Board. Also on the project were Drs. Ed Schelegle and Candice Clay (RD), and John Capitanius (Brain, Mind, and Behavior Unit).

The primary objective of this study was to determine the early life impact of air pollutant exposure on immune parameters that modulate responses to infections disease and contribute to lung function decline.

“These animals were breathing the same air that we were breathing, so from a health point of view, it’s very significant,” said Dr. Miller.

The research team compared immune parameters in smoke exposed animals and in a group of animals born during the same months the following year during which there were no wildfires, by analyzing small, peripheral blood samples. Both groups of animals also completed a series of lung function tests. The tests were similar to those that a human child would have a doctor’s office visit.

All of the animals were studied when they were three years of age (similar in maturity to a young adolescent human), and the sample collection did not affect the long-term health of the animals. This Periodically evaluate the group of exposed animals over their lifetimes.  

This study showed that fine particle pollution influences the branch of the immune system that combats infectious disease. Several parameters of immune system function that help protect the body from bacterial infection were found to be reduced in smoke exposed animals compared to control animals. This suggests that these individuals are more susceptible to infectious diseases, which may persist into adulthood. Unexpectedly, investigators also found a link between reduced immune system function and abnormalities in lung function, particularly in female animals.

The results also indicated that infancy is a highly sensitive window of susceptibility, during which high PM2.5 exposures may adversely influence development of the innate immune system, and adversely affect development of lung function. Infancy may be associated with increased vulnerability to high levels of air pollution exposure because of the rapid lung and immune system development that occurs during these first months of life.

The evaluation of this outdoor rhesus monkey colony has provided a unique opportunity to investigate the long-term impact of environmental exposures on overall health. The researchers intend to continue their research on the two groups of monkeys throughout their lives to see if the adverse immune and lung function impacts persist.

The study is timely given scientists’ predictions that climate change will increase the frequency and intensity of wildfires. At the US Forest Service, the effect of wildfire smoke on the human health is a serious area of study, said Andrej Bytnerowicz, a Forest Service ecologist.

The issue has become more pressing because of the environmental changes due to climate change. “With changing climate there is a higher potential for catastrophic fires,” Bytnerowicz said. “And this year may be a really bad one with the almost lack of snow in the Sierra Nevada. These conditions will be predisposing for potential fires.”

The agency is looking to use more prescribed blazes as a way to prevent catastrophic fires by reducing the amount of fuel available, he said. However, prescribed fires also add particulate matter to the region’s air. “We do not know yet if that would prevent us from using prescribed fires as a tool,” Bytnerowicz said.
primate psychology and health, he was selected as the American Society of Primatologists' "Distinguished Primatologist for 2012".

AAAS is an international, non-profit organization with the goals of promoting cooperation among scientists, defending scientific freedom specifically, responsibility, and supporting scientific education and science outreach for the betterment of all humanity. It is the world's largest and most prestigious general scientific society, with more than 125,000 individual and institutional members, and is the publisher of the well-known and prestigious scientific journal Science.

Dr. Capitanio will be recognized for his outstanding career and receive the Distinguished Primatologist Award. He is the fourth recipient of this honor, following Dr. Joe Simmons, who received the award in 2004, and Dr. Joe Anderton, who received it in 2008.

Dr. Capitanio has been working in the field of primate psychology and health for over 30 years. He has conducted extensive research on the behavior and cognition of nonhuman primates, contributing to our understanding of their complex social structures and communication systems. His work has been recognized with numerous awards and honors, including the Distinguished Primatologist Award.

Yee receive honorary membership

Yee receives honorary membership

Honorary Awarded Membership

In October 2013, at the Association of Primatologists (APVs) meetings in Cambridge, Maryland, JoAnn Swenson was awarded the Honorary Award at the CNPRC Pathogen Detection Laboratory. This award is given to individuals who have made significant contributions to the field of nonhuman primate infectious disease testing, and JoAnn Swenson has been a leader in this area for many years.

The APVs, whose membership consists of veterinarians concerned with the health, care and welfare of nonhuman primates, provides a mechanism by which primate veterinarians may collectively on issues relating to nonhuman primates; and to promote fellowship among primate veterinarians.
**Fish oil may prevent negative impacts of high-fat diet**

**Omega-3s could prevent metabolic syndrome**

* This study, which demonstrates the beneficial effects of fish oil in a nonhuman primate model, adds a significant understanding of nutrition that is applicable to human health.

Andrew Bremer (Vanderbilt University) conducted a study at the CNPRC to shed light on why these two dietary factors might be important in metabolic syndrome risk. They studied what happens when rhesus monkeys fed a fructose-rich diet are also given fish oil supplements.

The researchers would like to conduct additional studies to determine the physiologic basis of these effects, and whether these metabolic effects are also seen in humans.
Research Highlights

Brain, Mind, and Behavior Unit

Physiological similarities with mate attachment and drug addiction in a monogamous species

Opioids, such as morphine, are among the world’s oldest known drugs. In primates, opioids are also naturally occurring pharmaactive chemicals that act with similar pharmacological effects as morphine and other opiate drugs, and involve the same neural systems involved in addiction. Opioids work by binding to proteins called opioid receptors, which are found primarily in the central and peripheral nervous system and the gastrointestinal tract.

The role of opioid receptors in human and nonhuman primate infant-mother attachment has been well established with past studies. Morphine, a preferential mu opioid receptor agonist, has been shown to decrease separation distress vocalizations and also lessens physical contact between infant and mother.

However, there is little research on how opioid receptors are involved in adult primate attachment.

At the CNPRC, Ben Ragen, MA, a doctoral candidate in the Brain, Mind, and Behavior Unit used monogamous tamarin monkeys (Callicebus cupreus) to explore the role of opioid receptors in the behavioral and physiological components of pair-bonding (Ragen et al, “Presence of a pair-mate regulates the behavioral and physiological effects of opioid manipulation in the monogamous tamarin monkey (Callicebus cupreus),” Psychoneuroendocrinology, 38:2448-2461, 2013).

Animals received one of four treatments: morphine, the opioid agonist naloxone, a neutral vehicle, or a disturbance control, and were then filmed with or without their pair-mate for one hour. The video sessions were scored for social and non-social behaviors. Peripheral blood samples were taken before and after experimental sessions and plasma was assayed for cortisol, oxytocin, and vasopressin.

Results demonstrated that for male tamarin monkeys, being with their female pair-mate regulated their opioid system. In particular, blocking the mu opioid receptor with naloxone caused an increase in cortisol, which was attenuated by the presence of the pair-mate. Ragen’s next step has been to map the opioid receptors in tamarin monkeys. He is interested in whether or not being in a pair-bond alters opioid receptor binding.

These findings further our understanding of the neurobiology of social attachment and addiction and how having a partner significantly decreases the chances of drug relapse.

‘Banks and Monkeys Are Two Sides of the Same Coin’

A fascinating collaboration was recently conducted between disparate interests: the CNPRC, UC Davis Department of Statistics and Department of Economics, the International Institute for Human-Animal Networks, and the Department of Population Health & Reproduction at the School of Veterinary Medicine.

Monkey societal collapse as a model for financial collapse: What do the behavior of monkeys in captivity and the financial system have in common? Dr. Brenda McCoy, Core Scientist in Brain, Mind, and Behavior, and Program Head of Behavior Management, and Dr. Brianne Beisner, CNPRC & SVM Project Scientist, collaborated on a publication that addressed this question in the International Journal of Forecasting (e-pub Jan. 2, 2014, “Computing systemic risk using multiple behavioral and keyword networks: The emergence of a crisis in primate societies and banks”), H. Fushing, O. Jordi, B. Beisner, and B. McCoy.

Using monkey societal collapse as a model for systemic risk assessment in human populations, such as financial collapse, the authors propose that tools developed to predict instability in monkeys’ social systems can provide an early warning system of an impending crisis in human societies.

Studying the outdoor-housed rhesus macaques at the CNPRC, the team applied tools to determine social systems, which were observed under both stable and unstable states or phases. Interestingly, these primate social systems have many points of commonality with the architecture of a banking system.

The West Coast Metabolomics Center (WCMC) offers technological windows to observe disease pathways. The funding of the WCMC — which was one of only three such core facilities initially funded by the National Institutes of Health (NIH) in September 2012 (the total has since increased to five) — by the UC Davis CA is driven by recent advances in metabolomics research. Housed within the Genome Center on the Davis campus, the WCMC is a consortium of eight research groups (UC Davis, UC San Diego, Stanford, UC Berkeley, UC Santa Cruz, UC Irvine, and UC San Francisco) supported by a combination of five nuclear magnetic resonance instruments and advanced statistical software to process highly complex data.

The WCMC also has an Outreach and Promotional Core that includes educational offerings and a pilot program co-led by Lars Bengtberg, director of the UC Davis CTSC, and Alice Tarantal, director of the CTSC Pilot Translational and Clinical Studies Program and Translational Technologies, Methodologies and Resources Program. This past spring, in collaboration with the UC Davis Center for Global Health, and the UC Davis School of Medicine, the WCMC reviewed and awarded pilot awards of up to $50,000 in metabolomic services for clinical and translational research studies. The pilot projects funded are focused on enriching existing human cohort or animal model studies, and supporting metabolomics research for new or ongoing studies.

Vaccine Fends Off Virus That Strikes Weak Immune Systems

Excerpt from: California Air Resources Board, ‘West Coast Metabolomics Center’

A UC Davis team has received a $4.4 million grant from the California Institute for Regenerative Medicine (CIRM) to develop a stem cell-derived therapeutic to narrow the gap between those with a weakened immune system — who are vulnerable to infections — and those who have recovered.


CIRM funds UC Davis tissue-engineering research

Excerpt from: UC Davis Health System

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The grants will fund a study of an ex vivo lung perfusion device from Dr. Thomas Beisner’s lab at UC Davis. The device is designed to help scientists treat patients suffering from the critical narrowing of the upper windpipe (trachea) and lower voicebox (larynx). The device will refining and deliver ex vivo perfusion techniques as well as determine the fate of stem and progenitor cells for tissue-engineering airway implants. Fundamentally establishing the safety and efficacy of these techniques could allow a new transfusion treatment for patients who are medically underserved, said Dr. Tarantal, who is also Reproductive Sciences and Regenerative Medicine Unit leader at the UC Davis California National Primate Research Center and serves as associate director of the university’s Stem Cell Program.
I n vivo imaging techniques with sufficient sensitivity to detect small quantities of cells are needed to determine the safety and efficiency of stem/progenitor cell therapies for the treatment of human disease. A crucial gap in stem cell research is the need to improve detection, and to ensure that images can accurately identify transplanted cells at a given anatomical location. Nuclear medicine techniques, particularly PET, have much higher sensitivity than magnetic resonance imaging (MRI), and can provide three-dimensional quantitative images. Outcomes with PET can also be translated from primate models to humans since many of the quantitative images. Outcomes with PET can also be particularly PET, have much higher sensitivity than magnetic ensure that images can accurately identify transplanted cells at a given anatomical location. Nuclear medicine techniques, particularly PET, have much higher sensitivity than magnetic resonance imaging (MRI), and can provide three-dimensional quantitative images. Outcomes with PET can also be translated from primate models to humans since many of the techniques tested, the 89Zr immunocugenate was found to be the most efficient in identifying engrafted cells. Tarantal AF, Lee CCI, Kukis D, and Cherry SR. Radiolabeling human peripheral blood stem cells for positron emission tomography (PET) imaging in young rhesus monkeys. PLoS One 8:e77148, 2013. PMCID: PMC3789702.

12th Annual Gene Therapy Symposium for Heart, Lung, and Blood Diseases

The NHLBI 12th Annual Gene Therapy Symposium for Heart, Lung, and Blood Diseases (A, Tarantal, PI) was held November 20-22, 2013 in Sonoma, CA. The intent of these annual scientific symposia is to provide a novel setting for the dissemination and exchange of new ideas and research findings by bringing together trainees and investigators at all career levels that do not typically interact at other meetings. Presentations focus on unpublished works-in-progress, cutting edge technologies, and key thematic issues over two days of presentations. The focus topic this year was “Tolerance and Immune Modulation”, a very timely topic in the gene therapy field.

The Keynote Speaker, Katherine A. High, MD (Children’s Hospital of Philadelphia) presented on: “Immune Responses to AAV Vectors: Overcoming Barriers to Successful Gene Therapy”. During the first day there were presentations on viral and nonviral vectors for gene transfer by Drs. R. Jude Samulski (University of North Carolina at Chapel Hill), Michael C. Holmes (Sangamo BioSciences, Inc.), and Paloma H. Giangrande (University of North Carolina at Chapel Hill), and Michael C. Holmes (Sangamo BioSciences, Inc.). The second day concluded with a session on “Practical Strategies” for immune modulation presented by Dr. Roland Herzog (University of Florida).

The California National Primate Research Center has unique and specialized resources and Core Scientists with extensive expertise available to facilitate your research using nonhuman primates. Nonhuman primates provide a translational model that faithfully recapitulates many aspects of human physiology and behavior. This resource and internal infrastructure can provide a distinct advantage when considering research questions that will have direct application to human health and disease.

The CNPRC offers complete research services to facilitate nonhuman primate research including GLP studies. Highlights of the services offered are as follow:

- Complete nonhuman primate research, veterinary, and behavioral assessment services
- Pathology services
- Inhalation exposure services
- In vivo and microscopic imaging
- Endocrine services
- Immunology services
- Pathogen detection services
- Biomedical informatics service

These highlighted areas of expertise are a part of the larger UC Davis campus which provides a broad and comprehensive offering of research services that can be leveraged to facilitate nonhuman primate studies.

Research Highlights

Regenerative Medicine

Improving detection and accuracy in stem cell research

Techniques. This method was also adapted to radiolabel and track transplanted renal precursor cells differentiated from human embryonic stem cells in vivo [2012]. The overall goal of this recently conducted study was to explore a new radiolabeling method for human peripheral blood stem cells as a prototype population, and utilized the established rhesus xenograft model of human hematopoietic stem cell transplantation. In these studies, this team investigated radioactive copper (64Cu) and zirconium (89Zr) to a new technique that targets the cell surface instead of using an internalized agent. 89Zr provides the opportunity to monitor cells for longer time periods when compared to 64Cu. The primary objectives were to effectively synthesize the radioimmunonjugates, to test the safety and efficiency of radiolabeling the cells, and to evaluate the ability to identify engrafted cells with PET imaging. Of the approaches tested, the 89Zr immunonjugate was found to be the most efficient in identifying engrafted cells.

The CNPRC invites inquiries regarding access to services and the expertise available.

Accessing exceptional research opportunities at the CNPRC

New Respiratory Disease Center will expand and complement capabilities

To access these valuable resources, we ask that you follow these minimum time frames and use our single point of contact (SPOC) to make your access to our Research Services resources as easy as possible:

- 6 weeks or more prior to the application deadline: Contact Jenny Short (SPOC) at 530-752-7169 or through email at jsjhort@ucdavis.edu to discuss the project feasibility. If feasible, complete the CNPRC Pre-proposal Request Form.
- 4 to 5 weeks prior to the application deadline: Investigator receives notification of Research Advisory Committee (RAC) approval and Research Services begins working on the animal budget.
- 2 weeks prior to the application deadline: Submit grant/contract proposal to CNPRC Grants and Contract Management for the CNPRC Director’s approval. Allow two working days for review and approval.
- 10 days prior to the application deadline: NIH proposals must be finalized to be sent electronically to UC Davis Sponsored programs. Non-NIH proposals have a similar deadline, however an electronic submission may not be required.

It is also expected that you will contact and work with a Core Scientist in this process. If you need assistance, we will put you in touch with an appropriate scientist.

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Research Disease Center at the CNPRC

The recently completed Respiratory Disease Center will further expand research capabilities and develop the scope of collaborative projects that can be conducted at the Center. See page 1 for more details.
Reproductive Sciences and Research Highlights

Improving detection and accuracy in stem cell research

In vivo imaging techniques with sufficient sensitivity to detect small quantities of cells are needed to determine the safety and efficacy of new stem/progenitor cell therapies for the treatment of human disease. A crucial gap in stem cell research is the need to improve detection, and to ensure that images can accurately identify transplanted cells at a given anatomical location. Nuclear medicine techniques, particularly PET, have much higher sensitivity than magnetic resonance imaging (MRI), and can provide three-dimensional quantitative images. Outcomes with PET can also be translated from primate models to humans since many of the radiotracers are currently used in the human clinical setting.

Prior studies by this team reported methods for radiolabeling stem and progenitor cells with radioactive copper-64. These studies showed that a minimum of 2.5x10^4 CD34+ stromal cells (4.4 pCi/cell) could be detected, and that each cell type had a different level of sensitivity to the radiolabeling technique. This method was also adapted to radiolabel and track transplanted renal precursor cells differentiated from human embryonic stem cells in vivo [2012]. The overall goal of this recently published study was to explore a new radiolabeling method for human peripheral blood stem cells as a potential tool in the establishment and utilization of a xenograft model of human hematopoietic stem cell transplantation. In these studies, this team investigated radioactive copper (64Cu) and zirconium (89Zr) using a new technique that targets the cell surface instead of using an internalized agent. 89Zr provides the opportunity to monitor cells for longer time periods when compared to 64Cu. The primary objectives were to effectively synthesize the radioimmunoconjugates, to test the safety and efficiency of radiolabeling the cells, and to evaluate the ability to identify engrafted cells with PET imaging. Of the approaches tested, the 89Zr immunocugnate was found to be the most efficient in identifying engrafted cells.

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Accessing exceptional research opportunities at the CNPRC New Respiratory Disease Center will expand and complement capabilities

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Nonhuman primates provide a translational model that faithfully recapitulates many aspects of human physiology and behavior. This resource and internal infrastructure can provide a distinct advantage when considering research questions that will have direct application to human health and disease.

The CNPRC offers complete research services to facilitate nonhuman primate research including GLP studies.

Highlights of the services offered are as follow:

• Complete nonhuman primate research, veterinary, and behavioral assessment services
• Pathology services
• Inhalation exposure services
• In vivo and microscopic imaging
• Endocrine services
• Immunology services
• Pathogen detection services
• Biomedical informatics service

These highlighted areas of expertise are a part of the larger UC Davis campus which provides a broad and comprehensive offering of research services that can be leveraged to facilitate nonhuman primate studies.

Respiratory Disease Center at the CNPRC

The recently completed Respiratory Disease Center at the CNPRC will expand and complement existing research capabilities and develop the scope of collaborative projects that can be conducted at the Center. See page 1 for more details.
Research Highlights

Brain, Mind, and Behavior Unit

Physiological similarities with mate attachment and drug addiction in a monogamous species

Opioids, such as morphine, are among the world’s oldest known drugs. In primates, opioids are also naturally produced by neurons that act with similar pharmacological effects as morphine and other opiate drugs, and involve the same neural systems involved in addiction. Opioids work by binding to specific receptors found primarily in the central and peripheral nervous system and the gastrointestinal tract.

The role of opioid receptors in human and nonhuman primate infant-mother attachment has been well established with past studies. Morphine, a preferential mu opioid receptor agonist, has been shown to decrease separation distress vocalizations and also lessen physical contact between infant and mother.

However, there is little research on how opioid receptors are involved in adult primate attachment.

At the CNPRC, Ben Ragen, MA, a doctoral candidate in the Brain, Mind, and Behavior Unit used monogamous titi monkeys (Callithrix cupra) to explore the role of opioid receptors in the behavioral and physiological components of pair-bonding (Ragen et al., “Presence of a pair-mate regulates the behavioral and physiological effects of opioid manipulation in the monogamous titi monkey (Callithrix cupra)”, Psychoneuroendocrinology, 38:2448-2461, 2013).

Animals received one of four treatments: morphine, the opioid antagonist naloxone, a neutral vehicle, or a disturbance control, and were then filmed with or without their pair-mate for one hour. The video sessions were scored for social and non-social behaviors. Blood samples were taken before and after experimental sessions and plasma was assayed for cortisol, oxytocin, and vasopressin.

Results demonstrated that for male titi monkeys, being with their female pair-mate regulated their opioid system. In particular, blocking the mu opioid receptor with naloxone caused an increase in cortisol, which was attenuated by the presence of the pair-mate. Ragen’s next step has been to map the opioid receptors in titi monkeys—whether or not being in a pair-bond alters opioid receptor binding.

These findings further our understanding of the neurobiology of social attachment and addiction and how having a partner significantly decreases the chances of drug relapse.

Vaccine Fends Off Virus That Strikes Weak Immune Systems

California Primate Research Center (CNPRC) Associate News Blast: 12/19/2013

An experimental vaccine modeling human cytomegalovirus (HCMV) infection - which can endanger developing fetuses, transplant recipients, patients co-infected with HIV and other viruses and those with a weakened immune system -proved safe and effective in research conducted at the CNPRC using rhesus monkeys.

A team of scientists from the CNPRC, UC Davis Center for Comparative Medicine, and the University of Alabama, Birmingham, led by Dr. Andrew Bremer, PhD, CNPRC Infectious Diseases Core Scientist, developed the first-of-its-kind approach to preventing HCMV infection inducing broader immunological protections. The publication describing the research is entitled: “Vaccination Against a Virally-Encoded Cytokine Significantly Restricts Viral Challenge”, November 2013, Journal of Virology.

Fish oil may prevent negative impacts of high-fructose diet

Excerpt from: January 2014 Media Alert: The Journal of Nutrition

“...establishes a constellation of factors (such as high fructose consumption, metabolic syndrome and elevated blood lipids) that increase a person’s risk for heart disease and other serious health problems. One factor thought by some to be involved in the recent rise in metabolic syndrome is the overconsumption of foods and beverages sweetened with sucrose (table sugar) or high-fructose corn syrup. To shed light on this question, Drs. Peter Havel (UC Davis) and Colin West, of the University of Minnesota, performed at the CNPRC study which found that when monkeys fed a fructose-rich diet are also given fish oil supplements, (see pg for more information).

In the News

‘Long-term impact of air pollutants’

Excerpt from: California Air Resources Board
January 7, 2014

An AIRB-funded study at the California National Primate Research Center showed for the first time that exposure to high levels of fine particle pollution at infancy adversely influences development of the branch of the immune system that combats infectious diseases, and adversely affects the development of lung function.

The study was the product of unusually high levels of fine particle pollution in Northern California as the result of about 2,000 wildfires in June 2008. Over a period of 10 days levels of PM2.5 at the UC Davis campus were recorded at 50 to 60 micrograms per cubic meter. (See this issue, pg for more information.)

CIRM funds UC Davis tissue-engineering research

Excerpt from: UC Davis Health System
December 12, 2013

A UC Davis team has received a $4.4 million grant from the California Institute for Regenerative Medicine (CIRM) to develop a stem cell-derived airway organ to treat a difficult, life-threatening problem known as severe airway stenosis.

With the grant, Peter Belafsky, professor of otolaryngology and principal investigator for the new study, and Alice Tarantal, professor of pediatrics and cell biology and human anatomy, and the project’s co-principal investigator, will work to develop and refine airway airway organ xenotransplantation techniques as well as determine the fate of stem and progenitor cells for tissue-engineering airway implants. Firmly establishing the safety and efficacy of these xenotransplantation techniques as well as determining the fate of stem and progenitor cells for tissue-engineering airway implants is crucial to the goal of xenotransplantation for treatment of human patients,” said Tarantal, who is also Reproductive and Developmental Biology Program Dean and UC Davis Professor of Molecular and Medical Genetics.

The CIRM study is a collaboration with the UC Davis California National Primate Research Center and serves as associate director of the university’s Stem Cell Program.
Focus on Service

By Randy Bruce

From the 1960s to the 1980s, if you needed a pair of scrubs or medical supplies, you headed to the lab building room where Larry Hicks would meet you at the Dutch door, and fetch what was needed from the cramped and confined housing where all supplies, uniforms, and scrubs for the entire center were stored. Later Donna Dungan was hired, and the “Stockroom” was moved to TB 177. Randy Bruce was brought on board to run the Stockroom in 1993, and Donna was moved to the business office as a Purchasing Specialist.

At that time, all Stockroom purchase transactions were hand written on a log sheet to later be interpreted and entered into a system that would process recharges. Randy immediately brought the Stockroom up to date by redesigning the system to computerize system that would process recharges. Randy Bruce was brought in to make the transition, and the entire process. Randy has found memories of TB177, which

Upcoming Retirements
187 years of CNPRC knowledge will be lost in June

With the June 2014 retirement of key CNPRC personnel, we will lose the expertise, experience, and personal knowledge that these long-time outstanding employees bring to their jobs.

Please wish the following people best wishes in their retirement (Number of years that they have served at the CNPRC):

- Dallas Hyde, 35 years
- Ann Rosenthal, 25 years
- David Robb, 40 years
- Janice Steisand, 25 years
- Susan Taylor, 38 years
- Julie Willis, 29 years

Research Highlights

Development of infant influenza vaccine: importance of the monkey model

For pediatric populations, influenza remains a significant health threat. The Center for Disease Control estimates that 20,000 children under the age of five are hospitalized each year due to influenza-related illnesses, and during the 2009 H1N1 pandemic, children showed increased risk of severe outcomes and a death rate that was higher than that of seasonal influenza from previous years. The 2013 – 2014 influenza season is developing similarly to the 2009 pandemic where the H1N1 virus killed 281,000 people worldwide. By February 2014, 147 people had died during this flu season from H1N1 virus in California, and there were 37 pediatric deaths nationwide.

Despite the global burden of influenza, there are currently no vaccines for children less than 6 months of age and no antiviral drugs that are approved for use in children younger than one year of age.

The immunological basis for increased frequency and enhanced severity of respiratory virus infection observed in early life is poorly defined. Influenza-like immune responses when compared to adults, which may result in higher respiratory viral infection levels. Research suggests that a severe viral infection in early life can permanently affect lung growth and function, increasing concerns for long-term health.

Numerous studies have shown the interconnected maturation of pulmonary and immune systems in humans is distinct from that of rodents. However, mechanisms underlying the development of immune competency and animal survival in the human infant lung are not well understood because of obvious challenges and ethical concerns in studying pediatric patients.

Fortunately, infant rhesus macaques like those at the CNPRC make an ideal model that closely mirrors that of human infants – anatomically, developmentally and immunologically. Therefore, using a nonhuman primate species such as the rhesus monkey is critical to address translational questions associated with development of lung immunity, and work towards creating a vaccine for human infants less than 6 months of age.

Over the past 30 years, the CNPRC has established the usefulness of the rhesus macaque as a model of respiratory development and disease. The Center has unique capabilities that make it distinctly positioned to be the only facility that can conduct infant respiratory studies. It is the only NPRC with an Inhalation Exposure Facility, which has established extensive capabilities for pulmonary function testing in nonhuman primates, and has characterized and defined the pulmonary airway tree for the infant and adult rhesus monkey. Also at the Primate Center are the Computational Imaging Core and the Immunology Core, with remarkable expertise to support research with consultation in experimental design, sample collection, and data analysis.

A post-doctoral researcher in the Respiratory Diseases Unit, Dr. Candice Clay is collaborating with the Infectious Diseases Unit to pursue a goal of improving infant immunity and to test the safety of vaccines and antiviral drugs in infant nonhuman primates. She presented preliminary results from her current research to the Animal Care and Research Services staff on November 21, 2013. Her study on infant influenza will be published in the Journal of Virology in early 2014 (“Enhanced viral replication and modulated innate immune responses in infant airway epithelium following H1N1 infection”).

Dr. Clay recently completed comparative studies in primary airway epithelial cell cultures derived from infant and adult rhesus monkeys with pandemic influenza A/H1N1 strain – demonstrating for the first time that infant rhesus monkeys are readily susceptible to pandemic H1N1 infection – and assessed the in vivo implications of influenza infection by investigation of pulmonary and systemic responses following inoculation.

CNPRC research staff played important roles in the success of the study, including creatively inventing novel sample collection methods; Paul Michael Sosa, Research Services, created an automated “netipot” to make sample collection easier on the animals and staff. The data collection for this research involved noninvasive collection of nasal wash samples from infants infected with H1N1, clinical evaluations and blood draws were conducted, and respiratory tract, tracheal samples, and nasal swab samples were collected.

To directly compare innate immune responses for infant and adult lung, rhesus monkey primary airway epithelial cell cultures were infected with pandemic influenza A/H1N1 in vitro. Virus replication, cytokine secretion, and type I interferon (IFN) pathway PCR array profiles were evaluated for both infant and adult cultures.

The overall findings from Dr. Clay’s study are consistent with the known enhanced susceptibility of respiratory virus infection in pediatric populations. The results suggest that pulmonary immunity is intrinsically different in the infant as compared to the adult. The infant’s immature pulmonary cell immunity may contribute to the limited efficacy of host defense during infancy and early childhood.

These results support future studies that may ultimately translate into novel approaches to enhance efficacy of pediatric vaccines for respiratory pathogens.
Fish oil may prevent negative impacts of high-fructose diet

Omega-3s could prevent metabolic syndrome

O

Besity and elevated blood lipids (fatty acids and cholesterol) are common health problems in the United States, and are part of a group of metabolic risk factors that increase a person’s risk of heart disease, diabetes, stroke, as well as many other serious health problems.

A person has a condition called metabolic syndrome if they have three or more risk factors, including the two mentioned above: a large waistline, high triglyceride levels, low HDL cholesterol, high blood pressure, and high fasting-blood sugar.

Because the risk of developing metabolic syndrome is closely linked to being overweight, some experts predict that metabolic syndrome may soon overtake smoking as the leading predictor of heart disease in the United States.

There are many contributing causes to this recent rise in metabolic risk factors, but experts consider a major reason to be the overconsumption of foods and beverages sweetened with sucrose (table sugar) or high-fructose corn syrup (HFCS), which in the US is a common ingredient in many processed foods and a sucrose replacement sweetener.

Excessive intake of fructose (fruit sugar that is contained in both sucrose and HFCS) can increase concentration of triglycerides in the bloodstream. Exacerbating the negative effects of high fructose consumption can be an inadequate intake of the omega-3 fatty acids (especially those found in oily fish and fish oil supplements).

A research team led by Drs. Peter Havel (UC Davis) and Andrew Bremer (Vanderbilt University) conducted a study at the CNPRC to shed light on whether these two dietary factors might be important in metabolic syndrome risk. They studied what happens when rhesus monkeys fed a fructose-rich diet are also given fish oil supplements.

This study, which demonstrates the beneficial effects of fish oil in a nonhuman primate model, adds a significant understanding of nutrition that is applicable to human health.

Recently published in the Journal of Nutrition, the paper was entitled: “Fish Oil Supplementation Ameliorates Fructose-Induced Hypertriglyceridemia and Insulin Resistance in Adult Male Rhesus Macaques” (A.A. Bremer et al, January 2014).

The research was conducted at the Primate Center in healthy, adult male rhesus monkeys who were fed a fructose-rich diet for 6 months. Monkeys were simultaneously provided with daily “treats” containing either safflower oil (low in omega-3 fats) or the same amount of omega-3-rich fish oil.

At the beginning and end of the study, small blood samples were collected from each monkey. A glucose tolerance test was also conducted and showed how well the monkeys responded to insulin. As expected, consumption of the high-fructose diet resulted in elevated blood lipid levels and insulin resistance. Significantly, these effects were largely negated by consumption of the fish oil supplements.

The researchers would like to conduct additional studies to determine the physiologic basis of these effects, and whether these metabolic effects are also seen in humans.
T he American Society for the Advancement of Science (AAAS) has awarded the distinction of Fellow to Dr. John Capitanio, PhD, Core Scientist in the CNPRC Brain, Mind, and Behavior Unit. He was given this honor for his distinguished contributions to the understanding of individual variability in temperament and personality in nonhuman primates, particularly in how behavior and social processes contribute to physiological changes as they relate to significant health outcomes.

Dr. Capitanio continues to be recognized for his outstanding career and for making important and significant contributions to a diversity of fields in primatology, psychology, and human health. He has been highly interdisciplinary with expertise in a variety of areas including molecular biology, respiratory function, immunology, and neurobehavior, among others.

This latest honor adds to Dr. Capitanio's list of distinctions over the past two years. In June 2011, he was named a Fellow of the American Association for the Advancement of Science for his sustained and outstanding contributions to psychological science in the areas of molecular biology, respiratory function, immunology, and neurobehavior.

His work has been highly interdisciplinary with expertise in a variety of areas including molecular biology, respiratory function, immunology, and neurobehavior, among others. He has contributed to the understanding of the causes and consequences of nonhuman primate infectious diseases, and to promote fellowship among primate veterinarians.

Yee receives honorary membership

On October 13, at the Association of Primatologists (APV) meetings in Cambridge, Maryland, JoAnn Yee was awarded the9th such award in APV's history for her long term contributions to the CNPRC Pathogen Detection Laboratory, which was awarded an honorary membership for her instrumental role in the advancement of nonhuman primate infectious diseases testing, and introduced JoAnn as well-known to most of the association's members through past consultations and assistance with difficult diagnostic cases. "I am truly honored to receive this award because of the positive recognition it brings our Center and because it is a tribute to Dr. Nick Leonard and so many other colleagues who have taught me everything I know about monkeys."

The APV, whose membership consists of veterinarians concerned with the health, care and welfare of nonhuman primates, provides a mechanism by which veterinarians may collectively on matters relating nonhuman primates; and to promote fellowship among primate veterinarians.

**Publications**

Our research team has published extensively on the pathogenesis of simian immunodeficiency virus (SIV) infection in macaques and its potential relevance to human immunodeficiency virus (HIV) infection. We have also investigated the effects of environmental factors, such as temperature and humidity, on the immune system of nonhuman primates. Our studies have shown that these factors can influence the expression of immune responses and the development of disease.

We have also explored the effects of age and sex on the immune system and the risk of disease development. Our findings have highlighted the importance of considering these factors in the management of nonhuman primates and in the development of effective prevention strategies.

In addition, we have investigated the role of the microbiome in the development of disease and the impact of diet on the immune system. Our studies have suggested that the microbiome plays a critical role in the development of disease and that dietary interventions may be effective in modulating the immune response and reducing the risk of disease development.

We have also explored the role of the gut microbiome in the development of obesity and diabetes, and we have investigated the impact of dietary interventions on the gut microbiome and the development of these diseases.

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**Publications, cont’d**

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A successful “Baked Potato Fundraiser” raffle and lunch was held at the Primate Center on November 5th, raising more than $1,100 towards the Nicholas Lerche MPVM Scholarship. Thank you to the staff, faculty, and students at the CNPRC, CCM, and other affiliates who generously contributed to these funds. A special thanks goes to the members of the Staff Council, Pathogen Detection Laboratory, and Director’s Office for their food and gift basket donations.

Dr. Lerche was a very special part of the Primate Center and the MVPM program was important to him. This donation is a wonderful way to honor his memory.

New Animal Housing in Corn Crib
New South Colony housing (foreground) has increased room for the monkeys, is more functional for daily cleaning and upkeep, and more efficient for cleaning and those supplies are now available upon request. Contact Julie Willis to obtain the key to the supply closet.

Annual Pumpkins for Monkeys
The annual tradition of providing the outdoor colony-monkeys with Halloween pumpkins was carried on this year by staff volunteers from around the Center. Nine volunteers went to the Cool Patch Pumpkins farm in Dixon on November 4th and harvested as many pumpkins as they could fit into two vans. The monkeys enjoyed their fall treat, eating and playing with the fresh fruit.

Cleaning Supplies Available
Due to budget cuts, janitorial services are less frequent and staff are taking care of the general cleaning needs for lab office spaces. Miles Christensen led the drive to purchase cleaning supplies so that they would be available to people wishing to clean their own space, and those supplies are now available upon request. Contact Julie Willis to obtain the key to the supply closet.

Thank you for Supporting a Smoke-Free Campus!
Effective January 1, 2014, the Primate Center and all UCs join more than 1,100 colleges and universities nationwide by implementing a systemwide smoke & tobacco-free policy. Visit the UC system-wide Smoke and Tobacco Free website, utc tobaccofree.com, for information about tobacco cessation resources. Thank you for your support in making our campus and work environment smoke- and tobacco-free!

Conferences and Symposia
Faculty and students represent the CNPRC representing the Reproductive Sciences and Regenerative Medicine (RSRM) Unit: Dr. Mike McCune presented at the AIDS Vaccine 2013 meeting held October 7-10, 2013 at the International Convention Center in Barcelona, Spain. The presentation was entitled: “Protection against HIV: Vaccination to block inflammation rather than to prompt adaptive immunity”. Co-authors on the abstract and overheads included Drs. Dennis Hartigan-O’Connor (Core Scientist in the Infectious Diseases and RSRM Units) and Alice Tarantal (RSRM Unit).

Edgar Ochon, an undergraduate student in the UC Davis Biology Undergraduate Scholars Program (BUSP), completed a BUSP-Summer Honors project in the laboratory of Dr. Alice Tarantal, and was selected by the program to represent UC Davis at the Annual Biomedical Research Conference for Minority Students in Nashville Tennessee, November 13-16, 2013.

Dr. Alice Tarantal presented at the Department of Pediatrics Grand Rounds on December 13, 2013: “Nonhuman Primate Models for Translational Research and Preclinical Studies”.

Dr. Simon Cherry presented two invited oral presentations at the International Congress on Medical Physics, Brighton, UK, September 1-4, 2013 entitled: “Hybrid PET/MBI: QoP Validation” and “Cerenkov Luminescence from Radioisotopes: A New Tool for Imaging and Therapy”.

Dr. Cherry gave a keynote presentation at the Stanford University Department of Radiology Retreat, in September in Asilomar, California entitled: “QoP and More: Delivering Molecular Imaging Technologies to Under served Biomarkertargets”.


Representing the Infectious Diseases (ID) Unit: Roberto Barron, a doctor in ID, presented a poster entitled: “Modulation of the Helicobacter pylori Type IV Secretion System Function in Response to Adaptive Immune Pressure” at the International Workshop on Campylobacter, Helicobacter, and Related Organisms in Aberdeen, Scotland, September 15 – 17, 2013.

Dr. Jay V. Sohnick, MD, PhD, Core Scientist in ID, presented a poster entitled: “Taming the Host Inflammatory Response: Plasticity in Helicobacter pylori” at the Type IV Secretion System 8th Minisymposium: A Day on Infection Associated Diseases Forum of the ID in Braunschweig Germany, November 21, 2013.

Representing the Brain, Mind, and Behavior Unit: Brenda McCowan recently returned from Hong Kong where she gave an invited talk at the International Animal Welfare Symposium at the Centre for Animal Research at City University. The conference focused on human-monkey conflict in South, East and Southeast Asia. Dr. McCowan outlined the nature of this conflict and how tools developed from research on CNPRC’s large captive social groups of monkeys were used to evaluate and address this welfare and conservation issue. The title of the talk was: “Planet the Monkeys: Animal Welfare at the Human-Macaque Interface in South, East, Southeast Asia & Beyond”.

At the annual meeting of the Society for Neuroscience (SIN), in San Diego, California, November 2013, Dr. Melissa Bauman presented a poster entitled: “Endogenous hyposociality in juvenile macaque monkeys: A novel nonhuman primate model for autism treatment discoveries”. Co-authors on the poster were staff Gilda Mosadab, Jennifer Bozler, and Gemma Lopez.

Also at the SIN 2013 meetings, were doctoral students Ben Ragen who presented a poster entitled: “Mu and Kappa Opioid Receptor Binding in the Forebrain of the Monomogous Tit monkey (Cullecebus cupreus)” and Rebecca Larke, whose poster was entitled: “Flaunestin expression during development affects later social behavior in the prairie vole (Microtus ochrogaster)”.

Sara Freeman, post-doctoral student in BMI, presented two posters at SIN 2013 entitled: “Distribution of extravacuolar and vacuolar protein receptor binding sites in the brain of the socially monogamous tit monkey (Cullecebus cupreus)”; and “Oxytocin receptor expression in the rhesus macaque brain is restricted to the ventromedial hypothalamus, nucleus basalis of Meynert, and superior colliculus”.

At the SIN 2013 meetings, Dr. Tamara Weinstein’s poster was entitled: “The Presence of a Companion Alters Neural Responses to Group Separation in Rhesus Macaques (Macaca mulatta)”. Doctoral student Emily Rothwell presented a poster at SIN 2013, entitled: The role of dopamine D1-like receptors in pair-bond maintenance in monogamous tit monkeys (Cullecebus cupreus). She also presented a poster at the Society for Behavioral Neuroendocrinology 2013 in Atlanta, Georgia, June 23 – 26, entitled: The role of dopamine D1 receptors in pair-bond maintenance in monogamous tit monkeys (Cullecebus cupreus).”, and at the American Society of Primatologists 2013 meetings in San Juan, Puerto Rico June 19 – 22, where her poster presentation was entitled: The role of dopamine D1 receptors in pair-bond maintenance in monogamous tit monkeys (Cullecebus cupreus)”.At the annual meeting of the International Society for Developmental Psychobiology (ISDP), in San Diego, California, November 2013, Dr. Capitanio presented a poster entitled: “Assessing variation in infant rhesus monkeys (Macaca mulatta): A behavioral assessment program at the California National Primate Research Center”. Also authors on the poster were: Drs. Katie Hinds, Erin Kinzally, Daniel Gottlieb, and doctoral student Katie Chun.

One of the CNPRC’s newest researchers, Ben Ragen, presented a poster entitled: “A New Tool for Imaging and Therapy”.

Dr. John Capitanio gave an invited paper at a symposium in Göttingen, Germany, December 2013: “The role of dopamine D1 receptors in pair-bond maintenance. His talk was entitled: “Individual differences in sociability and health in rhesus monkeys: From gene expression to the social context”.

Staff Learn Life Saving Measures
Thanks to the Staff Council, Safety Officer, and Sona Santos, Recruitment Assistant, there were 2 CPR/AED classes held in October 2013. UC Davis’ Outdoor Adventures sent an excellent instructor and plenty of “CPR Annies” to instruct staff on life saving measures both with CPR and using an AED (Automatic External Defibrillator). The CNPRC is in the process of obtaining AEDs to be placed at strategic points throughout the Primate Center, and thanks to these classes a number of staff are now trained in using these devices.

Facility News
New Animal Housing in Corncobs
New South Colony housing (foreground) has increased room for the monkeys, is more functional for daily cleaning and upkeep, and more efficient for cleaning and those supplies are now available upon request. Contact Julie Willis to obtain the key to the supply closet.

CNPRC Newsline • Volume 14.1 • February 2014
Translational Research

Developing a new diagnostic test for TB
Roodgar shares his research with Congress

Speaking to the US Congress about the science conducted at the CNPRC is a unique and rare opportunity. In May 2013, Morteza Roodgar, DVM, PhD student under Dr. David Glenn Smith in the CNPRC Genomics/Molecular Anthropology Lab, met with US House Representatives John Garamendi, Doris Matsui, and Ami Bera. As well as US Senator Diane Feinstein in Washington DC. He was able to discuss the high-impact implications of his research, and how well positioned UC Davis is for translational research. “Having a medical school, veterinary school, primate research center and the important connecting role that the UC Davis Clinical and Translational Science Center (CTSC) provides cannot be underestimated,” Dr. Roodgar said. “That combination provides a unique opportunity for conducting translational biomedical research.”

Dr. Roodgar was chosen to represent UC Davis as part of the annual UC Day in DC, a government advocacy program sponsored by the UC Office of the President.

Working in collaboration with the CTSC, David Glenn Smith, PhD, CNPRC Core Scientist, and the CNPRC, Dr. Roodgar is developing a more efficient means of diagnosis for tuberculosis (TB), a crucial problem in human health that affects more than 2 billion people. “One-third of the human population worldwide is infected latently with the TB bacterium, and they don’t know it,” Roodgar explains. “They are carriers of tuberculosis but do not have clinical symptoms.

Dr. Roodgar decided on TB as the focus of his graduate work after a search for an infectious disease that was complex, afflicted humans with a variety of clinical presentations, and had the potential for animal to human transmission. His work focuses on identifying and exploring genetic biomarkers that might correlate with susceptibility to tuberculosis, using an important animal model of human TB, the nonhuman primate. A subsequent test of these biomarkers in rhesus macaques has shown promise, and Dr. Roodgar hopes to study human subjects eventually.

These biomarkers ultimately could be used to develop a new diagnostic test for TB – one that is more sensitive than the current Mantoux test (which was developed a century ago and is only 59.7 percent accurate in identifying TB-positive cases), and also able to identify latent infections. Latent TB infection is particularly problematic for people who become infected with HIV, because they will develop active tuberculosis due to the immuno-suppressive effects of HIV. Under these circumstances, treatment becomes more complicated.

With the goal of translating his research into a product with the potential of saving many lives, human and nonhuman alike, Dr. Roodgar recently completed a business fellowship with the UC Davis Graduate School of Management. In this program he gained insight about translational and commercialization prospects for the new TB test – yet another demonstration of Dr. Roodgar’s ability to parlay research into the effects of Bisphenol A on lung function, and developing pediatric influenza vaccines.

New Respiratory Disease Center will provide extraordinary opportunities for teamwork

The CNPRC has been a leader in understanding pulmonary development and function for more than 30 years. It has the distinction of being the only National Primate Research Center (NPRC) with an Inhalation Exposure Facility, with abilities to study airway biology and immunity, environmental air pollutants, pediatric pulmonary disease, and asthma. The CNPRC developed the first rhesus monkey model of adult and childhood asthma using a human allergen, which has given researchers the ability to test numerous biological mechanisms and new therapies.

More recently, the CNPRC has conducted research projects that include a diversity of cross-disciplinary and collaborative topics: experimentally establishing an association between early life exposure to tobacco smoke and long-term airway disease; discovering a link between temperament and asthma; and developing new links between environmental tobacco smoke and adverse effects on prenatal and neonatal lung development, cognitive function, and brain development.

Ongoing research includes: critical and current research into the effects of Bisphenol A on lung development; working to identify mechanisms that limit pediatric defenses against viruses and bacteria in the lung; and developing pediatric influenza vaccines.

The newly completed Respiratory Disease Center (RDC) at the CNPRC will further expand these capabilities and develop the scope of collaborative research projects that can be conducted at the Center. Researchers from the UC Davis School of Veterinary Medicine, UC Davis School of Medicine, the College of Engineering, and other NPRCs, as well as national and international investigators, will be able to take advantage of the advanced capabilities at the new RDC.

For information about conducting research at the CNPRC or the RDC, please contact Jennifer Shott at jshott@ucdavis.edu.

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