

31st Annual Meeting of the **Academy of Surgical Research**

31
YEARS

October 8-10, 2015

Winston-Salem, North Carolina
Embassy Suites Hotel

"Everyday Heroes: Surgical Models Saving Lives"

What does a hero look like? Take a look in the mirror, at your fellow colleagues and at the patients you work with. Treatments are developed, diseases are cured and human and animal lives are saved because of you and your surgical models! Heroes are around us every day!

The 31st Annual ASR Meeting will include presentations and hands-on learning from experts in their field. Through the Academy, we can learn and advance from one another.

Learn about surgical research and surgical challenges in areas including:

- 3D Bioprinting
- Pain Management
- Telemetry
- Transplantation and Tissue Engineering
- Refinement, Replacement and Reduction Innovations
- Cardiopulmonary Bypass
- Anesthesia
- Suturing
- Physiological Monitoring
- Orthopedics
- Infusion and Ports



Academy of Surgical Research

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Partners for their generous contributions:

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Silver Level	Charles River Laboratories Data Sciences International VetEquip, Inc.
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Academy of
Surgical Research

DISCOVER OPEN INNOVATION AT WAKE FOREST

Joel Stitzel, PhD, partners with industry to study injury biomechanics, computational body modeling and automotive safety. He is one of more than 1,100 faculty at Wake Forest engaged in breakthrough discoveries in basic science and clinical care.

Visit **Wake Forest Innovations** online to discover opportunities for partnerships with Wake Forest in the development of new therapeutics, vaccines, diagnostics and medical devices.

WakeForestInnovations.com



Welcome

It is my great pleasure to welcome you to North Carolina for the 31st Annual Academy of Surgical Research Meeting. It is hard to believe so many years ago this academy was but just a few members who paved the way to bettering surgical research education. Now more than ever, it is important to maintain that focus.

I would like to extend a great thank you to our Program Committee and Program Chair, Heather Bogie. Being in that position myself in the past, I recognize the enormous effort and organization needed to accomplish this annual meeting, with planning extending over a year and a half prior to the actual meeting. They have worked extremely hard to create a program and wetlabs that are engaging and new.

Your board members have worked incredibly hard to continue to raise the bar in our education efforts. The Surgical Savvy newsletter put forth by the Communications Committee this year has had a great overhaul by the team. Our Board of Directors, Certifications Committee, Publications Committee, Exhibitor Committee, Membership Committee, and Bylaws Committee, have all continued to think of the future and be resilient in our efforts, seeking to improve our Academy. I would like to thank our volunteers for their investment of time and for continuing to produce such a contagious energy. I would also like to thank our Sponsors and our supporting Exhibitors. Please take advantage of this opportunity to explore what they have to offer!

Please enjoy the meeting by participating with your colleagues in discussion and friendship. I have never found a better meeting or forum that is as welcoming. So if you are new to our meeting please let us know. We'd be happy to introduce you and would love for you to become involved. You will gain far more than you give!

Best to all,

Nance Moran





Nance Moran, SRS, RLATG, MS

Staff Scientist

Nance Moran is a Staff Scientist at a successful biotechnology company where she has investigated therapies for degenerative orthopedic diseases of the joint and spine for over 14 years. Nance worked in small animal practice for 7 years after achieving a degree in Veterinary Technology and later a Master's degree in Biology.

Nance has further interests in teaching, leading a Science Kids program with over 120 students annually, ecology, and areas of companion animal behavioral psychology and training.

For several years she's enjoyed being active in the ASR, chairing the Communications Committee, Program chair, and serving in several board positions up to the current position of President. She has enjoyed working with all of the ASR board members as well as our individual members. She enjoys being approached with a challenge and invites constructive critique, as it will only strengthen our organization and validate the worth of all of our members. She believes in sharing information and peer education. Nance wishes to promote the qualities of the organization to the best of her abilities and to help our members understand the value of their contributions to research and one another.

Welcome

Welcome to Winston-Salem!

Thank you so much for attending the 31st Annual Meeting for the Academy of Surgical Research! It's been a pleasure to put together this meeting for you! I chose this year's theme "Everyday Heroes: Surgical Models Saving Lives" because to me, that's what I see you and our patients as. Heroes don't just wear capes or stop speeding trains; they also wear labcoats and gloves or may walk on four legs and bark. The amount of lives that are touched everyday by this ever evolving field is outstanding!

Over the next few days, you'll hear many great presentations and meet many more awesome people. We have three exceptional keynote speakers and another 26 wonderful general session presenters. Combine that with 11 posters, 5 wetlabs and 4 drylabs and we have an exciting meeting in store! The program content is varied and I hope it will invoke thought, conversation and excitement.

In addition to all of the informative sessions, we also have numerous exhibitors. Be sure to stop by and visit each and every one of them. I'd like to thank them and all of our generous sponsors for supporting this year's meeting and helping to make it a success. Their presence and generosity is greatly appreciated!

A meeting such as this is not planned alone. There are also MANY other people who donate their time to ensure the meeting runs smoothly and that all goes as planned. I would like to personally thank the members of the Program Committee for their time and effort put forth to construct an exceptional meeting. I also would like to thank Jim Manke and Kathi Schlieff. I truly value all of the assistance and patience provided throughout the planning process!

Heather Bogie
2015 Program Chair





C H A I R

Heather Bogie, SRS, RLATG, CVT

Senior Research Surgeon

Heather received her Associate of Applied Science degree in Veterinary Technology from Ridgewater College in 1999. She joined DSI as an Animal Lab Technician in 2001. During her 14 year career at DSI, she has been involved with many new product launches, worked with a variety of species and trained hundreds of people how to use telemetry around the world.

Heather is a member of the National AALAS organization, the Minnesota AALAS Branch, the Minnesota Association of Veterinary Technicians and the Academy of Surgical Research. Positions held include: 2013 MN AALAS Branch President, 2013 Co-Workshop Program Chair for ASR, IACUC member for the Minnesota School of Business Veterinary Technology program and DSI and 2015 MN AALAS Branch President. Heather also serves on the ASR Board of Directors.

Program Committee

Nance Moran

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Kathryn Lillegard

Data Sciences International

Tracy Ziegelhofer

Envigo

Karen Brocklehurst

University of South Florida

Leslie J. Stoll

Charles River Laboratories

Margi Baldwin

University of South Florida

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SAI Infusion Technologies

Jon Ehrmann

Bristol-Myers Squibb

Justin Prater

Wake Forest University

Louis Toledo

Western Michigan University Homer Stryker M.D School of Medicine.

Heather DeLoid

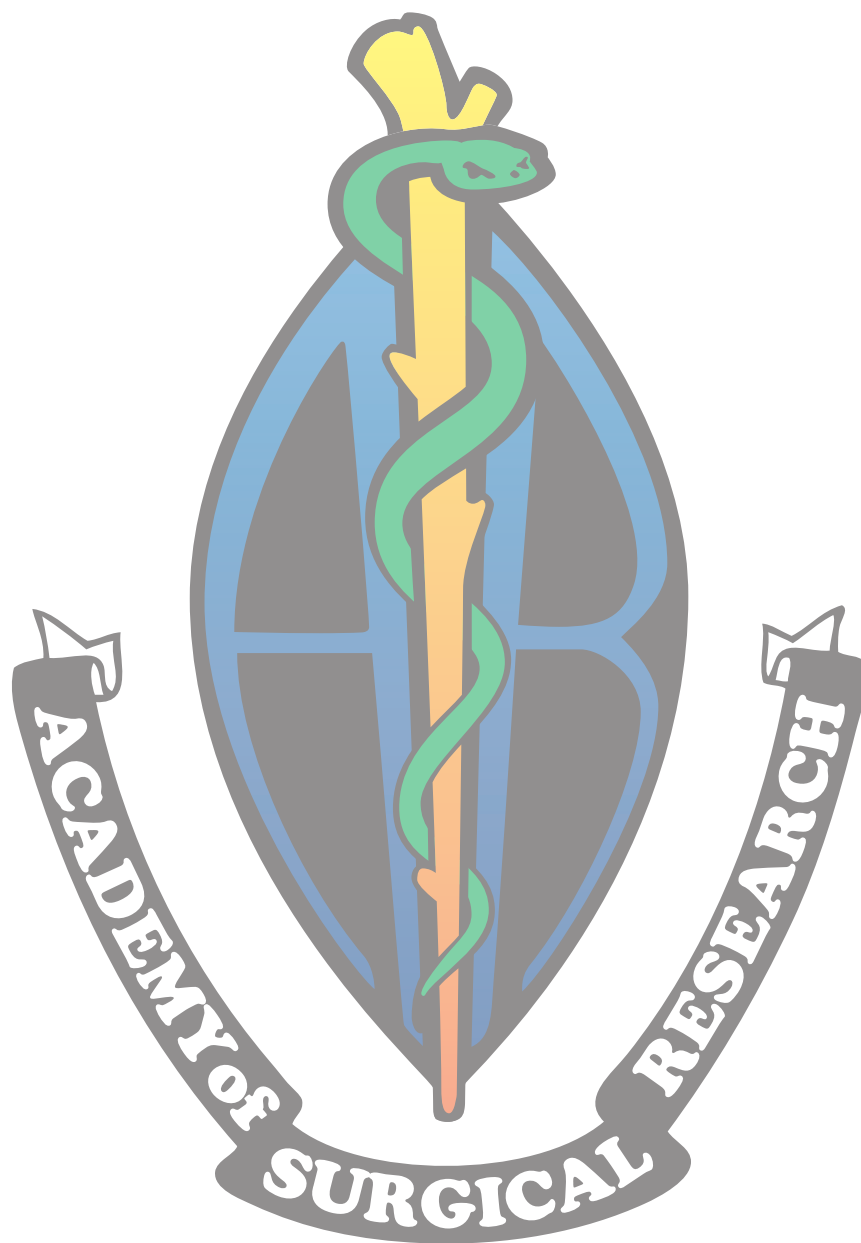
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**James J. Yoo, MD, PhD**

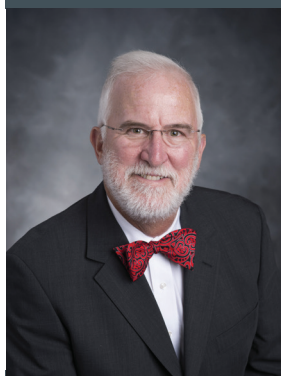
Professor

Associate Director and Chief Scientific Officer

Wake Forest Institute for Regenerative Medicine

Wake Forest School of Medicine

Dr. Yoo is a surgeon and researcher. He is currently a Professor, Associate Director and Chief Scientific Officer at the Wake Forest Institute for Regenerative Medicine, and is cross-appointed to the Departments of Physiology and Pharmacology and Biomedical Engineering. Dr. Yoo's research efforts have been directed toward the clinical translation of tissue engineering technologies and cell-based therapies. Dr. Yoo's background in cell biology and medicine has facilitated the transfer of several cell-based technologies from the bench-top to the bedside. A few notable examples of successful clinical translation include the bladder, urethra, vagina, and muscle cell therapy for incontinence. Dr. Yoo has been a lead scientist in the bioprinting program at WFIRM, and has been instrumental in developing skin bioprinting and integrated organ printing systems for preclinical and clinical applications.

**R. Dustan (Dusty) Sarazan, DVM, PhD**

Vice President and Chief Scientific Officer

Data Sciences International (DSI)

Dr. Sarazan received a B.S. degree in chemistry from the University of Idaho-Moscow, his Doctor of Veterinary Medicine at the University of Missouri and practiced large animal veterinary medicine in southern Wisconsin for 2 years. He pursued his Ph.D. in cardiovascular physiology in the laboratory of pioneering biophysicist, Dean Franklin. He subsequently joined Eli Lilly and Company, where he was responsible for cardiovascular safety pharmacology, for 15 years. He left Eli Lilly to relocate to Wisconsin, where he joined Covance Laboratories as the Director of Safety Pharmacology. He was promoted to Global Chief Scientific Officer, Safety Pharmacology, with responsibility for the Safety Pharmacology and nonclinical cardiovascular safety program at all Covance sites. He left Covance after 5 years to join Data Sciences International (DSI) as the Vice President & Chief Scientific Officer. He was a founding member of the Board of Directors of the Safety Pharmacology Society (SPS) where he served as President in 2006. He was the winner of the 2011 SPS Annual Distinguished Service Award, which was presented at the annual meeting in Innsbruck Austria. During 2001-2004, he served as a member of the ILSI/HESI Cardiovascular Safety Committee, which pursued an understanding of the role of preclinical assays in predicting clinical QT interval prolongation by pharmaceuticals. In 2009, he became a member of the ILSI/HESI Cardiovascular Safety Technical Committee and is now the co-chair of the Integrated Strategies Working group. In addition to his professional activities, he served with the US Army Security Agency during the war in Vietnam, holding a Top Secret security clearance. Dusty and his wife are Gold-level ballroom dancers.

**Jim Pomonis, PhD**

Director, Pharmacology Services

American Preclinical Services (APS)

Dr. Pomonis has served as Director, Pharmacology Services of American Preclinical Services, LLC since 2013. Dr. Pomonis has over 14 years of experience in pre-clinical drug discovery and development, as well as 2 years of experience with clinical trials, primarily focused in the area of pain management. Dr. Pomonis received his PhD from the University of Minnesota and did his post-doc in the laboratory of Dr. Patrick Mantyh.

Dr. Pomonis' work with animal models of pain in a drug discovery setting began at Purdue Pharma, LP where he helped establish in vivo pharmacology laboratories for pain drug discovery program and served as a Senior Research Investigator and Program Leader and continued at Algos Preclinical Services where he served as Director, Scientific Affairs and Liaisons, being responsible for the expansion, refinement, and validation of service offerings, as well as serving as the primary intermediary between Algos' clients and its operational staff.

His experience in clinical research in clinical research was Empi, Inc., a medical device company located in Minneapolis, MN as Director of Clinical Programs overseeing externally-directed research programs in orthopedic rehabilitation and pain management, and a multi-center, randomized, placebo-controlled, double blind clinical trial investigating the efficacy of transcutaneous electrical nerve stimulation for the management of chronic low back pain.

S P E A K E R

Venue



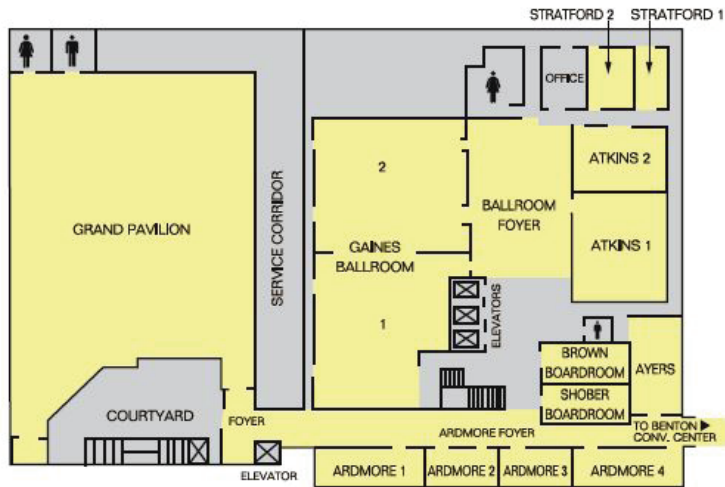
Floor Plan



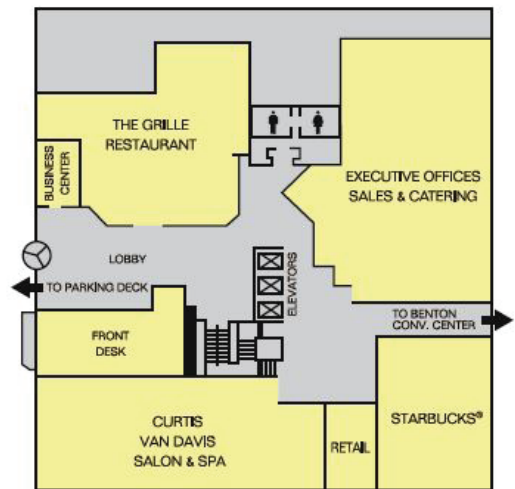
EMBASSY SUITES
HOTEL®

Winston-Salem

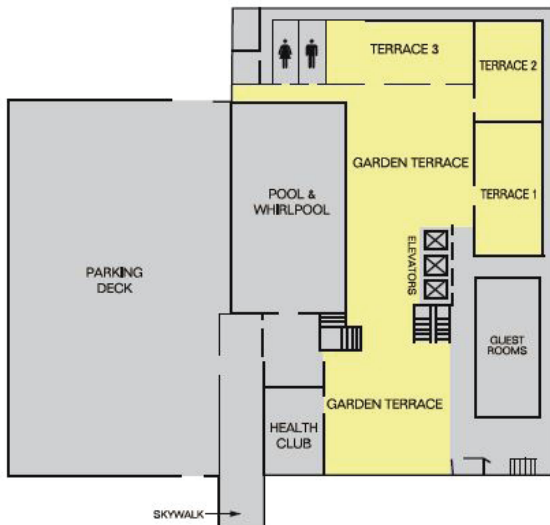
LOWER LEVEL



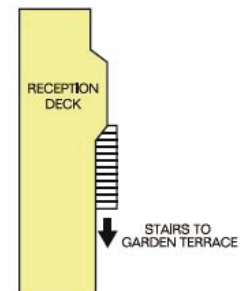
LOBBY LEVEL



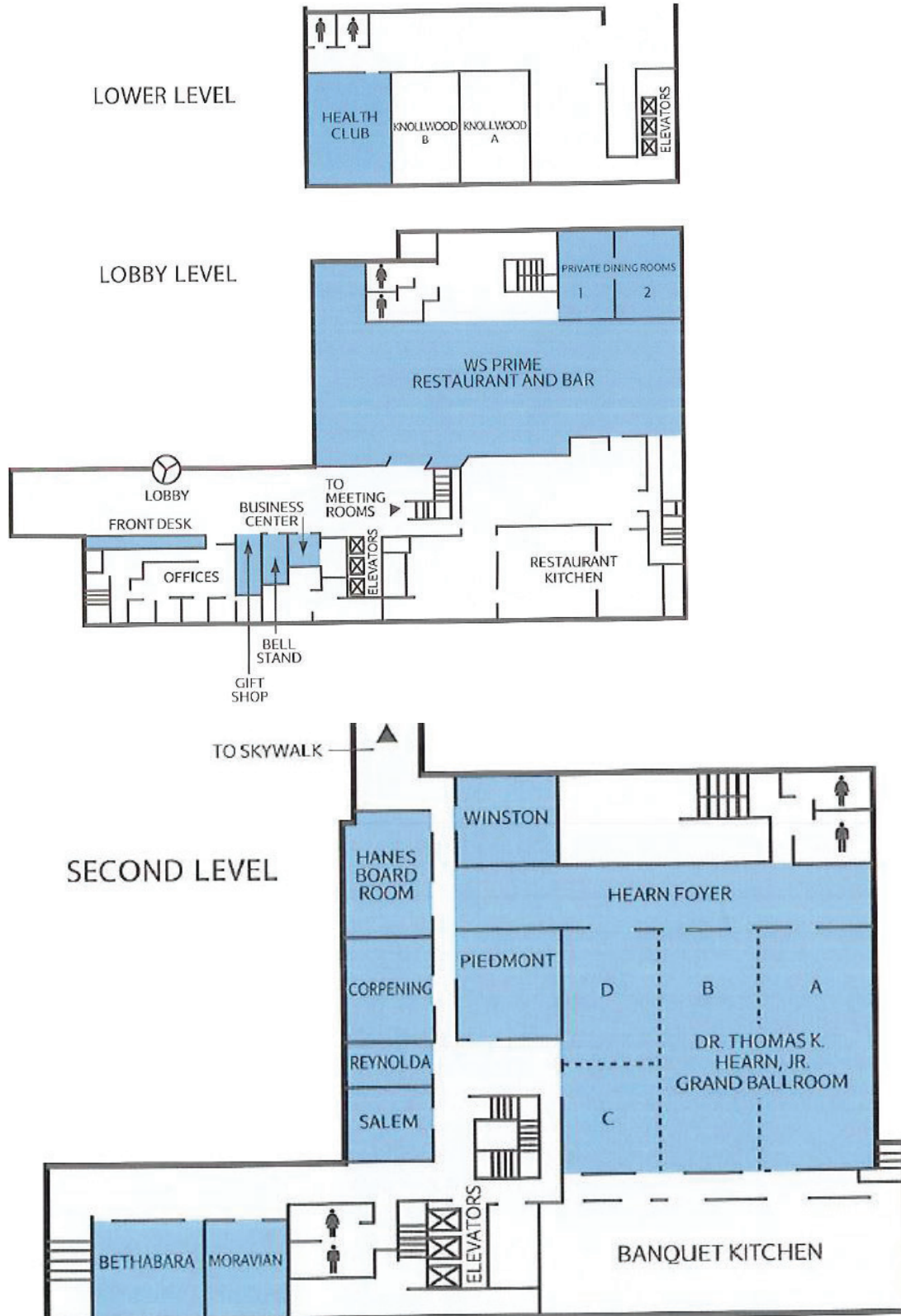
SECOND LEVEL



FOURTH LEVEL



Floor Plan



Meeting Overview

Registration Hours – Ardmore Foyer	
Thursday, October 8th	07:00 am – 05:00 pm
Friday, October 9th	07:00 am – 05:00 pm
Saturday, October 10th	07:00 am – 12:00 pm
Wednesday, October 7th	
02:00 – 05:00 PM	ASR Board Meeting
Thursday, October 8th	
07:00 AM – 08:00 AM	Registration and light breakfast for test takers and wet lab attendees – Ardmore Foyer
08:00 AM	Bus departs from hotel to Wake Forest University
08:00 AM – 12:00 PM	ASR Examinations
08:00 AM – 12:00 PM	Wet Labs <ul style="list-style-type: none"> ▪ PV-Loops/Hemodynamics in Rodents ▪ Calvarial Defects in the Rat
08:00 AM – 05:00 PM	Wet Labs <ul style="list-style-type: none"> ▪ Sheep Anesthesia ▪ Traditional Aortic Valve Replacement
11:45 AM	Bus departs from Hotel to Wake Forest University
12:00 PM	Bus departs from Wake Forest University to Hotel
01:00 PM – 05:00 PM	Wet Labs <ul style="list-style-type: none"> ▪ Advanced Anesthesia
01:30 PM - 03:30 PM	Dry Lab <ul style="list-style-type: none"> ▪ A Hands-On Experience with Cardiopulmonary Bypass Equipment
05:00 PM	Bus returns to hotel
04:00 PM – 07:30 PM	Welcome Reception with Exhibitors
Friday, October 9th	
07:00 AM – 08:00 AM	Continental Breakfast Poster set-up
08:00 AM – 08:15 AM	Opening Remarks
08:15 AM – 09:15 AM	Keynote Speaker
09:15 AM - 11:45 AM	Track 1 and 2 Scientific Sessions
09:45 AM – 10:15 AM	Break with Exhibitors
10:15 AM – 11:15 AM	Infusion Dry Lab (Registration Required)
12:00 PM – 01:00 PM	Lunch with Exhibitors
01:00 PM – 02:00 PM	Keynote Speaker
02:00 PM - 04:30 PM	Track 1 and 2 Scientific Sessions
02:00 PM – 03:00 PM	Small Animal Anesthesia Dry Lab (Registration Required)
03:00 PM – 03:30 PM	Break with Exhibitors
04:45 PM – 05:45 PM	Poster Judging
06:00 PM – 08:00 PM	Reception
Saturday, October 10th	
08:00 AM – 09:00 AM	Continental Breakfast
09:00 AM – 09:15 AM	Opening Remarks
09:15 AM – 11:45 AM	Track 1 and 2 Scientific Sessions
9:45 AM – 10:15 AM	Break
10:15 AM - 11:15 AM	Suturing Dry Lab (Registration Required)
12:00 PM – 2:00 PM	Business Lunch/ASR Awards Presentations Keynote Speaker
02:00 PM – 03:00 PM	Track 1 and 2 Scientific Sessions
03:00 PM	Adjourn
03:00 PM – 05:00 PM	Board of Directors Meeting

Lab Descriptions

31
YEARS

Wet Lab Instructors

Christina Gross, BA, SRS
American Preclinical Services

Liisa Carter, SRS, CVT, ALAT
American Preclinical Services

Mark Beckel, SRS, BS
American Preclinical Services

Vince Mendenhall, PhD, DVM
Consultant in Preclinical Surgery

Heather DeLoid, DVM
Wake Forest University

Tom Smith, PhD
Wake Forest University

Dry Lab Volunteers

David FitzMiller
Kent Scientific

Jeffrey Sites, BS, CCT, CBMT, CCP-E
CardioVascular and ExtraCorporeal Technologies

Jan Bernal, DVM
Pfizer

Leslie Stoll, SRS, AS, LATG, AHT
Charles River Laboratories

Candace Rohde-Johnson
SAI Infusion Technologies

Wet Lab Volunteers

Karen Brocklehurst, SRA
University of South Florida

Margi Baldwin, RVT, LATG, SRS, CMAR, MS
University of South Florida

Leslie Stoll, SRS, AS, LATG, AHT
Charles River Laboratories

David FitzMiller
Kent Scientific

**Thank you to Wake Forest University
for hosting our wet labs and all of your
support!**



Wet Labs

Wake Forest University

All Day Lab

Traditional Aortic Valve Replacement (Swine)

The morning portion of the lab will focus on the thoracotomy and cannula placement. There will be two students per animal to practice cannula placement and removal. This will be a hands on lab with each student placing cannula sutures as well as practicing inserting cannulas and removing them. The afternoon portion will focus on replacing the aortic valve. For this an animal will be previously cannulated and ready to go on bypass. The class will gather around one animal undergoing a valve replacement procedure on cardiopulmonary bypass. This portion will mostly be direct observation of the valve replacement surgery with minimal hands on. Each student will be able to visualize the procedure and active Q&A will be taking place during the procedure.

All Day Lab

Sheep Anesthesia

The various methods of anesthetizing sheep for long periods of time will be described and demonstrated. The common mistakes and pitfalls will also be discussed and demonstrated. Participants will then perform the procedures as many times as they can in the time allowed.

AM Lab

PV-Loops/Hemodynamics in Rodents

This wet lab is designed to teach participants best practices and use of obtaining hemodynamic measurements in rodents including pressure-volume loops utilizing the Millar Hemodynamics System. Participants will be shown methods to improve data quality capture and analysis technics of hemodynamic data.

AM Lab

Calvarial Defects in the Rat

The surgical techniques and necessary equipment involved in the creation of calvarial defects in the rat as a model of a critical sized defect will be demonstrated. The common mistakes and pitfalls of the procedure will also be demonstrated. Participants will then perform the procedure as many times as they can in the time allowed.

PM Lab

Advanced Anesthesia

The lab will be conducted during the valve replacement procedure. Students will be given an overview of the cardiopulmonary bypass machine and how it functions for supporting an animal during a surgical case. The lab will focus on the important aspects of monitoring anesthesia while an animal is on cardiopulmonary bypass which includes anesthetic depth, blood gas analysis, and patient management. Other areas that will be discussed will be trouble shooting during the case and emergency situations.

Dry Labs

Embassy Suites Hotel

Thursday, October 8th 1:30 p.m. - 3:30 p.m.

Hands-On Experience with Cardiopulmonary Bypass Equipment

Cardiopulmonary bypass (CPB) is an application of devices and components which when assembled and operated correctly, comprise a means to provide Extracorporeal Circulation (ECC) support to a living creature and maintain metabolic activity, and organ support to have a surviving subject at the end of the procedure.

Applications of CPB have grown from basic circulatory support during an intervention (surgical procedure) such as a heart valve replacement, or coronary artery bypass, to current applications of long term life support- and a surgical model of pulmonary failure, cerebro-vascular preservation for neurosurgery, modifications to renal function as an adjunct to dialysis, and many more applications. The wide range of applications has driven component development of the CPB/ECC systems, making it configurable to many unique and “target-specific” designs. Descriptions of basic CPB/ECC components will be displayed and a complete mock circulation heart lung machine will be available to try hands-on.

The key take-away is to gain familiarity with the entire realm of possibilities of CPB and ECC as well as a tactile experience. Post-session discussions and a resource for planning your first project is available.

Friday, October 9th 10:15 a.m. - 11:15 a.m.

Proper Technique for Accessing, Flushing and Locking Catheters and Implanted Devices

One of the most overlooked aspects of catheter success comes after the surgery is complete. Proper technique in accessing the implanted device, as well as appropriate routines for flushing and locking are essential to the ongoing success of any catheter. In this workshop, we will focus on the post-surgical care of your catheter including discussion on locking solutions, recommended frequency of flushing, aseptic technique for accessing the catheter, and troubleshooting. In addition to the discussion, participants will have the opportunity to practice proper cleaning, flushing and locking procedures for both the catheter and for the vascular access harness using realistic rodent models. Participants will be introduced to several types of access devices, including harnesses, buttons, and VAPs and will understand the benefits and limitations of each. This session is ideal for anybody who is new to catheter implantation and maintenance, but can also serve as a great refresher and forum for discussion on the best techniques and new products that aid in catheter care and longevity.

Dry Labs

Embassy Suites Hotel

Friday, October 9th 2:00 p.m. - 3:00 p.m.

Small Animal Anesthesia

An anesthesia system designed to accommodate the physiological characteristics of small animals, including rats and mice, has the potential to provide great practical value to the life science research community.

Small animal surgery requires an investment in equipment and time. The task of anesthetizing research subjects is complicated by the equipment itself, which is designed for use on larger species, such as humans or horses.

Laboratory animal anesthesia is governed by societal concerns to minimize harmful exposure to the research subjects and to the people performing the surgery. Today's economy puts pressure on laboratories to conserve time and resources while maintaining successful research. A miniaturized anesthesia system designed to administer inhalant anesthetics to small animals can address those challenges by providing the following advantages:

- Improved laboratory safety by minimizing exposure to anesthetic gas
- Precision anesthetic dosing resulting in faster, more efficient performance of procedures, and reducing morbidity rates
- Reduction of expense by using less anesthetic, eliminating outside calibration services, improving laboratory space utilization, and increasing successful outcomes

Saturday, October 10th 10:15 a.m. - 11:15 a.m.

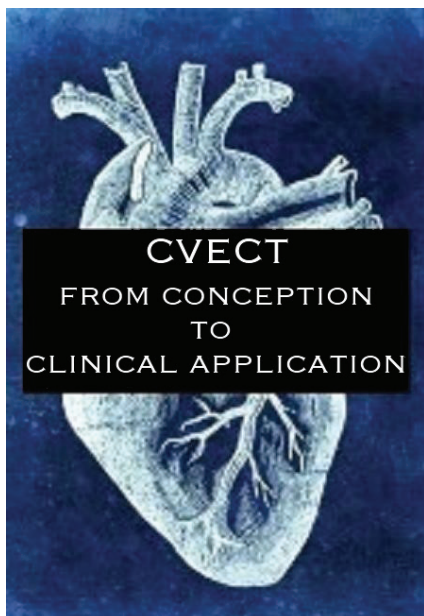
Still Suturing with the "Oldies"

Through many millennia, various suture materials were used, debated, and remained largely unchanged. Needles were made of bone or metals such as silver, copper, and aluminum bronze wire. Sutures were made of plant materials (flax, hemp and cotton) or animal material (hair, tendons, arteries, muscle strips and nerves, silk, catgut)...

The earliest reports of surgical suture date back to 3000 BC in ancient Egypt, and the oldest known suture is in a mummy from 1100 BC. A detailed description of a wound suture and the suture materials used in it is by the Indian sage and physician Sushruta, written in 500 BC.[citation needed] The Greek father of medicine, Hippocrates, described suture techniques, as did the later Roman Aulus Cornelius Celsus. The 2nd-century Roman physician Galen described gut sutures.[1] In the 10th century the manufacturing process involved harvesting sheep intestines, the so-called catgut suture, and was similar to that of strings for violins, guitar, and tennis racquets.

The objective of this dry lab is to provide an opportunity to learn and improve one's suturing skills. Using a skin simulator, participants practice various suturing techniques, including simple and straight lacerations, deep-layer closure, skin closures, and tying knots using hand and instrument ties. The dry lab offers a variety of common procedures performed in the primary care setting. Didactic information as well as a hands-on component will be available. This dry lab is geared toward those wishing to refresh their suturing skill, as well as those interested in practicing advanced suturing techniques under professional direction and guidance.

Lab Sponsors



31
YEARS

Program Schedule

Wednesday, October 7th

2:00 – 5:00 PM

ASR Board of Directors Meeting – **Ayers**

Thursday, October 8th

8:00 AM – 5:00 PM

Wet Labs

8:00 AM – 12:00 PM

Certification Exams – **Ardmore 1**

01:30 PM - 03:30 PM

Hands-On Experience with Cardiopulmonary Bypass Equipment Dry Lab – **Ardmore 4**

4:00 – 7:30 PM

Welcome Reception with Exhibitors – Sponsored by Colonial Medical Supply Company
Grand Pavilion Ballroom



Friday, October 9th

7:00 – 8:00 AM	Continental Breakfast – Sponsored by Kent Scientific Corporation – Grand Pavilion Ballroom	
7:00 – 8:00 AM	Poster Setup – Grand Pavilion Ballroom	
8:00 – 8:15 AM	Opening Remarks – ASR President Nance Moran – BH Gaines Ballroom 1	
8:15 – 9:15 AM	Keynote – Dr. James J. Yoo, MD, PhD – 3D Bioprinting for Surgical Applications – BH Gaines Ballroom 1	
TRACK 1 – BH Gaines Ballroom 1		
9:15– 9:45 AM	Control of Pain and Distress in Swine in the Perioperative Period	Michael Swindle, DVM
9:45 – 10:15 AM	Break with Exhibitors – Sponsored by Access Technologies – Grand Pavilion Ballroom	
10:15 – 10:45 AM	Surgical Advances in Kidney Transplantation	Alexander H. Toledo, MD
10:45 – 11:15 AM	Pain Management for Laboratory Animals: Non-human Primates	Mary Ellen Goldberg, BS, LVT, CVT, SRA, CCRA
11:15 – 11:45 AM	Telemetry Implant in a Ferret Influenza Model	Lisa Kercher, PhD
12:00 – 1:00 PM	Lunch – Sponsored by SAI Infusion Technologies– Grand Pavilion Ballroom	
1:00 – 2:00 PM	Keynote – Dr. R. Dustan Sarazan, DVM, PhD – Standing on the Shoulders of Giants: Dean Franklin and His Remarkable Contributions to Physiological Measurements in Animals	
2:00 – 2:30 PM	Diabetic Pigs: Anesthesia and Peri-operative Management	Kate Reed, MA, VetMB, MRCVS
2:30 – 3:00 PM	24 Hour Anesthesia in the Ventilated Sheep Model: Trials and Tribulations	Heather DeLoid, DVM
3:00 – 3:30 PM	Break with Exhibitors – Sponsored by Toxikon Corporation & DRE Scientific – Grand Pavilion Ballroom	
3:30 – 4:00 PM	Validation and Refinement of the PhysioTel Digital Telemetry System in the Canine for Cardiovascular Safety Studies	Marlo Volberg, BS, RVT, SRS, RLATG
4:00 – 4:30 PM	Pain Management for Laboratory Animals: Rodents	Mary Ellen Goldberg, BS, LVT, CVT, SRA, CCRA
4:45 – 5:45 PM	Poster Judging – Grand Pavilion Ballroom	
6:00 – 8:00 PM	Reception – Marriott Restaurant Private Reception Area - Sponsored by Data Sciences International (DSI) and Lomir Biomedical, Inc.	

Friday, October 9th

7:00 – 8:00 AM	Continental Breakfast – Sponsored by Kent Scientific Corporation – Grand Pavilion Ballroom	
7:00 – 8:00 AM	Poster Setup – Grand Pavilion Ballroom	
8:00 – 8:15 AM	Opening Remarks – ASR President Nance Moran – BH Gaines Ballroom 1	
8:15 – 9:15 AM	Keynote – Dr. James J. Yoo, MD, PhD – 3D Bioprinting for Surgical Applications – BH Gaines Ballroom 1	
TRACK 2 – BH Gaines Ballroom 2		
9:15– 9:45 AM	Thromboelastography-guided Anticoagulation in Juvenile Sheep Implanted with the Penn State Infant Ventricular Assist Device	Heidi Bixler, BS, CVT
9:45 – 10:15 AM	Break with Exhibitors – Sponsored by Access Technologies – Grand Pavilion Ballroom	
10:15– 10:45 AM	Development of a Chronic Pulmonary Arterial Pressure (PAP) Model in the Beagle Dog	Jennifer Sheehan, BS, SRS, LATG
10:45– 11:45 AM	Surgical Writing-From Protocol Development, Conception of the Research Hypothesis, Data Collection and Publication-Part 1	Luis Toledo, MD, PhD
12:00 – 1:00 PM	Lunch – Sponsored by SAI Infusion Technologies– Grand Pavilion Ballroom	
1:00 – 2:00 PM	Keynote – Dr. R. Dustan Sarazan, DVM, PhD – Standing on the Shoulders of Giants: Dean Franklin and His Remarkable Contributions to Physiological Measurements in Animals	
2:00 – 3:00 PM	Surgical Writing-From Protocol Development, Conception of the Research Hypothesis, Data Collection and Publication- Part 2	Luis Toledo, MD, PhD
3:00 – 3:30 PM	Break with Exhibitors – Sponsored by Toxikon Corporation & DRE Scientific – Grand Pavilion Ballroom	
3:30 – 4:00 PM	Cardiopulmonary Bypass in Multiple Disciplines- More Than Just a Pump!	Jeffrey P. Sites, BS, CCT, CBMT, CCP-E
4:00 – 4:30 PM	The Use of an Intervertebral Plate for Lumbar Vertebral Immobilization Following Either Posterolateral Fusions (PLF) or Posterolateral Intervertebral Body Fusions (PLIF) in Sheep	Vince Mendenhall, DVM, PhD
4:45– 5:45 PM	Poster Judging – Grand Pavilion Ballroom	
6:00 – 8:00 PM	Reception – Marriott Restaurant Private Reception Area - Sponsored by Data Sciences International (DSI) and Lomir Biomedical, Inc.	

Saturday, October 10th

8:00 – 9:00 AM	Continental Breakfast – Sponsored by ALZET Osmotic Pumps and AVA Biomedical, Inc. – BH Gaines Ballroom Foyer	
9:00 – 9:15 AM	Opening Remarks – ASR President Nance Moran – BH Gaines Ballroom 1	
Track 1 – BH Gaines Ballroom 1		
9:15 – 9:45 AM	Development of a Rabbit Model for Comprehensive Vital System Monitoring	Michael Horsman, MS
9:45 – 10:15 AM	Break – Sponsored by CBSET, Inc. – BH Gaines Ballroom Foyer	
10:15 – 10:45 AM	Novel Telemetry Implantation of D70-CCTP Transmitter (EEG, ECG, BP) and VAP in Young Gottingen Minipigs	Oscar Bermeo Blanco, DVM, RLATG, SRS
10:45 – 11:15 AM	Pain Management For Laboratory Animals: Tricks of the Trade	Mary Ellen Goldberg, BS, LVT, CVT, SRA, CCRA
11:15 - 11:45 AM	Surgical Technique for Collection of Right Ventricular Systolic Pressure (RSVP) in the Rat	Leslie Stoll, SRS, LATG, LVT
12:00 – 2:00 PM	Business Lunch/ASR Awards Presentations Post-Surgical Pain: Etiology, Pharmacology and Complications Grand Pavilion Ballroom	Keynote – Dr. Jim Pomonis, PhD
2:00 – 2:30 PM	Pain Management For Laboratory Animals: Rabbits	Mary Ellen Goldberg, BS, LVT, CVT, SA, CCRA
2:30 – 3:00 PM	Is Your Job Worth Losing Brain Cells? Reduce Your Exposure to Waste Anesthetic Gas Now!	Janet Wolforth, LVT, LATG
3:00 – 5:00 PM	Board of Directors Meeting – Ardmore 2	

Saturday, October 10th

8:00 – 9:00 AM	Continental Breakfast – Sponsored by ALZET Osmotic Pumps and AVA Biomedical, Inc. – BH Gaines Ballroom Foyer	
9:00 – 9:15 AM	Opening Remarks – ASR President Nance Moran – BH Gaines Ballroom 1	
TRACK 2 – BH Gaines Ballroom 2		
9:15 – 9:45 AM	Opportunities for Veterinarians and Technicians in the Field of Research	Jennifer Shockley, DVM
9:45 – 10:15 AM	Break – Sponsored by CBSET, Inc. – BH Gaines Ballroom Foyer	
10:15 – 10:45 AM	Organ Bioengineering and Regeneration as the New Holy Grail for Organ Transplantation	Giuseppe Orlando, MD
10:45 – 11:15 AM	Surgical Implantation of Intrathecal Pumps and CSF Access Ports via Laminectomy in the Vervet.	David Moddrelle, SRS
11:15 -11:45 AM	Embracing the Three R's; Surgical Procedures to Repair Chronically Instrumented Animal Models	Jon Ehrmann BS, SRS, SRA, LATG
12:00 – 2:00 PM	Business Lunch/ASR Awards Presentations Post-Surgical Pain: Etiology, Pharmacology and Complications Grand Pavilion Ballroom	Keynote – Dr. Jim Pomonis, PhD
2:00 – 2:30 PM	Surgical Animal Models for the Preclinical Testing of Potential Chemotherapeutic Agents	Vince Mendenhall, DVM, PhD
2:30 – 3:00 PM	Bile Duct Catheterization in Rats	Brad Gien
3:00 – 5:00 PM	Board of Directors Meeting – Ardmore 2	

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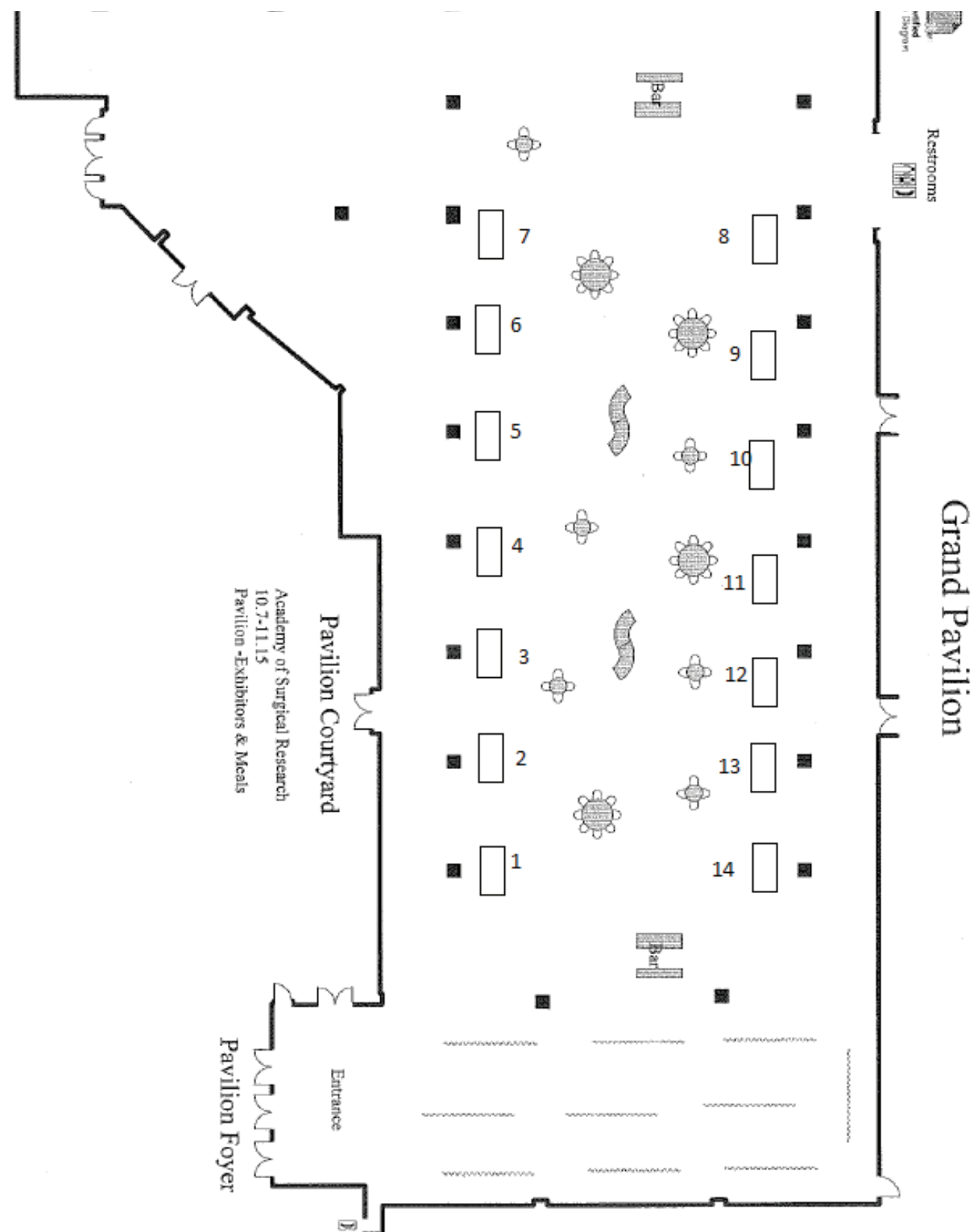
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Exhibitor Directory





Access Technologies

BOOTH 1

www.norfolkaccess.com

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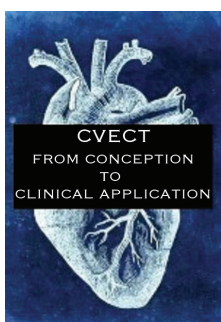


AVA Biomedical, Inc.

BOOTH 13

www.avabio.com

AVA Biomedical, Inc. is a leading manufacturer of cutting-edge laboratory animal infusion products. We provide complete, customized infusion systems for all species. AVA Biomedical provides researchers with unique infusion products including; Cath-In-Cath 2 Port System the gold standard for long-term access, and introducing our newest products the AVA Genesis Port featuring the lowest profile, largest septum available with Cath-In-Cath Technology and the New FastTether 2 LoPro Rodent Infusion System that utilizes standard syringes and stub adaptors. In addition, we carry state of the art cost effective infusion pumps with realtime WIFI monitoring. Come and see what makes us different.



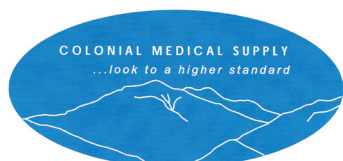
CardioVascular and ExtraCorporeal Technologies

BOOTH 14

www.cvect.devhub.com

CardioVascular and ExtraCorporeal Technologies (CTECT) provides preclinical and clinical medical device research and development and specialist consultancy within the fields of cardiac surgery and related clinical sciences for the laboratory and CRO. We provide the client, company R&D, and clinicians with concise solutions for methods, means, and instrumentation to achieve the optimum model for success. CTECT specializes in circulatory support techniques applied to multiple fields of investigation including synthetic blood components, isolated organ perfusion, metabolic manipulation, systemic and regional perfusion for cancer therapies, and systemic hypothermia and hyperthermia methods proven in clinical practice.

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Colonial Medical Supply

BOOTH 6

www.colmedsupply.com

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our privilege and pleasure to assist the devoted individuals that work throughout the animal health field by having all equipment we sell, support and service run as smoothly as possible every day.



DRE Scientific, a division of DRE Veterinary

BOOTH 15

www.dreveterinary.com

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Hilltop Lab Animals, Inc.

BOOTH 3

www.hilltoplabs.com

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Instech Laboratories, Inc.

BOOTH 4

www.instechlabs.com

Instech designs and manufactures products for laboratory animal infusion, sampling and oral gavage, including: catheters, tethers, swivels, infusion pumps, automated blood sampling systems, and rodent feeding tubes. Products highlighted at ASR will include the PinPort, for quick aseptic access to externalized catheters, and the OrchesTA system of pumps and software to automate infusion toxicology studies.



Kent Scientific Corporation

BOOTH 7

www.kentscientific.com

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Lomir Biomedical Inc.

BOOTH 5

www.lomir.com

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Marshall BioResources

BOOTH 8

www.marshallbio.com

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Medline Industries, Inc.

BOOTH 9

www.medline.com

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As a manufacturer with the ability to distribute, Medline is a uniquely positioned hybrid company, offering customers the ability to deal directly with a manufacturer for many supplies, while consolidating distribution through Medline as well.

Medline has been globally sourcing products for over 40 years and now maintains a large sourcing office based in Shanghai. Medline utilizes their ability to source products, combined with their manufacturing capabilities, to drive costs down immediately, as well as develop a plan for even more significant mid and long term savings, customized to the individual customer needs.



Preclinical Medevice Innovations

BOOTH 11

www.pmipreclinical.com

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SAI Infusion Technologies

BOOTH 10

www.sai-infusion.com

SAI doesn't just make great infusion products, we make them work for you. SAI creates components for preclinical infusion and sampling. We provide technical support for all our products, including on-site surgical training and services. Improve surgical outcomes with customizable catheters, skin buttons, locking solutions, and a variety of surgical supplies, like introducers, drapes, and anesthesia machines. Our focus is on helping animal researchers get work done faster and better so your focus stays where it belongs- improving human and animal lives. We know the challenges you face in animal research and we'll put that knowledge to work for you.



Toxikon Corporation

BOOTH 12

www.toxikon.com

Toxikon Corporation is a preclinical Contract Research Organization (CRO), with ISO/IEC 17025 accreditation that is registered with the US FDA and Japanese MHLW for drug and medical device testing. The Company provides in vivo, analytical, and in vitro testing services for the pharmaceutical, biotechnology, and medical device sectors. Toxikon's safety services include toxicology (acute, subchronic, and chronic toxicity, reproductive toxicity, genetic toxicology, carcinogenicity), pharmacokinetics, toxicokinetics, bioavailability, ADME, chemical characterization, impurities analysis and synthesis, bioanalytical, and microbiology.

Poster Abstracts

31
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Formulation Stability Assessment Of Ketamine-Xylazine Preparations Using High Performance Liquid Chromatography Mass Spectrometry

POSTER 1

Dr. Aurore Dodelet-Deviller, DMV, MSc
Université de Montréal

ABSTRACT

Injectable anesthesia drugs remain a widely used alternative for certain procedures in the field of laboratory animal science. The combination of ketamine and xylazine, with or without acepromazine, is commonly the first choice of injectable drugs for rodent species. However, the combined solutions and appropriate dilutions used for rodents are not available commercially, thus imposing research facilities to rely on in-house cocktail preparations and storage. The objective of this study was to evaluate the stability of specific ketamine, xylazine or acepromazine preparations over time. Three distinct mouse and rat formulations of ketamine, xylazine or acepromazine, were prepared and stored at room temperature or at 4°C for period ranging of 1, 2 and 3 months. The individual drug concentrations were then compared to fresh solutions at each time point, using a High Pressure Liquid Chromatography- Mass Spectrometry/Selected-Ion Monitoring (HPLC-MS/SIM) assay. The concentrations of ketamine and xylazine, diluted in physiological saline, did not change over time. In contrast, xylazine gradually decreased in concentration when stored at room temperature when no physiological saline is used for dilution. Acepromazine in a physiological saline solution mixed with ketamine and xylazine, also decreased in concentration at room temperature over the duration of 3 months. All of the drug concentrations remained above 90% of their original concentration when kept at 4°C for 3 months. These findings suggest that ketamine and xylazine cocktails when diluted in physiological saline, can be kept 3 months after preparation at room temperature, and that undiluted ketamine-xylazine as well as ketamine, xylazine and acepromazine cocktails can possibly lose efficacy over 3 months at room temperature, and that storage at 4°C could help preserve the original concentration of these drug preparations.

Refinement Of An Established Skin Grafting Mouse Model Of Alopecia Areata

Nina Krutrök
AstraZeneca

ABSTRACT

Alopecia Areata (AA) is a common autoimmune condition for which preclinical research is enabled by a translatable murine model (C3H/HeJ). Moreover, the disease has been proposed as a means to research T- cell driven autoimmunity in general. We aimed to further optimise the C3H/HeJ mouse model of Alopecia Areata (Silva & Sundberg Comp Med 2013) in order to study T-cell driven mechanisms in vivo. The C3H/HeJ mice spontaneously develop AA in 15-20% of females within 6-12 months of age. Grafting skin from affected donor mice to naïve young recipients of the same strain increases the disease development to 95% within 6-12 weeks after grafting. Here we describe refinements and amendments to the published method that in our hands resulted in better animal welfare and success of disease induction. As published, under anaesthesia (2% Isoflurane, 0.5% O₂, 0.5% air) and sterile conditions, an oval donor skin sample was sutured and glued in the same sized wound on the back of a recipient mouse. However, we found that subsequent bandaging was problematic - impairing respiration and locomotion and causing distress to the animals, quantified by 10-15% reduction in body weight ($p < 0.0001$ bandage vs without bandage, $n=26$ vs $n=34$ respectively. Repeated measures ANOVA). We also found the recommended use of woundclips could cause more injury than the actual surgery. Therefore, our refinements were to stop bandaging yet retain 5 days of oral antibiotic usage (Bactrim: 0.4 mg sulfamethoxazole and 0.08 mg trimethoprim o.d.), daily observations and recordings of body weight. 3 mg/kg of Comforion (100 mg Ketoprofenum/mL) were administered s.c at induction of anaesthesia for pain relief. Animals were individually housed for 14 days until the grafts were either completely healed or had dried out, thereafter the mice were returned to their groups. They then helped each other remove remaining sutures as well as potential residues of the grafts. Moreover, we separated the mice three days prior to surgery, placed them in the post surgery room and introduced Jell-O to stimulate their appetite post surgery. During surgery, we dripped angiotensin II (50fÝL of 10- 7M) in the wound to enhance angiogenesis and better enable the graft to heal. The quoted success rate of 90-95% Alopecia Areata induction in young C3H/HeJ recipient mice within 6-12 weeks after grafting was initially difficult to achieve (60-70% success), with significant concerns over the relative cost to animal welfare. In amended studies, we improved the disease success rate to 60-100%. We also reduced the timeframe of disease induction to 6-8 weeks post grafting. Here we demonstrate our amendments to improve upon the Alopecia Areata model published by Silva & Sundberg. Importantly, we were able to make these practical modifications together with a profound improvement upon body weight, resulting in a model of enhanced utility in animals displaying no overt signs of stress or depression.

Determinants Of Ischemic Wound Healing In Diabetes: A Bipedicule Flap Wound Model In Diabetic Yucatan Miniature Swine

POSTER 3

Kimberly Buckman, BS
Sinclair Research Center

ABSTRACT

Our objective was to understand the relationships between wound sizes vs. ischemic area dimensions in full thickness ischemic wounds using a bipedicule flap model in diabetic miniswine. Full thickness paraspinous chronic ischemic wounds were created in three diabetic miniswine (duration of induced diabetes onset >10 months). The wounds were allocated to the three animals and were comprised of A: six bipedicule ischemic flaps (5 x 15 cm: 75 cm²) with center punch biopsy (diameter: 0.8 cm) with corresponding six non-ischemic control full thickness punch biopsies or B: two larger bipedicule ischemic flaps (9 x 24 cm: 216 cm²) with center punch biopsy (diameter: 5 cm) with corresponding two non- ischemic control full thickness punch biopsies. Each of the flaps had silicone film underlying the flap. Dressing changes were performed 3 times per week until the end of the study at 3 weeks. During dressing changes, all wounds were photographed. Time to complete healing was determined by clinical observation and photographic documentation. The 8 mm diameter punch full thickness wounds on 75 cm² bipedicule flaps showed fully delayed and/or incomplete healing at Day 21 and the flaps did not break down. However, the 8 mm punch biopsies were too small for measuring wound healing rates other than time to complete healing. The 5 cm diameter full thickness wounds on 216 cm² bipedicule flaps did not heal due to apparent ischemic necrosis and the dehiscence of some of the flaps. Our data showed that the 8 mm ischemic wounds showed clear evidence of impaired wound healing in our diabetic Yucatan miniswines. The 5 cm full thickness ischemic wound model showed evidence of impaired wound healing with associated necrosis. Our data suggest that a bipedicule flap wound model with an estimated 2:1 ratio for flap width to height produce wounds that can be useful in diabetic ischemic wound healing research.

Evaluation Of Longevity Of Intracerebroventricle Cannulation (IVC) In Rats And Mice

POSTER 4

Dr. Yiyang Luo, MD
Charles River Laboratories

ABSTRACT

Pharmacokinetic studies and research applications include the direct dosing of compounds to the intracerebroventricle of the brain, which can be achieved via intracerebroventricle cannulation (IVC). IVC patency longevity directly affects study outcomes. In this study, we investigated the patency longevity of the IVC model in rats and mice. **Materials and Methods:** 22 adult male 225–275 g CD rats (CrI:CD® (SD)IGSBR) were randomly allocated into 2 groups of 11 each (GROUP1 and GROUP2). 22 adult male 25–28 g CD-1 mice (CrI:CD-1® IGSBR) were randomly allocated into 2 groups of 11 each (GROUP3 and GROUP4). All animals were provided standard rodent chow and water ad libitum. The study was approved by the Charles River Laboratories IACUC. The animals were anesthetized and a guide cannula implanted in the left lateral ventricle of the brain. Animals were placed in a stereotaxic apparatus. Bregma and lambda were identified and holes were made, through which anchoring screws (4 for rats, 3 for mice) were mounted onto the skull. A guide cannula was loaded onto the holder of the stereotaxic apparatus, the tip of the cannula was pointed directly over the bregma and the zero coordinates recorded. Based on the coordinates, a hole was drilled into the skull and the guide cannula inserted to reach the left intralateral ventricle of the brain. A layer of cranioplastic powder was applied to affix the cannula and cover the exposed portion of the skull, then a small amount of cranioplastic liquid was applied to the powder. Finally, a dummy cannula was inserted into the guide cannula. IVC patency was checked weekly in GROUP1 and GROUP3 animals, and biweekly in GROUP2 and GROUP4 animals for 13 weeks. To check patency, the dummy cannula was removed, the internal injector cannula was completely inserted into the guide cannula and artificial CSF (5–6 µL for rats and 2–3 µL for mice) was slowly injected. The IVC was considered patent if artificial CSF could be injected into the intracerebroventricle without any resistance. **Results:** 2 mice in GROUP3 and 1 mouse in GROUP4 failed to recover from anesthesia. The number of animals that entered the study in GROUP1, GROUP2, GROUP3 and GROUP4 was 11, 11, 9 and 10, respectively. All the animals remained clinically healthy throughout the study and showed similar weight gains postoperatively. During the 13- week study, 7 of 41 animals were removed at various timepoints due to the IVC becoming dislodged and falling off. Animals that completed the study were patent through study end at 13 weeks. In GROUP1, 10 of 11 rats (91%) remained at week 4 and decreased to 8 of 11(73%) at week 13. In GROUP2, 10 of 11 rats (91%) remained at week 7 and decreased to 8 of 11(73%) at week 13. In GROUP3, 9 of 9 mice (100%) remained at week 13. In GROUP4, 9 of 10 mice (90%) remained at week 5 and continued until study end. **Conclusion:** Greater than 70% of rats and 90% of mice completed the 13-week study, maintaining IVC patency throughout. The cause of IVC dislodgement was not determined, but this observation highlights that failures unrelated to catheter patency may occur on longer-term studies, and animal numbers should be adjusted accordingly.

Surgical Animal Models In Support Of 3Rs

POSTER 6

James Nelson
Covance

ABSTRACT

We have developed surgical techniques for portal vein- and recirculating bile duct-cannulation in dogs and lumbar laminectomy in nonhuman primates (NHP) resulting in maintenance of animals in a colony setting for reuse without compromising animal welfare. The 3Rs (replacement, reduction, refinement) are the foundation of animal welfare in research. Animal models are critical for studying xenobiotic metabolism, biomarkers and pharmacological/toxicological effects on the body. Alternatives for the replacement of animals in research are invaluable; however, there is still a need to use live animal models and refinements of methods that reduce the number of animals used are of critical importance. Acute surgical models are available that can be used for sampling of various matrices non-terminally, but these are limited in number of samples and robustness/duration of the model. Study direction, the surgical/research and development team and inlife worked in conjunction to collaborate our efforts. We enhanced our bile duct catheterization procedure to utilize recirculating bile duct catheterization. We created a colony for the hepatic portal vein catheterized animals and reused them after an appropriate washout period. We also integrated serial liver biopsy collections via laparoscopy for a complete hepatic picture for that animal. CSF collection in primates typically is done via percutaneous needle puncture under anesthesia. We performed a hemilaminectomy catheterization which allows for unanesthetized serial CSF collections. Portal vein-cannulated dogs have maintained bidirectional patency for >1 year; recirculating bile duct-cannulated dogs have maintained patency for 6+ months. Lumbar laminectomy NHPs have maintained bidirectional patency for up to 6 months. In all cases, animals recovered completely following surgery, are BAR (bright, alert, responsive), eating and mobile on the same day of surgery and display no signs of pain or distress, indicating exceptional pain management. Animals are commingled in accordance with SOPs and there have been no significant changes in body weight or clinical pathology and no surgical complications. Study designs allow for serial samples of each matrix, as applicable, resulting in complete data sets for individual animals and overall animal use has been decreased substantially. Ultimately, these models provide refined surgical methods to reduce overall animal use without compromising welfare, providing a significant advantage over current techniques and supporting the 3R philosophy. Our findings/techniques can be transferred to other organizations to enhance the 3Rs theory by reducing the number of animals used and providing a high quality level of data.

Safety Analysis Of A Hemostatic Powder In A Porcine Model Of Acute Severe Gastric Bleeding

POSTER 7

Jose Negron-Garcia, MS, SRS
Cook Research Incorporated

ABSTRACT

Non-variceal upper gastrointestinal (UGI) bleeding is a common condition that requires prompt lifesaving therapy and traditional endoscopic treatments require high technical proficiency to perform. This study was conducted to identify any local or systemic histopathologic effects of a hemostatic powder in a porcine model of active, severe, non-variceal UGI hemorrhage. This prospective, non-blinded animal study was performed in accordance with Good Laboratory Practice and Animal Care and Use Guidelines. Six animals underwent gastrotomy and creation of a looped vascular bundle, which was placed into the stomach lumen. The transplanted vascular bundle was punctured with an endoscopic needle–knife to create Forrest grade Ia or Ib bleeding. The hemostatic powder was then applied until hemostasis was achieved. Initial hemostasis was achieved in all animals. Results of pre- and post-treatment coagulation studies were similar. All animals survived at least 9 days postprocedure. The hemostatic powder was not found in any local, regional, or systemic tissues. Gross and histologic analysis of systemic organs showed no infarct, particulate, or embolic effects. No gross or microscopic necropsy findings were treatment-related. The hemostatic powder achieved initial hemostasis (even in animals with spurting arterial bleeding) with no bowel obstruction or unintended luminal effects, no local or regional particulate effects, no systemic embolic effects, and no systemic coagulopathic effects.

Multiple Venous And Arterial Access Ports In A Model Of Extracorporeal Circulation In Yorkshire Swine

Dana Bolgen, BS, RALAT

Wyss Institute for Biologically Inspired Engineering at Harvard

ABSTRACT

Most studies involving extracorporeal circulation require the animal to be under full anesthesia in order to successfully run therapy with multiple access ports. However, anesthesia is known to cause cardiodepressive effects which impact natural flow rates and physiological parameters. The purpose was to develop a clinically relevant model for extracorporeal circulation (ECC) in conscious large animals with multiple venous and arterial access ports to enable monitoring and sampling of clinical physiologic parameters without impacting normal activity and eliminate the cardiodepressive effects of anesthesia. Yorkshire swine (20-45kg) were chosen for anatomical and physiological similarities to humans, to allow extracorporeal flow rates of 150 – 300ml/min. The external jugular veins, the inferior vena cava (IVC) and the right carotid artery were cannulated to provide sufficient ports for central line monitoring, blood draws and administration of medication during ECC. Surgery consisted of bilateral jugular cutdowns to isolate the right and left external jugular vessels and the right carotid artery. The jugular vessels were cannulated with standard venous ECMO cannulae, secured and connected to extension tubing ensuring enough length to safely reach the extracorporeal circuit while limiting the blood volume outside of the body to a minimum (max 10% total blood volume). The right carotid artery was cannulated with a sheath catheter and extension line. All tubing was subcutaneously tunneled using a sharp tip chest tube trocar and exteriorized between the shoulders. A midline laparotomy was performed to access and cannulate the IVC with a sheath catheter. All incisions were closed once catheter was secured and the extension exteriorized. The pigs were recovered from anesthesia and individually housed before ECC. The pig was heparinized to an ACT >450 seconds prior to ECC to eliminate clotting of the circuit. ECC was executed by connecting circuit tubing to both jugular lines via a swivel. Flow was initiated by pumping blood from the left jugular into the circuit then returning via the right jugular at a rate of 200ml/min. This surgical approach allowed successful conscious ECC of 4 pigs without complication for up to 9 hours and allows custom monitoring, sampling and intervention for dialysis, ECMO and other extracorporeal therapies. This model will provide the field with additional techniques and procedures to conduct further research using extracorporeal circuits.

Local And Systemic Effects Of Fibrin* And Octyl-Cyanoacrylate** Adhesives Applied To Lung Lesions In Rabbits

POSTER 9

Marcus Carvalho
Jundiaí Medical School, Brazil

ABSTRACT

Despite continuous surgical advances, the challenge still exists to prevent air leaks after lung surgery. Tissue adhesives can be an alternative to avoid air leaks when used as an adjuvant to manual or mechanical sutures, but there is ongoing debate about their biocompatibility. To evaluate the local and systemic effects of Fibrin and Cyanoacrylate tissues adhesives applied to lung lesions by videothoracoscopy procedures in rabbits. Three groups of 6 white New Zealand rabbits (n= 18) were anesthetized and submitted to videothoracoscopy without any intervention (control group) or to a 2 cm lung incision in the right middle lobe with subsequent application of 1 mL of fibrin (fibrin group) or 1 mL of cyanoacrylate (cyanoacrylate group). Then the residual air of the pleural space was aspirated until complete lung expansion and the incisions closed. In postoperative days 2 and 28 blood samples were collected and assayed for leukocytes and neutrophils counts and determination of the cytokines IL-8, VEGF and TGF levels. After 28 days the animals were euthanized and had their thorax extracted en block, formalized and opened for gross inspection of local pleural adhesions. Lung fragments were removed for histological examination of the cellular infiltrate (fibroblasts, neutrophils and giant cells), neovascularization and collagen deposition. For the statistical analysis, One-way ANOVA was used to compare data of the three groups, and paired t-test to compare the blood results at days 2 and 28. A $p < 0.05$ was considered significant. Both fibrin and cyanoacrylate produced adhesions of the middle lobe to the pleura, with no difference between both groups and the control ($p = 0.051$). Analysis of the local where the adhesive was applied showed an uniform low- cellular tissue infiltrate in the fibrin group, while in the animals of the cyanoacrylate group an intense tissue reaction characterized by dense inflammatory infiltration of granulocytes, giant cells and necrosis was noted. No differences in blood leukocytes, neutrophil counts or in serum levels of cytokines IL-8, VEGF and TGF- $\beta 1$ were observed among all groups at time-points 2 and 28 days. In this experimental study in rabbits, Fibrin adhesive applied to lung lesions permits normal tissue healing, while Cyanoacrylate causes important local inflammatory reactions. Nevertheless, none of adhesive promotes any systemic reaction in this experimental model (this fact has not been well known in case of Cyanoacrylate).

Immunosuppression With Cyclosporine Accelerates The Incorporation Of Non-Vascularized Diaphyseal Massive Bone Allografts. An Experimental Study On The Ovine Femur

José M. Lloris

Valencia University Medical School, Spain

ABSTRACT

There is still a controversy concerning the influence of the immune system on the clinical outcome of bone allograft transplants. Experimentally, immunosuppression has been found to improve incorporation in vascularized allografts. In this work, the osteogenic response induced by decalcified and non- decalcified frozen bone allografts used to repair a femoral diaphyseal defect was assessed in a sheep model with immunosuppression with cyclosporine A (CyA) during a period of 16 weeks after transplant. Institutional Animal Care and Use Committee approved study. A series of 28 skeletally mature animals of 1 year of age and a weight ranging from 35 to 45 kg were included in the study. The experimental design consisted of the reconstruction of a 5-cm in length segmental bone defect experimentally induced in one of the sheep femurs. Allografts were stabilized by means of external fixation. Animals were grouped according the type of bone used for defect repair and the administration of the immunosuppression agent or not. Group I: the bone defect was repaired with a decalcified allograft (12 animals) . Six animals of this group were treated postoperatively with CyA, and other 6 do not receive immunosuppression. Group II: The reconstruction of the defect was performed by using fresh frozen allografts without decalcification (12 animals). Six animals received CyA and other 6 six had no immunosuppression. Control group included 4 animals undergoing bone defect repair by autograft. Cyclosporine A was applied by intramuscular injection in olive oil solution (5 cc total volume) containing 10 mg/kg of the drug the first postoperative month, 5 mg/kg the second and third month and 2.5 mg/kg the fourth month after surgery. The allograft bone incorporation was radiographically evaluated every month until the animal sacrifice. Isolated specimens including the entire femur were assessed histologically by standardized criteria quantifying the biological characteristics of both the graft and the union between the graft and host. Out of the 28 animals, 3 did not complete the study because mechanical failure of the external fixation (1), and infection (2). All these complications occurred in animals treated with immunosuppression (3/12). Four months after surgery, all 9 bone allografts treated with CyA exhibited total repair of the bone defect with complete consolidation of the graft in both proximal and distal osteotomies. In decalcified allografts, some areas of the graft showed no complete osteointegration. In 2 of the 4 frozen allografts, there were findings suggesting lack of bone allograft incorporation. Independently of the allograft type, bone defect repair in CyA- treated animals was indistinguishable from control animals repaired with autologous bone. Only 5 (4 frozen and 1 decalcified) of the 12 allografts with absence of immunosuppressive treatment showed bone consolidation. Histologically, significantly better incorporation was observed in allografts treated with CyA than in those without immunosuppression. Decalcified allografts disclosed better histological incorporation than fresh frozen allografts in CyA-treated animals. Short-term immunosuppression with progressive low-dose CyA improves the otherwise poor biological outcome of cortical bone allotransplants into the sheep femur. Allograft bone healing in animals treated with CyA was almost indistinguishable of that found with autografts. These results suggest an attractive clinical possibility to improve bone allograft survival in patients requiring massive bone allotransplants.

A New Porcine Experimental Model Of Severe Progressive Thoracic Scoliosis Induced By Interpedicular Bent Rigid Temporary Tethering. A Pilot Study

Carlos Barrios

Valencia Catholic University, Spain

ABSTRACT

Numerous experimental procedures leading to a spinal deformity have been reported in various animal models. Using flexible tethering techniques, porcine models of scoliosis have been previously described. These scoliotic curves showed vertebral wedging but very limited axial rotation. In some of these techniques, a persistent scoliotic deformity was found after tether release. To induce severe progressive true scoliosis in a big animal model useful for research purposes, including new corrective therapies. Experimental study using a growing porcine model. Institutional Animal Care and Use Committee approved study with the register number of CEBA 13/277. Animals were housed at a fully accredited animal housing facility with full-time husbandry staff. After 48 hours acclimatization, animals were premedicated with an intramuscular combination of Ketamine (10 mg/kg), Dexmedetomidine (0.1mg/kg) and Azaperone (2 mg/kg), and received a dose of morphine (2.2mg/kg) 30 minutes before surgery. After intravenous cannulation, propofol (2 mg/kg) was used for induction and two percent lidocaine spray was used to facilitate intubation. The anesthesia was maintained with Sevoflurane (1.5%) and Fentanyl (5 µg/kg) was used as rescue analgesic. Scoliosis was initiated on eight pigs by using a unilateral spinal bent rigid tether anchored to two ipsilateral pedicle screws. Five spinal segments were left between the instrumented pedicles. The spinal tether was removed after 8 weeks. Ten weeks later the animals were sacrificed. Conventional radiographs and 3D CT- scans of the specimens were taken to evaluate changes in the coronal and sagittal alignment of the thoracic spine. Fine-cut CT-scans were used to evaluate vertebral and disc wedging and axial rotation. After 8 weeks of rigid tethering, the mean Cobb angle of the curves was $24.3^{\circ} \pm 11.3^{\circ}$. Once the interpedicular tether was removed, the scoliotic curves progressed in all animals until sacrifice. During these 10 weeks without spinal tethering the mean Cobb angle reached $48.8^{\circ} \pm 26.7^{\circ}$. The sagittal alignment of the thoracic spine showed loss of physiologic kyphosis. Axial rotation ranges from 8.5 to 49.2°. There was no auto-correction of the curve in any animal. A further pathologic analysis of the vertebral segments revealed that animals with greater progression had more damage of the neurocentral cartilages and epiphyseal plates at the sites of pedicle screw insertion. Interestingly, in these animals with more severe curves, compensatory curves were found proximal and distal to the tethered segments. Conclusions: Temporary interpedicular tethering at the thoracic spine induces severe scoliotic curves in pigs, with significant wedging and rotation of the vertebral bodies. As detailed by CT morphometric analysis, release of the spinal tether systematically results in progression of the deformity with development of compensatory curves outside the tethered segment.

The Influence Of Growth Blocking Of The Neurocentral Cartilages On The Development Of The Spinal Canal. An Experimental Study In Pigs

POSTER 12

Dr. Rafael Llombart-Blanco, MD
Navarra University, Spain

ABSTRACT

The introduction of pedicle screws in the immature spine may have implications for the growth of the vertebra. The effect of blocking the growth of neurocentral cartilage (NC) is not yet fully defined. Block hypothetically leads to a bilateral symmetrical alteration of the vertebral growth. Using an experimental animal model, our goal is to analyze if a bilateral epiphysiodesis of the NC using pedicle screws is able to induce narrowing of the spinal canal in the thoracolumbar spine. A total of 24 domestic pigs were operated on by bilateral blocking of the NC using pedicle screws. The animals were divided into 4 groups depending on the level of blockage: A, low thoracic levels; B, thoracolumbar transitional hinge; C, upper lumbar spine; and D, blocking of the caudal lumbar level below L5 segment. Different morphological, morphometric and standard radiological parameters were analyzed at the thoracic and lumbar vertebrae of the animals. The deviation from the physiological parameters was established by comparing all parameters obtained in the NC-blocked animals with those acquired in 14 pigs without NC blocking. These animals were considered as the control group. None of the animals that underwent NC epiphysiodesis showed asymmetrical spinal growth inducing deformities in the coronal plane. There was neither rotation nor wedging of the vertebral bodies. Whatever the level involved, NC epiphysiodesis caused shortening of the sagittal length of the pedicles and a subsequent decreasing of the antero-posterior diameter of the spinal canal. These features resulted in a frank spinal stenosis at the operated levels. However, the transverse diameter of the spinal canal was conserved in the coronal plane. In the sagittal plane, blocking of the NC conditioned a lumbar hyperlordosis with compensatory kyphosis of the upper level to the operated vertebra. In conclusion, Symmetrical growth arresting of neurocentral cartilages induces a narrow spinal canal by decreasing the sagittal diameter similar to that observed in patients with achondroplasia. The most affected structure was the development of the vertebral pedicles. These results may have clinical implications: should we limit the use of thoracolumbar pedicle screw in immature patients?

Handwritten notes on lined paper.

Presentation Abstracts

31
YEARS



Friday, Track 1

Control Of Pain And Distress In Swine In The Perioperative Period

Dr. M Michael Swindle, DVM, Diplomate ACLAM & ECLAM
Medical University of South Carolina

ABSTRACT

The presentation will provide specific recommendations for control of pain and distress in the perioperative period in swine based upon >30 years of experience with the models. The program will provide the attendees with specific recommendations to prevent complications to surgical protocols caused by inappropriate selection of anesthetics and analgesics. It will also make recommend non pharmacological procedures to ensure the welfare of porcine models. The author has experience with >10,000 porcine surgical cases. The methodologies which have been developed are the result of personal research, literature reviews, and practical experience working in laboratories around the world. In the authors experience in consulting with other laboratories, inappropriate selection of anesthetic and analgesic protocols are the most common causes of protocol complications. Recommendations for pharmacological control of pain and distress include preemptive analgesia with opioids, NSAIDS, local anesthetics and/or epidural analgesia. Specific recommendations will be made concerning the selection of the agents and discussion of which agents cause the most complications will be provided. Perioperative care techniques developed in our laboratory have made it possible to perform complex surgical procedures with a minimum of complications and these methodologies will be detailed.

NOTES

SURGICAL ADVANCES IN KIDNEY TRANSPLANTATION

Dr. Alexander H. Toledo, MD
University of North Carolina

ABSTRACT

Alexis Carrel described the basic surgical principles of kidney transplantation in 1906. While incredible advances surrounding organ transplantation over the last century have enabled great success, the procedure itself has remained remarkably similar for decades. What scientific achievements occurring today will provide the foundation for tomorrow's surgical advancements? The aim is to investigate what scientific advancements have near-term applications towards the kidney transplant procedure. Specifically, the use of robotics and the development of an artificial kidney are considered in detail. Robotics have proven useful in many other surgical subspecialties over the last 15 years. These advantages are now being applied in kidney transplantation. While it is likely to remain a niche utility, its use in obese patients for kidney transplant is particularly promising. While still several years from clinical practice, the artificial kidney is an exciting development in renal replacement therapy. This modality could even have some advantages over traditional kidney transplantation. Many of the most difficult hurdles to clinical relevance have already been cleared in recent models. The University of California San Francisco model is likely the closest device to clinical practice and will be discussed as a prototype. The evolution of the field of transplantation has seen numerous scientific breakthroughs over the years in immunology, immunosuppression, organ preservation and organ allocation. These advances have allowed for outstanding outcomes in kidney transplantation. However, for many years the essence of the operative procedure has remained unchanged. Exciting advances in robotic surgery and the development of artificial kidneys are poised to dramatically change the field in the near future.

NOTES

Pain Management For Laboratory Animals: Non-human Primates

Mary Ellen Goldberg, BS, LVT, CVT, SRA, CCRA

International Veterinary Academy of Pain Management

ABSTRACT

How to assess and recognize pain in non-human primates plus what management techniques are available will be discussed. What problems can pain cause in Non-human Primates? What analgesics work best? Topics include: analgesics commonly used for Non-human Primates in research, routes of administration and special techniques used for analgesia. We have an ethical responsibility to properly use and care for all research animals.

NOTES

Telemetry Implant In A Ferret Influenza Model

Dr. Lisa Kercher, PhD

St. Jude Children's Research Hospital

ABSTRACT

Part of influenza pandemic preparedness involves characterization of highly pathogenic avian influenza (HPAI) viruses in animal models. HPAI can result in severe illness and there is a need for methods to reduce the pain and suffering of these animal models during experimental infection. Wireless physiological monitoring (telemetry) has become integral in the success of animal research as investigators seek to maximize animal models, analyze and report data efficiently and mitigate potential personnel risk. The information obtained from telemetry will serve as objective measures to use for defining humane endpoints that can help reduce discomfort without compromising study endpoints. We implanted eight ferrets with HD- S21 telemetry devices to collect objective physiological data in a ferret model of influenza. Multiple units in our department were involved, such as Veterinary Services, Technical Services, Husbandry Services, and Biocontainment Services. Animals were induced and maintained with isoflurane anesthesia.¹ Surgeries involved abdominal incisions to gain access to the abdominal esophagus and distal aorta, as well as implantation of EKG leads. The lengthy procedure was first learned on rats and involved a team of two surgeons, two anesthetists, and a person to monitor the equipment on a computer in real time. The procedure was then translated to a ferret which had several challenges not seen in the rat, such as a narrowed thorax that made isolation of the esophagus difficult. This was overcome by using a bolster under the mid-abdominal area that helped to expand the narrow abdominal-thorax area. Respiratory arrest was also an unexpected adverse event in 75% of study ferrets and was overcome with team planning and well-defined roles of CPR.² In all arrested ferrets, problems occurred at 2-2.5 hour's post-anesthetic induction and may have been due to several factors not commonly reported in the literature,³ such as hypothermia and hypercapnia. Future studies may involve the use of a mechanical ventilator. Additionally, this animal model was a challenging surgical model as venous access is also limited. Surgery times took well over 3 hours to complete on average, however, the animals recovered without incident. We found the most appropriate anesthesia regimen to be induction and maintenance with isoflurane and oxygen, and intubation with a 2.5mm uncuffed pediatric ET tube. Post-operative treatment consisted of Buprenex (high and low doses to avoid side effects associated with this drug such as hyporexia and pica), Cephalexin, and Metacam. For each implanted ferret, concurrent data on internal temperature, activity, blood pressure, heart rate, ECG, and respiration rate was obtained. Experimentally, both naïve ferrets and vaccinated ferrets were utilized to demonstrate physiological differences during the course of influenza infection. All eight animals were successfully used after recovery for challenge with HPAI and significant changes in body temperature and blood pressure were seen in experimental groups as compared to control groups.

NOTES

Diabetic Pigs: Anaesthesia And Peri-Operative Management

Dr. Kate Reed, MA VetMB MRCVS

Envigo

ABSTRACT

A diabetic conventional pig model was used to assess the efficacy of a surgically implanted artificial pancreas device. The diabetes impacted upon many aspects of the husbandry of these animals and the procedures that were performed, including anaesthesia and peri-operative care. A number of refinements were made to ensure the best possible animal welfare while meeting the study objectives. Anaesthesia and peri-operative care: Considerations and refinements that became necessary as a result of the diabetic condition of these animals included: a) Pre and post-operative husbandry: acclimatisation, training, feeding and housing b) Anaesthesia and induction of diabetes c) Blood glucose monitoring: skin pricks and implantation and maintenance of a vascular access port d) Other procedures: Device filling/refilling and Oral Glucose Tolerance Tests. e) Uncontrolled diabetes: staff training in emergency protocols for both hypoglycaemia and ketoacidosis. f) Increased susceptibility to infection due to diabetes. Four pigs underwent anaesthesia and surgical implantation of the device. Diabetes was induced successfully in all cases, and all animals recovered well. Through refinement of the skin prick blood sampling technique we were able to monitor their diabetes closely. The vascular access ports remained patent throughout the variable study period and the devices were filled and refilled successfully on multiple occasions.

NOTES

24 Hour Anesthesia In The Ventilated Sheep Model: Trials And Tribulations

Dr. Heather DeLoid, DVM
Wake Forest University

ABSTRACT

This presentation is intended to discuss the development of a 24 hour anesthesia procedure in a ventilated sheep model. Ten sheep (22-30kg) were used under approved IACUC protocols to undergo 24 hours of anesthesia. The purpose of the study was to evaluate and characterize the buildup of mucus and other secretions in the airway over time. Briefly, the animals were anesthetized and prepared using standard methods. Then, they were mechanically ventilated and monitored for approximately 24 hours. Monitoring parameters included HR, RR, EtCO₂, SPO₂, temperature, ECG, indirect BP, direct BP, CVP, air flow rate, oxygen flow rate, inhalant anesthetic level, peak inspiratory pressure (PIP), tidal volume, and urine output. Additionally, blood gas, hematocrit, and total protein values were periodically checked. This discussion will cover the various changes and improvements that were made to the anesthetic procedure during model development from a non- survival model to a survival model, and then back to a non-survival model. A large emphasis will be placed on discussing the various complications that arise during long-term anesthesia and appropriate treatment methods.

NOTES

Validation And Refinement Of The PhysioTel Digital Telemetry System In The Canine For Cardiovascular Safety Studies

Mario Volberg, BS, RVT, SRS, RLATG

Pfizer Inc.

ABSTRACT

Global Safety Pharmacology is currently evaluating the Data Sciences PhysioTel Digital telemetry system (PTD) as an alternative to JET for use on toxicology studies. The purpose of this study was to successfully develop a canine model using the new PhysioTel digital telemetry technology for collection of cardiovascular data. Regulatory guidance requires an appropriate cardiovascular safety assessment for new drugs prior to testing in humans using conscious unrestrained animals. Canine jacketed external telemetry (JET) has been primarily used as an add-on to toxicology studies to collect high quality cardiovascular data such as blood pressure and heart rate, allowing the data to be correlated with other toxicity data such as biomarkers and pathology. JET is a minimally invasive surgery, requires only 1 surgeon, and multiple animals can be implanted in a day. The disadvantages of JET include jacketing of the animals, inconsistent electrocardiogram quality, commitment of resources, and singled housed animals. PTD, in comparison with JET, has many advantages over JET as it promotes enhanced animal welfare (no jackets required), and each transmitter has a unique digital signal which allows for group housing of animals. From a data quality standpoint, the digital signal results in significantly less dropout compared to JET technology, providing increased data quality. However, PTD is a more invasive surgery with increased surgical time that requires two surgeons to maintain surgical efficiency. My talk will describe the surgery involving ten animals that were instrumented with M11 PhysioTel telemetry devices, all of whom recovered with no postoperative complications. A comparison of this new PhysioTel technology with the JET telemetry model is discussed, along with a description of the studies done to validate this model in-house.

NOTES

Pain Management For Laboratory Animals: Rodents

Mary Ellen Goldberg, BS, LVT, CVT, SRA, CCRA

International Veterinary Academy of Pain Management

ABSTRACT

How to assess and recognize pain in rodents plus what management techniques are available will be discussed. What problems can pain cause in rodents? What analgesics work best? Topics include: analgesics commonly used for rodents in research, routes of administration and special techniques used for analgesia. We have an ethical responsibility to properly use and care for all research animals.

NOTES

Friday, Track 2

Thromboelastography-Guided Anticoagulation In Juvenile Sheep Implanted With The Penn State Infant Ventricular Assist Device

Heidi Bixler, BS, CVT

Penn State College of Medicine

ABSTRACT

Precision monitoring of anticoagulation is important in animal studies of circulatory support devices using low-doses of unfractionated heparin. Previous studies using an aPTT target range resulted in hypocoagulability as measured by thromboelastography (TEG). The current protocol is to maintain a 2x normal TEG R-time. TEG is a method of measuring the coagulation properties of whole blood. It measures the length of time to form a clot, the physical properties of the clot, and can be used to determine the global anticoagulation status of the patient. In the pre-operative period, TEG is performed on each animal twice weekly to obtain baseline values. Post-operatively, when heparin is being administered through a constant rate infusion, TEG is performed daily. Heparin infusion rate is adjusted to maintain R-values within the designated range for the study. One ml of whole, uncitrated blood is collected through an indwelling jugular catheter and added to a kaolin activator within 2 minutes of the draw. A volume of 360 μ l is then immediately pipetted into a plain cup and a heparinase cup. TEG, ACT, aPTT, and antifactor-Xa were measured routinely during chronic testing in lambs (23-32kg) with the Pediatric VAD. Four studies with uneventful post-operative courses were electively terminated at 27, 50, 73, and 62 days. Results (mean \pm se) are summarized below. Following a 2 week post-operative recovery period, only the mean TEG R- time differed significantly (*T-test $p < 0.0058$) from pre-op values. The mean TEG R-time was 1.87 times the pre-op mean, which is close to our target range of 2 times normal. At the low level of heparin used in these studies, antifactor-Xa was often below the lab detection limit of 0.1 U/ml, and post-op aPTT and ACT were not significantly different from pre-op normal values. Conclusion: TEG R-time was shown to be the most sensitive measure of anticoagulation level when compared to aPTT, ACT, and antifactor-Xa in this study in ovines using a low heparin dose.

NOTES

Development Of A Chronic Pulmonary Arterial Pressure (PAP) Model In The Beagle Dog

Jennifer Sheehan, BS, SRS, LATG

Envigo

ABSTRACT

The measurement of pulmonary arterial pressure is critical for the efficacy assessment of pharmaceuticals that may have the potential to reduce pulmonary arterial pressure. Many techniques are described in the literature, however most involve an acute assessment or the placement of a Swan Ganz catheter, introduced through the jugular vein and passed through the right atrium and ventricle to the pulmonary artery. However, a permanent catheter through the tricuspid and pulmonary valves has a high risk of causing cardiac insufficiencies, infection and endocarditis. This method would not be suitable as a chronic model for screening compounds designed to alter pulmonary arterial pressure. The most appropriate current model as described in the literature in mongrel dogs and minipigs involves the placement of a catheter directly into the pulmonary artery via a thoracotomy. Beagle dogs are the preferred species because they are the standard toxicology model, so we attempted this approach in beagle dogs using a telemetry transmitter with a gel-filled pressure catheter. This model was unsuccessful due to the unexpected fragility of the pulmonary artery in the beagle leading to tearing of the artery upon securement of the catheter to the vessel. We developed an alternative method to assess pulmonary arterial pressure via measurement of right ventricular pressure. The diastolic pressure in the right ventricle is slightly lower than in the pulmonary artery but systolic pressure is comparable, making it a suitable index. This approach required the placement of the pressure catheter directly into the right ventricle to measure right ventricular systolic pressure as an index of PAP. The model was tested for magnitude and consistency of response by hypoxic challenge via inhalation of 10% O₂. This model demonstrated a predictable and reproducible response that can be used as a screening model to assess efficacy of compounds designed to reduce or prevent elevations in pulmonary arterial pressure.

NOTES

Surgical Writing: From Protocol Development, Conception Of The Research Hypothesis, Data Collection And Publication-Part 1 & 2

Dr. Luis Toeldo, MD, PhD

Western Michigan University Homer Stryker M.D. School of Medicine

ABSTRACT

A hands-on session will address the details associated with protocol development from the conception of the idea and characterization of the hypothesis to integration of the written scientific protocol. Possibility of success will be related to the individual interest and participation in the process. A final written abstract with a completed version of the whole session will be gathered at the end of the this experience. Please bring a research idea (hypothetical or real) to use.

NOTES

Cardiopulmonary Bypass In Multiple Disciplines- More Than Just A Pump!

Jeffrey P Sites, BS, CCT, CBMT, CCP-E

Cardiovascular and Extracorporeal Technologies

ABSTRACT

Cardiopulmonary bypass has been in use since the first application of extracorporeal circulation in 1902. In the ensuing century, technology and physiology concepts evolved together to improve outcomes, refine applications and create methods of research not possible earlier. A detailed discussion of the parallel evolution of an advanced technology for life support, transplantation, surgical management of life-threatening conditions and its application in multiple disciplines: oncology, pulmonary medicine, transplantation of visceral organs, obstetrics and more. The animal lab is the progenitor of the ideas and technologies of the current state of method and technology in the human clinical setting. CPB is a growing need in surgical research. This presentation is intended to bring applied methods back to the laboratory and preclinical study environment to help accelerate understanding of CPB and it's possibilities. Mechanical cardiopulmonary support methods are increasingly applied in preclinical and clinical procedures. Cardiopulmonary bypass (CPB) is the replacement of the function of the heart and lungs in maintaining homeostasis in the corpus. Whole body applications, such as in cardiothoracic surgery (using full body CPB) and partial body bypass. Parts of the body with isolated circulatory support, such as in transplant surgery, dialysis, ventricular assist and others are only a few examples of the versatility of the process. Each application requires unique methods and an understanding of the physiology and pathophysiology- while using components of the CPB system to manage, alter and correct functionality of the target tissue and/or the goal of the procedure. Examples of thermoregulation of tissue for retro-viral and oncology therapeutics, unusual research models and other advanced applications will be discussed briefly and contrasts to whole body applications in will be highlighted.

NOTES

The Use Of An Intervertebral Plate For Lumbar Vertebral Immobilization Following Either Posterolateral Fusions (PLF) Or Posterolateral Intervertebral Body Fusions (PLIF) In Sheep

Dr. H. Vince Mendenhall, DVM, PhD
Consultant in Preclinical Surgery

ABSTRACT

Classically, fusion of intervertebral bodies are immobilized with bilateral pedicle screws and rods. Both procedures can be done through one posterior (dorsal) incision in humans. Adequate access to the intervertebral discs in sheep requires a posterolateral incision with a separate dorsal approach to implant the screws and rods. One procedure must be completed first prior to initiating the second. Pedicle screws are difficult to safely place in the sheep pedicle because of its small size and close relation to the spinal cord. The screws and rods are also quite expensive. The use of an intervertebral body plate to immobilize the space to be fused may alleviate both these issues. Twelve animals were used to evaluate the safety and efficacy of a surgical technique to allow for placement of an intervertebral body bone fixation plate through the same incision as done for PLFs or PLIFs. The animals were positioned in right lateral recumbency and the skin prepared and draped for strict aseptic surgery. The skin incision extended from the caudal aspect of the last rib to over the iliac crest, at the level of the transverse processes. The iliac crest was exposed and the required amount of bone graft removed from it through a cortical window that did not disrupt its contour. The posterolateral aspects of the vertebrae to be fused (usually L3-4) were identified, exposed and cleaned of overlying tissue. An adjustable cervical distractor was then inserted over pins in the bodies of L2 and L5; the vertebrae were distracted approximately 5 mm. An L3-L4 discectomy was then performed, removing the vertebral endplates to a dimension appropriate for the spacer for PLIFs; for PLFs, the autologous bone was impacted into a similar sized space. Intervertebral body plates: A single intervertebral body plate was then placed over the vertebral bodies extending from L2 to L5. The appropriate sized bone screws were then placed into each vertebral body, taking care to direct them ventrally in order to avoid the spinal canal. The drill holes used for the distractor pins could also be used for some of these screws. Closure was routine in three layers. A short plate was used with two screws placed both dorsally and ventrally in the first two animals in this study. The dorsal screws were found to have entered the spinal canal, impinging upon the spinal cord. Subsequently, a long plate was used, so that only one ventrally placed screw in the two vertebral bodies both cranial and caudal to the fused segment could be used; still, two cortices were engaged both cranial and caudal to the segment being fused. This proved to be adequate for solid immobilization. All animals except the first two recovered normally with no adverse clinical signs for the duration of the study (26 weeks).

NOTES

Saturday, Track 1

Development Of A Rabbit Model For Comprehensive Vital System Monitoring

Michael Horsmon, MS

US Army Edgewood Chemical Biological Center

ABSTRACT

Improving the quality of physiologic data collected from research animals in toxicology studies is key to the advancement of animal research. This is most easily accomplished by collecting as much data as possible from a single animal, thereby reducing animal use and error associated with satellite groups. The present study investigates the feasibility of applying two implantable telemetry devices capable of providing data on animal activity, core body temperature, blood pressure (BP), electrocardiogram (ECG), electroencephalogram (EEG), and impedance-based respiratory parameters in the rabbit. As well as a discussion of techniques which were successful versus those which were unsuccessful. Six New Zealand white rabbits were implanted with two telemetric devices one device is placed in the abdominal cavity while the other is placed subcutaneously between the scapulae. The first task was to develop an optimal implantation technique that yields calibrated tidal volume (Vt) measurements within 10% of those obtained simultaneously from a pneumotachograph (PNT), low noise ECG, stable BP, and regular EEG. The second task was to challenge with a known respiratory stimulant and a seizure inducer (doxapram HCl, 5.0mg/kg I.V. and bicuculline HCl (0.2mg/kg I.V. respectively) to assess linearity of the calibration across a range of Vt and confirm EEG electrode placement captures generalized seizure activity. Of the three impedance electrode placements attempted, only one resulted in calibrations consistently under 10% error. Optimal impedance electrode placement results in calibrated Vt measurements within 1.7% ($\pm 1.6\%$) of those obtained from a PNT during normal tidal breathing, 6.0% ($\pm 3.6\%$) following doxapram HCl injection and 7.3% ($\pm 4.4\%$) following saline injection. Vt range for normal tidal breathing and saline injection was 9-15mL, and following doxapram injection was 25-30mL. Similar error ranges were associated with derived flow parameters. Increases in mean arterial pressure of 25.0mmHg ($\pm 6.82\text{mmHg}$) and decreases in heart rate of 56.3bpm ($\pm 6.82\text{bpm}$) were associated with doxapram injection only. In all cases, the two electrode EEG placement was able to detect generalized seizure activity induced by bicuculline administration. No departure from normal body temperature was observed in any group.

NOTES

Novel Telemetry Implantation Of D70-Cctp Transmitter (EEG,ECG,BP) And VAP In Young Gottingen Minipigs

Dr. Oscar A Bermeo Blanco, DVM, RLATG, SRS
Battelle

ABSTRACT

The advantages of implantable wireless telemetry for neurological research on freely moving young Minipigs. No confounding variables associated with external complicated wiring and tethering systems. Continuous collection of EEG,ECG,BP, Temperature data over hours, days, weeks and real time acquisition data. We produce an acceptable Surgery Research model to be use in critical Neurological, Cardiovascular and Toxicology Research. I worked with Investigators within my business unit to understand their needs and goals of their intended research then I provided solutions using previous experiences with telemetry in research models. Initially we use two young farm pigs for our pilot study and then we implanted 16 young Gottingen Minipigs for the final study. The results were based on the successful ability to continuously collect data like EEGs, ECGs, heart rate, blood pressures, temperature etc. and blood collections from Gottingen Minipigs between 8-15 Kg implanted with Radiotemetry transmitters D70-CCTP and 1 Cath in Cath II system VAP.

NOTES

Pain Management For Laboratory Animals: Tricks Of The Trade

Mary Ellen Goldberg, BS, LVT, CVT, SRA, CCRA

International Veterinary Academy of Pain Management

ABSTRACT

Discussions will take place on how to best utilize the support and knowledge of pain management in your research protocols. What is pain? What is the Pain Pathway? What medications work where in the pain pathway? What factors to consider when determining analgesic protocols? What are detrimental effects of pain? Recognition of Pain in Laboratory Animals Pain Classification in Protocols Does it Matter? What about Pain Scoring? And Pain Scales? Are there concerns for working with painful patients? Pain Management is absolutely necessary for animal research. There are certain studies where analgesia may not be used, but overall it is not only better for the animal subject but also for study results..

NOTES

Surgical Technique For Collection Of Right Ventricular Systolic Pressure (RVSP) In The Rat

Leslie J. Stoll, SRS, LATG, LVT
Charles River Laboratories

ABSTRACT

This abstract describes surgical techniques, refinement of techniques with experience and the successful catheterization of the right ventricle of the heart for blood pressure data collection in the rat and the sometimes humorous trials and tribulations of a large animal surgeon learning techniques in rodents. The rat is a species that is commonly used as a suitable model of pulmonary hypertension and other cardiovascular assessments. Right jugular catheterization with a custom catheter, advanced into the vena cava, then the right atrium, terminating in the right ventricle is used to monitor and collect data using pressure waveforms generated transducer signals to computer software. The purpose of my presentation is to show the techniques that enabled me to reliably and consistently cannulate an approximately 200-250g nude rat quickly and efficiently. Monocrotaline (MCT) induced pulmonary hypertensive nude rats were anesthetized with induction with Isoflurane and further anesthetized with Ketamine/Xylazine by intraperitoneal injection. A right jugular cut down was performed and the vein isolated. The vessel was cannulated with a custom 2.8 French polyurethane catheter with a 15° curve at the tip and advanced into the right ventricle of the heart in close proximity to the pulmonary valve. The catheter was flushed with heparinized saline and connected to a BD DTX Plus disposable pressure transducer. A Data Sciences International Ponemah software application, P3 Plus was used to collect pressure waveform data for at least 2 minutes after wave stabilization was achieved. Following data collection, the rat was humanely euthanized IP with injectable euthanasia solution. Jugular catheterization and cannulation of the right ventricle of the heart is a relatively simple procedure and can be performed efficiently and effectively with the correct instruments, techniques, practice and patience.

NOTES

Pain Management For Laboratory Animals: Rabbits

Mary Ellen Goldberg, BS, LVT, CVT, SRA, CCRA

International Veterinary Academy of Pain Management

ABSTRACT

How to assess and recognize pain in rabbits plus what management techniques are available will be discussed. What problems can pain cause in rabbits? What analgesics work best? Topics include: analgesics commonly used for rabbits in research, routes of administration and special techniques used for analgesia. We have an ethical responsibility to properly use and care for all research animals.

Is Your Job Worth Losing Brain Cells? Reduce Your Exposure To Waste Anesthetic Gas Now!

Janet Wolforth, LVT, LATG
University of Michigan

ABSTRACT

Induction chambers are commonly used to anesthetize small animals. Following induction, the chamber is opened to remove the animal. We have measured up to 200 parts per million (ppm) of waste anesthetic gas (WAG) escaping from a 1 liter chamber. Can using a flushing system to push accumulated anesthetic gas out of a chamber before opening, reduce exposure to hazardous anesthetic waste gas and provide a safer procedure for veterinarians, technicians, and researchers to use induction chambers to anesthetize animals. All animal use was approved by the IACUC and conducted at the University of Michigan by Janet Wolforth and Dr. Melissa Dyson, who are both interested in reducing exposure to waste anesthetic gas. We used halogenated gas monitoring badges as well as an infrared ambient gas analyzer to measure the amount of gas escaping from a 1 liter induction chamber with and without flushing the chamber before opening. Personnel using induction chambers to anesthetize rodents are regularly exposed to isoflurane emissions. Flushing the induction chamber before opening significantly reduces isoflurane concentration in the air 2 cm above the chamber but did not significantly reduce isoflurane concentration at user height (45 cm above the chamber) according to samples taken in real time. Results obtained from the halogenated anesthetic gas monitoring badges suggest that isoflurane exiting the induction chamber could, over time, accumulate in the user's environment. All samples collected at the vent of a vertically positioned activated charcoal filter had isoflurane concentrations well below 2.0 ppm (the daily exposure limit set by NIOSH), all samples collected at the vent of a horizontally positioned filter had isoflurane concentrations greater than 2.0 ppm.

NOTES

Saturday, Track 2

Opportunities For Veterinarians And Technicians In The Field Of Research

Dr. Jennifer Shockley, DVM
Xenometrics

ABSTRACT

This presentation will provide the attendees/audience with an insight of the role of the veterinarian and veterinary technicians in preclinical research. One of the primary focuses will be general surgical procedures and reasons for performing the procedures. In addition, the presentation will also touch on the requirements of high standards of animal welfare within contract research organizations. This session will be beneficial to laboratory technicians, surgery assistants, veterinary technicians and all those who aspire to be.

NOTES

Organ Bioengineering And Regeneration As The New Holy Grail For Organ Transplantation

Dr. Giuseppe Orlando, MS, PhD
Wake Forest School of Medicine

ABSTRACT

Organ transplantation (OT) remains a half way technology, despite the progress achieved in the past decades. Moreover, in view of the excellent results achieved to date, the demand for organs is escalating whereas the supply has reached a plateau. Consequently, waiting times, mortality and dropout rate on the waiting list are increasing dramatically. Recent groundbreaking achievements in organ bioengineering and regeneration (OBR) have shown the immense promise to meet the most urgent needs of modern organ OT, namely the identification of a new inexhaustible source of organs and immunosuppression-free transplantation. As investigators are focusing their interest on the utilization and manipulation of autologous cells, ideally the end product will be the equivalent of an autograft such that the recipient will not require any antirejection medication. Achievement of an immunosuppression-free state has been pursued but has proven to be a difficult odyssey since the early days of the transplant era, yet an immediate, stable, durable, and reproducible immunosuppression-free state remains an unfulfilled quest. Therefore, organ transplantation should switch interest towards a OBR-focused type of research and OBR should become the new holy Grail for OT.

NOTES

Surgical Implantation Of Intrathecal Pumps And Csf Access Ports Via Laminectomy, In The Vervet Intrathecal Catheterisation In The Rat

David S. Moddelle, SRS

RxGen/St Kitts Biomedical Research Foundation

ABSTRACT

The Caribbean-derived African green monkey, or vervet (*Chlorocebus sabaeus*), has been instrumental in the study of various neurological diseases and processes for over 40 years and represents one of the most widely used Old World nonhuman primate species in preclinical research. This presentation will explore the processes and procedures, model consideration and changes made to support surgical implantation of intrathecal pumps and cerebrospinal fluid (CSF) access ports in the green monkey. Development of the surgical strategy was necessary to support long-term efficacy studies and near term pharmacokinetic studies requiring continuous delivery of test articles into the intrathecal space and serial CSF sampling for drug and biomarker analyses. Eight (4 intrathecal dose and 4 IV bolus) males were chosen for this project. All animals received both port and a pump while the pump for the IV bolus group delivered saline as a control. All animals were prepped accordingly and under IACUC approval. A L4/L5 laminectomy was performed exposing the dura for placement of 2, side by side, 6-0 prolene purse-string sutures. A durotomy was performed in the center of each suture for access to the intrathecal space. On one side a 3 FR silicone catheter attached to a SMP 200 micro-infusion pump (iPRECIO, Alzet) was inserted and cranially advanced ~ 2.0 cm. A 3.5 FR CBAS catheter was then cranially advanced ~ 5.0 cm through the other durotomy. CSF flow was confirmed prior to connection to a VAP; PortHold Ti SoloPort MIN, Solomon Scientific. Any resistance met during insertion required the catheters to be removed and attempted again. The sutures were then closed and anchored around the catheters. Bone material, generated during the laminectomy, was placed into the vertebral defect to facilitate closure and covered with Gelfoam. The pump and port were placed into subcutaneous pockets located lateral to the laminectomy sites and anchored to the underlying muscle bed. All muscle, fascia and skin incisions were closed appropriately. The same surgeon was utilized for all animals to limit surgical variability. All animals received post-operative NSAIDS, analgesics and antibiotics and recovered normally. None of the animals exhibited any paresis or complications associated with urinary or bowel function. Complications noted as one animal found dead in the cage on day 8 (due to phlebotomy complications), the CSF access port from one (1) animal became non-patent at day 21 CSF collection and one animal exhibited seroma formation around the pump implant requiring surgical re-anchoring.

NOTES

Embracing The Three R's; Surgical Procedures To Repair Chronically Instrumented Animal Models

Jon Ehrmann BS, SRS, SRA, LATG
Bristol-Myers Squibb

ABSTRACT

As Bristol-Myers Squibb requires, when animals are used for research or testing, serious consideration is given to finding innovative, scientific ways to: replace animal research and testing with other methods, reduce the number of animals used, and refine procedures to enhance animal welfare. These principles are applied to all aspects of our research, including development of surgical animal models. In the past, if a complex chronically instrumented surgical model failed, unless it was repaired, the animals involved could not be used on additional studies. We have spent several years developing surgical procedures to repair chronically instrumented animals, and by refining our surgical methods, we have reduced the total number of animals used. This presentation will focus on surgical procedures to correct issues with three commonly used surgical models in dogs and non-human primates: telemetry implantation, cerebrospinal fluid collection catheterization and vascular access port implantation.

NOTES

Surgical Animal Models For The Preclinical Testing Of Potential Chemotherapeutic Agents

Dr. H. Vince Mendenhall, DVM, PhD

Consultant in Preclinical Surgery

ABSTRACT

"Specialized" toxicology is that branch of toxicology that deals with the administration of test articles to appropriate animal models by methods other than oral or parenteral routes. This is especially applicable to chemotherapeutics, since a systemic dose of such agents is likely going to be toxic, but administration to a confined local area may be therapeutic.

Most chemotherapeutic agents are designed specifically to destroy rapidly growing cells, but normal healthy cells also grow and multiply, and some more quickly than others. Chemotherapeutic agents, therefore, can also affect normal cells, as well as the "cancer" cells. Thus, their parenteral administration may result in significant damage to healthy tissue.

Methods by which potentially effective chemotherapeutic agents can be delivered directly to cancer cells without affecting others is known as "targeted drug delivery". These methods allow for very high and efficacious local concentrations of the agent with minimal effects to the entire organism.

This method of administration, however, requires specialized surgical instrumentation of an appropriate animal model to allow for drug administration to the site/organ/tissue of interest. Also, multiple administrations should preferably be done in a conscious animal in a way that induces minimal stress.

Employing these methods will require surgical manipulations of varying complexities in order to allow for the implantation of an appropriate catheter and generally, a vascular access port (VAP) or infusion pump (or both) as well.

The surgical methods in suggested animal models to allow for targeted drug delivery to the (1) intrathecal (subarachnoid) space in the cerebral ventricles and (2) spinal cord areas, as well as to the liver via the (3) hepatic artery and/or (4) portal vein, (5) the chambers of the eye and (6) conjunctiva, as well as (7) intracystic (urinary bladder), (8) intrasplenic, (9) myocardial, (10) the hypophyseal-thalamic portal system, and even (11) local delivery via various coatings on implantable devices (orthopedic, vascular, ophthalmic, etc.) will be discussed and demonstrated.

NOTES

Bile Duct Catheterization In Rats

Brad Gien

Envigo

ABSTRACT

To improve animal welfare and increase catheter patency in a rat bile duct catheterization model. This project was initiated due to previous variability in patency results and findings of moderate adhesions in the surgically modified area during necropsy. The purpose of this project was to address issues of adhesions at the catheter implant sites (bile duct and duodenum) which will improve animal health and welfare. If the levels of adhesions are decreased to minimal levels the catheter patency will be extended beyond our current levels. This project began as a result of the amount and severity of adhesion at the implant sites and decreased patency from the bile duct catheter. A study was initiated to evaluate then current surgical Bile Duct – Duodenal catheterization model. After completion of the in-life portion of this study necropsies were performed and findings were gathered and analyzed. It was noted that there were high incidences of moderate to severe adhesions of the Liver, Bile Duct, Duodenum, Spleen, Stomach and Intestines. Catheter placement was very difficult to determine due to the severity of the adhesions. Working with our surgical team leaders and our senior surgery technicians a new catheter design was developed, surgical techniques were refined and refined surgical instruments were acquired. We conducted 5 separate cohorts of study animals with the newly improved catheter, instruments and techniques and measured catheter patency during a set time period. Necropsies were performed on every animal to determine the levels of adhesions and surgical proficiency. The result of this group of studies was improved animal health and welfare and an improved surgical model for Bile Duct catheterizations. Catheter design changes made it easier for the surgeon to insert the catheter into the bile duct and required less manual manipulation of the surgical area, resulting in fewer adhesions in that area. The bile duct implanted end of the catheter was redesigned to have a larger inside diameter which more accurately matched the inside diameter of the bile duct itself. This change allowed the bile to flow more naturally and therefore increased patency of our model. The technique changes allowed the surgeons more flexibility when placing the catheters inside of the abdominal cavity resulting in less damage to surround tissues and they were less prone to kinking and twisting. The use of refined microsurgical instruments made it easier for the surgeons to implant and exteriorize the catheters, decreasing the time for surgical completion. A reduction in surgical time improved animal welfare by faster recovery times and caused less abdominal adhesions. Replacement of some of the sutures used to secure the catheters inside of the abdominal cavity with small amounts of tissue adhesive decreased surgery time and the amount and severity of the adhesions. Overall the changes made to the catheter, technique and instruments had a significant increase in animal welfare, positive surgery outcome, increased patency and surgery technician welfare. The changes resulted in a decreased amount and severity of adhesions in the abdomen. An unexpected result of this study was the decrease in time it took to complete the surgery which had a positive effect of animal and technician welfare.

NOTES

Keynote Speakers

31
YEARS



3D Bioprinting For Surgical Applications

Dr. James J. Yoo, MD, PhD

Wake Forest Institute for Regenerative Medicine

ABSTRACT

Advances in tissue engineering and regenerative medicine have led to the development of many clinical therapies. However, challenges still exist in developing complex tissue systems. One challenge that hampers rapid clinical translation is the lack of effective delivery methods for cells and biomaterials to build complex tissue constructs. Living tissues maintain inherent multi-cellular heterogeneous structures, and rebuilding of such complex tissue structures requires subtle arrangements of different cell types and extracellular matrices at their specific anatomical target sites. 3D bioprinting has emerged as an innovative tool that enables rapid construction of 3D cell and tissue structures with complex geometries. This developing field promises to revolutionize the field of medicine addressing the dire need for tissues and organs suitable for surgical reconstruction. In this session novel and versatile approaches to building tissue structures using 3D printing technology will be discussed. Clinical perspectives unique to 3D printed structures will also be discussed.

NOTES

Standing On The Shoulders Of Giants: Dean Franklin And His Remarkable Contributions To Physiological Measurements In Animals

Dr. R. Dustan Sarazan, DVM, PhD
Data Sciences International (DSI)

ABSTRACT

The use of electronic instrumentation to monitor physiological function in conscious research animals and humans has become routine. Beyond basic research, animal studies using these methods are required by government regulatory agencies worldwide before human testing of potential new drugs. Living, as we do, in an age of miniaturized high-tech electronic devices, we are accustomed to believing this technology is easy; however, this has not always been the case. While a broad supporting cast of engineers, physiologists, fellows, and technicians was involved, the true innovators were Dr. Robert Rushmer, Dr. Robert Van Citters, and Mr. Dean Franklin. Before Dean Franklin's death in 2007, the primary author recorded 5 h of interviews with him at his home in Columbia, MO. An additional approximate 1.5-h interview was recorded with Dr. Van Citters via telephone. The information contained herein is based on the recollections of these men as recorded in their interviews.

NOTES

Post-Surgical Pain: Etiology, Pharmacology And Complications

Dr. Jim Pomonis, PhD

American Preclinical Services (APS)

ABSTRACT

The need for anesthesia is a clear demonstration that surgeries are painful. The causes of pain associated with surgery are generally obvious – incisions are made in several organs or tissues including skin and muscle, peripheral nerves may be cut or stretched, while other tissues such as bone may be drilled or subjected to implantation of foreign objects. Yet each type of tissue damage produces distinct biological responses that generate unique pain phenotypes each type responding to different pharmacological interventions. The pain associated with surgery can be further complicated by the phenomenon of persistent post-surgical pain (PPP), which lasts well beyond the normal healing process, often for years following surgery. This presentation will describe the basic neuroanatomy and neurochemistry underlying post-surgical pain as well as methodology for assessing pain in various species. Building on that, models of post-surgical pain involving soft tissue, bony tissue, and peripheral nervous tissue will be discussed and examined for their utility as translational tools for drug discovery and the improvement of surgical procedures.

NOTES

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