

VETERINARY INSTITUTE FOR REGENERATIVE CURES

VIRIC Express

2017-2018 EDITION

Pioneering Regenerative Medicine Cures for Animals and People



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Letter from *the Director*

Welcome to the 3rd Annual Veterinary Institute for Regenerative Cures (VIRC) Express Newsletter.

Time flies, as they say, and the past year has been incredibly productive. We focused on creating a business infrastructure to support industry-VIRC collaborations centered on our unique expertise in regenerative medicine products, protocols and clinical trials. We have developed the best practices for how to work with our industry partners. This infrastructure helps us to build our “translational pipeline”—meaning we can help our partners get their products tested for safety and efficacy and thus increase the likelihood of regenerative medicine therapies getting approved for animals and people. We cannot do this alone and as the number one Veterinary School in the nation...we offer one-of-a-kind assistance to industries focused on developing clinical trials in animals with naturally-occurring disease. We have learned a tremendous amount about defining our niche, marketing, and consulting, as well as providing quality service tailored to our partners’ needs. We will expand our capacities this year by reaching out to all of our faculty members at UC Davis to create a more inclusive document of our capabilities in research and clinical services available to industry partners. We are also establishing key academic alliances at partner institutions to facilitate multicenter clinical trials and shared protocols. Similar to our industry partnerships, these academic alliances expand our capacities to carefully design standardized therapies and enroll patients to improve animal health all over the United States.

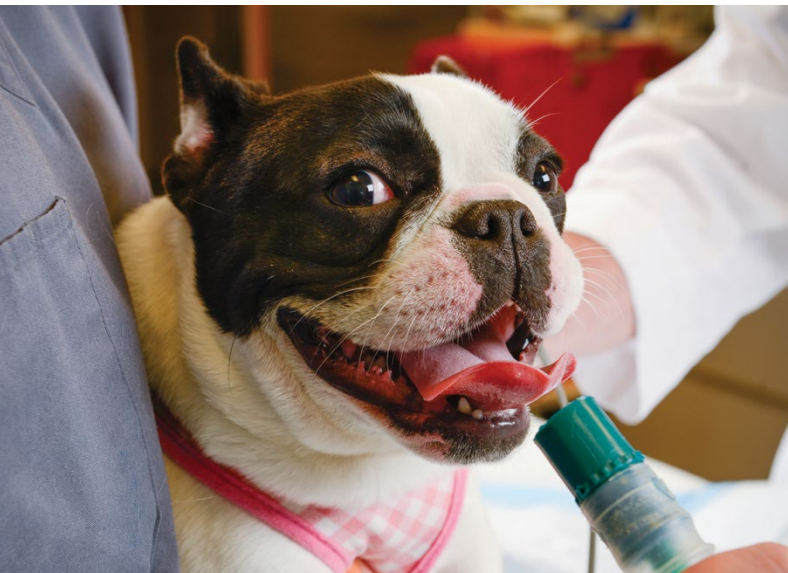
For the upcoming year, we have set our sights on generating more “friends of the program” who will consider supporting our work through philanthropy. Our work aligns with many of the strategic goals of the School of Veterinary Medicine and UC Davis broadly and we want to share our successes and

dreams with a new generation of donors. Your support of our program can be directed towards helping dogs, cats or horses with incurable diseases through direct engagement with our clinical trials program. We are working with significant diseases that affect both animals and people including spina bifida, severe oral inflammation, inflammatory brain disease (similar to some forms of multiple sclerosis), eye inflammation (such as recurrent uveitis in horses) and inflammatory bowel disease. In the coming year, we want to extend our work to diabetes and chronic kidney disease. Your support can help drive the basic and clinical research that moves novel therapies from the lab into our patients. To develop new, state-of-the-art initiatives, faculty need seed money to build the ideas and data that lead to large grants and successful programs. We are also educating the next generation of students in regenerative medicine- from undergraduates to Veterinary students to PhD students. These students are eager to explore research opportunities in the lab and your support can help. Finally, we hope to create an endowment that will sustain our institute for future generations of researchers, clinicians, and students to pioneer regenerative cures for animals and people.

We look forward to meeting with you and sharing our program, successes and opportunities. With your help, we will continue to establish ourselves as the premier Veterinary Regenerative Medicine Program. Thank you for all of your support.



Dr. Dori Borjesson
Director, VIRC



Become a Member



- VIRC members are pioneering regenerative medicine cures for animals and people.
- To learn more about becoming a member of the VIRC please visit: <http://www.vetmed.ucdavis.edu/virc/people/membership.cfm.cfm>
- Core and Affiliate memberships are available.

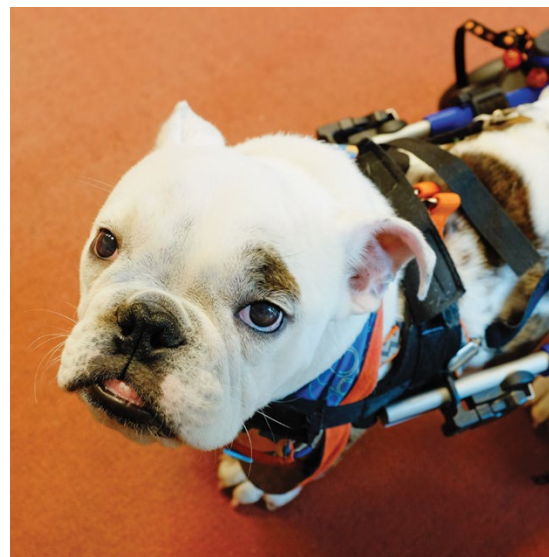
To make a donation to the VIRC, please contact Jason Legrand at jjlegrand@ucdavis.edu

Successes in Regenerative Medicine

The success of our program relies on the high impact research being performed by talented investigators who aim to cure patients of disease using regenerative medicine.

Feline Chronic Gingivostomatitis (FCGS): FCGS is a common, chronic immune-mediated oral disease in cats resulting in severe inflammation and pain. We have treated more than 30 affected cats using fat-derived stem cells. 71% of cats showed significant clinical improvement and many cats demonstrated complete disease cure. We continue to enroll cats in this study and recently initiated a multi-center clinical trial with Cornell University. We are also developing other clinical studies that involve determining the effectiveness of stem cell therapy in cats during different stages of FCGS. (Investigators: Drs. Dori Borjesson and Boaz Arzi)

Spina Bifida: Spina Bifida is the most common cause of lifelong childhood paralysis in the United States; approximately four children are born with this devastating defect every day. Spina Bifida is the result of incomplete closure of the neural tube which leads to an exposed spinal cord in newborns. Like humans, dogs are naturally affected with Spina Bifida. Unlike humans, there are no treatment options for these dogs and thus many are euthanized at birth. Dr. Aijun Wang (School of Medicine) in collaboration with Drs. Dori Borjesson and Beverly Sturges (School of Veterinary Medicine) have worked to develop a novel stem cell therapy to treat dogs with Spina Bifida. To date, 2 dogs have been treated with more being recruited as part of an ongoing clinical trial.



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Get Involved!

Just as with human patients, chronic inflammatory disease, spinal cord injury, heart disease, orthopedic disease and neural degenerative disorders can also affect animal patients leading to a poor quality of life and possibly even death. Regenerative medicine holds tremendous promise to reduce pain and suffering and eliminate disease. By promoting both stem cell biotechnology and tissue engineering, the VIRC is leading the way in developing novel therapeutics for animals and people. In order to realize the full potential of regenerative medicine in veterinary and human patients, assistance from individuals such as yourself, is needed and greatly appreciated. With your help, together we can strengthen the regenerative medicine infrastructure at the #1 ranked UC Davis, School of Veterinary Medicine, enable more animals to be treated in potentially life-saving clinical trials, inspire and educate students and support our basic and translational research efforts for several diseases.

It is our hope to change the face of regenerative medicine by treating patients both big and small. You can help by 1) making a donation (money, equipment, time), 2) getting the word out about our program, 3) volunteering at events and meetings, 4) organizing fundraisers or 5) helping to identify

patients for potentially life saving veterinary clinical trials. For those wishing to donate financial resources to the VIRC please see our Development Priorities below.

Education

- Graduate Student Support
- DVM Fellowship
- DVM Summer Research Fellowship
- Sponsor established K-12 diversity/outreach programs

Research

- Pilot Grant Program
- Bridge Grant Program
- Travel awards for students/trainees

Endowment

- Ensure financial sustainability of the VIRC
- Build infrastructure to promote success in research and education

To make a donation to the VIRC, please contact Jason Legrand at jjlegrand@ucdavis.edu.

Educating the next generation

of Regenerative Medicine Professionals: A Pipeline of Excellence

Regenerative medicine is poised to become the next great medical milestone for human and animal patients. Recognizing the need to educate and train the next generation of medical professionals and scientist, the Veterinary Institute for Regenerative Cures (VIRC) has developed several opportunities to guide educational progress. This includes: K-12 outreach and diversity programs, scientific seminars, undergraduate courses and case-based teaching in the Veterinary curriculum.



Dr. David Simpson
Associate Director,
VIRC

K-12 Outreach and Diversity:

The VIRC works directly with the School of Veterinary Medicine's Summer Enrichment Program and Early Academic Outreach Program to help encourage and prepare K-12 and undergraduate students for a career in veterinary medicine.

Scientific Seminars: Every month the VIRC holds the Regenerative Medicine Seminar series to update our constituency on research being done by VIRC members. Additionally, twice a year the VIRC invites and hosts world leaders in the field of regenerative medicine to present their research and meet with faculty and students as part of our Distinguished Speaker Seminar Series.

Undergraduate Courses: The VIRC continues to develop and implement new educational opportunities at UC Davis. In 2017 we taught two undergraduate classes (Vertically Integrated Projects – Stem Cell Potency and a First Year Seminar – Intro to Regenerative Medicine). The goal of these courses is to attract UC Davis undergraduates toward research in regenerative medicine.

Veterinary Courses: Regenerative medicine was formally introduced in the Doctor of Veterinary Medicine (DVM) curriculum for the first time. Drs. Amir Kol, Boaz Arzi and Larry Gallupo introduced students to Regenerative Medicine through lectures and case studies.

The programs above will undoubtedly aid the VIRC to inspire our next generation to become more involved in developing solutions to unmet needs in regenerative medicine. In order to support this goal, the VIRC has developed a Pipeline of Excellence to guide students, faculty, industry and donors in working together to release the full potential of regenerative medicine. Our goal is to work with industry and donors to provide funding to help students investigate problems in regenerative medicine. Such research will have the potential to progress toward clinical trials and ultimately toward strategic partnerships to ensure that regenerative medicine therapies become available to the patients that need them the most.

VIRC Pipeline of Excellence highlights the importance of education in developing solutions to unmet needs in regenerative medicine

Unmet Needs in Regenerative Medicine



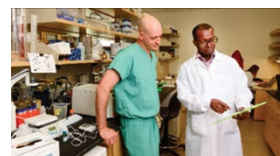
Multidisciplinary translational research



Clinical trial program development



Outreach and development of key partnerships



Novel Regenerative Medicine Solutions

Fostering Collaborative High-Impact Research via our **Pilot Grant Program**



Two years ago the VIRC launched its Pilot Grant Program. The goal is to provide investigators with funds to support novel ideas in regenerative medicine and generate preliminary data for larger grants. We funded 4 applications this year! These included:

Somatic cell source influence on the efficiency of Induced Pluripotent Stem Cell Pluripotency and Epigenetic Memory

Pluripotent stem cells (PSC) are cells that can give rise to all cell types in the body. Induced PSC or iPSC is a technology that allows the reprogramming of mature adult cells back to a pluripotent stem cell state. iPSC technology has incredible potential and promises to reshape our practice of regenerative medicine. In order for this technology to be translated into clinical practice, a robust and clinically relevant large animal model is needed. Successful completion of this project will provide a better understanding of mechanisms that determine dog iPSC reprogramming and maturation.



Dr. Amir Kol

Stem cell-secreted platforms for bone engineering with the stromal vascular fraction

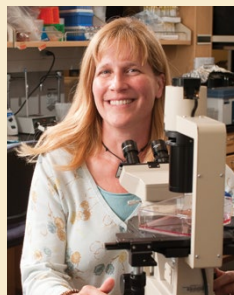
The stromal vascular fraction (SVF) isolated from fat is a promising cell source for use in cell-based therapies of bone regeneration. However, standard culture techniques allow critical accessory cells to be removed thus limiting the therapeutic potential of SVF. We hypothesize that using the secreted components from stem cells to coat constructs maintained under perfusion culture will aid in selecting and retaining accessory cells to generate a more bone producing graft. This approach will establish a new strategy to effectively utilize autologous cells for engineering bone grafts, providing a much-needed alternative to standard procedures.



Dr. J Kent Leach

Deciphering feline stem cell interactions with CD8+ T cells

Mesenchymal stem cells (MSCs), isolated from fat, are being used in clinical trials for a number of inflammatory and immune-mediated diseases in both animals and people. In a current clinical trial to treat severe inflammation of the mouth in cats, we found that MSC therapy is safe and often curative. In this clinical trial, and in complementary tests in the laboratory, we discovered that MSCs act on a specific subset of immune cells (activated T cells) and decrease their proliferation, activation and even shift them from a T cell that initiates inflammation to a T cell that dampens inflammation. In this study, we will determine how MSCs both directly and indirectly decrease T cell proliferation and activation. We will also investigate one novel pathway by which MSCs may effectively “reprogram” the lymphocytes and result in long-term cure in cats with severe inflammation in their mouths. These findings will inform clinical trials in people who have similar, chronic, severe inflammation in their mouths for which there is currently no cure.



Dr. Dori Borjesson

How Age Affects Tenogenic Potential of Murine Progenitor Cells

Healthy, properly functioning tendons greatly impact not only our well-being but also that of our companion animals. Injuries to tendons like the Achilles tendon, have been shown to cause pain, debilitation and reduced activity. Degenerative conditions often persist and intensify with age. Tendon forming potentials of progenitor (stem) cells within different parts of the tendon with respect to age have yet to be investigated. We propose to examine the tendon forming capabilities of progenitor cells from each region of the Achilles tendon, comparing young and aged mouse tendons. An understanding of the tendon formation capabilities of these cells will allow us to determine utility of each population for tissue engineering and could lead to strategies as to how to bolster their tendon forming potentials.



Dr. Michael Mienaltowski

INDUSTRY HIGHLIGHTS

Fee-for-Service: In 2017 the Veterinary Institute for Regenerative Cures (VIRC) launched its fee-for-service program as a strategy to work with industry sponsors to drive significant progress in regenerative medicine through clinical trials and other research studies. This program allows us to facilitate progress and forward regenerative medicine product development through the following ways:

STEM CELL QUALITY CONTROL: Ensures that stem cell products are safe and meet specific quality standards. Services include: sterility, viability, potency and flow cytometric measures of identity and purity.

DONOR TISSUE PROCUREMENT AND QUALIFICATION: Provides access to tissues from patients at the UC Davis Veterinary Medical Teaching Hospital and network clinics in order to derive new investigational cell therapy products. Donors are qualified using stringent quality standards to assure safe and compliant tissue.

RESEARCH SERVICES: To facilitate research into product mechanism of action we offer services that include a wide range of species-specific cell and molecular assays to determine cell phenotype, bioactivity and potency.

CONSULTATION SERVICES: Consultation is available to industry partners to develop research and clinical protocols to test the safety and efficacy/quality of their product.

Building our industry network

In August 2017, the VIRC joined the Associate Vice Chancellor for Technology Management and Corporate Relations, Dushyant Pathak and School of Veterinary Medicine Dean, Dr. Michael Lairmore, at the Kansas City Animal Health Investment forum. The VIRC took this opportunity to network and meet with companies interested in regenerative medicine and to grow our portfolio of potential industry partners.



August 29, 2017: UC Davis represented at the Kansas City Animal Health Investment Forum (Left to Right – Dori Borjesson, Dean Micheal Lairmore, Robin Stears, Hyemi Sevensing, David Simpson, Tony Hazarian)

Visit our website at www.vetmed.ucdavis.edu/virc to learn more about our industry programs

OTHER VIRC 2017 HIGHLIGHTS

International Academic Collaborations

The Partnership Collaboration Awards (PCA) provide funding to support initiatives that foster international partnerships in research, teaching and learning, capacity building and other areas between the University of Sydney (USyd) and the University of California, Davis. In 2017, Dr. Amir Kol was awarded a PCA to collaborate with Dr. Paul Sheehy at the University of Sydney to develop novel regenerative medicine solutions for patients with diabetes.



Ensuring Stem Cell Quality

Recently the VIRC took over the Regenerative Medicine Lab (RML, also known as the clinical “manufacturing” lab) located within the Veterinary Medical Teaching Hospital. What this means is better oversight and assurance of quality for our stem cells used in clinical trials. Additionally, this change will allow for easier maintenance of compliance with all FDA and institutional guidelines and regulations



Welcome to the Team

We were pleased to welcome two new members to the VIRC team! Ubaldo de la Torre is a Staff Research Associate who is working on fee-for-service projects and overseeing the manufacture and quality control of stem cells from the RML. Also, Claudia Tang is a student assistant who will be working with us over the next year on administrative tasks and compliance issues.



The Best of the Best

The VIRC recognizes the need to develop strategic partnerships with other universities in order to progress the field of regenerative medicine. Therefore the VIRC is working to develop an “Academic Alliance” in order to standardize operating procedures and expand our clinical trails network. Our goal is to combine our strengths in order to perform higher impact research and potentially expedite approval of regenerative medicine therapies.

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Veterinary Institute for Regenerative Cures

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Save the Dates



Distinguished Speaker Seminar Series

- Dr. Klearchos Papas, University of Arizona
March 13, 2018
- Dr. Keith March, University of Florida
May 8, 2018

NAVRMA Conference

- September 6-9, 2018, Sacramento, CA
www.navrma.org

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