35th Annual Meeting of the

Academy of Surgical Research

35 YEARS

September 25 - September 27, 2019

Clearwater Beach, Florida
Hilton Clearwater Beach

"The Future is Bright: Medical Advancements, Growth and Opportunity."

"The glory of medicine is that it is constantly moving forward, that there is always more to learn. The ills of today do not cloud the horizon of tomorrow, but act as a spur to greater effort." William James Mayo

"Limitless is your potential. Magnificent is your future." Gordon B. Hinckley

The 35th Annual Academy of Surgical Research Meeting will include new, novel and refined models, methods and materials in the arts and sciences of experimental surgery. Every new idea or refinement comes with challenges and stories along the way-- so let's listen and share our experiences with each other, as we continue to journey together to advance the field of surgery in all aspects of research, education and the development of products for clinical applications.

Learn about surgical research and surgical challenges in areas including:

- Anesthesia and Pain Management
- Suturing
- Cardiac Surgical Models
- Neurological Surgical Models
- General Surgery
- Telemetry
- Infusion and Ports
- Refinement, Replacement and Reduction Innovations
- Ethics and Welfare
- Model Development
- Medical Devices

Meeting attendees will have the opportunity to network with speakers and presenters, colleagues and friends. The meeting will offer diverse scientific content that will promote and encourage the advancement of the field of experimental surgery.

Academy of Surgical Research

Thank You to the following Corporate Partners for their generous contributions:

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ACADEMY OF SURGICAL RESEARCH

Welcome

Welcome to Clearwater Beach, Florida! Clearwater Beach is known for breathtaking sunsets, white sand beaches, most consecutive days of sunshine (768!), and being the location of the 35th Annual Meeting of the Academy of Surgical Research! The ASR annual meeting is an opportunity to connect with professionals around the globe to share ideas, refinements, successes, failures (and how they were overcome), and advancements in the field of surgical research. The breadth of knowledge of the keynote speakers, presenters and instructors is humbling, and I am proud to be part of an organization that includes such a diverse and talented membership.

I'd like to thank the Program Chair, Jenifer Sweet, for putting together this year's comprehensive program. There is an incredible amount of work that goes on throughout the entire year to ensure we bring together an amazing program with compelling keynote speakers, scientific presentations, exhibitors, advanced wet labs and networking events. Jenifer and the Program Committee have knocked it out of the park this year and even added some fun, new features such as photo ops, vendor bingo and ASR swag!

The wet and dry labs offered this year include targeted delivery routes and complex animal models. There is nowhere else where you could get hands on experience with such a wide variety of specialized techniques and surgical models all in one place. Special thanks to all the wet and dry lab instructors and assistants who have offered to share their time and expertise in the name of education. Also, to Margi Baldwin for her support in organizing the wet labs at the University of South Florida and ensuring the ASR attendees have the best possible experience.

There are several exhibitors joining us this year who contribute an enormous amount to the Academy in the form of products, experience, support, advice and information. Please take the time to visit the exhibitors to see what exciting and new products they have and become familiar with the valuable resources they offer. Don't forget to fill out the bingo board for a chance to win a gift card!

This year has brought many exciting updates for the Academy, including a completely re-designed website. If you have not done so already, please explore the new website on your PC or mobile device to update your member profile and see all the Academy has to offer. Very special thanks to Heather Bogie for competently and efficiently leading the website re-design and Andy Henton from InsideScientific for making it happen! We have also incorporated many of your suggestions from the membership survey, such as offering multiple submission formats (topic lectures, panel discussions, workshops, scientific sessions), including more rodent wet labs and topics, and ending the conference after the awards ceremony lunch on the 2nd day.

Best of luck to all those sitting for a SRA, SRT, or SRS certification exam! Obtaining a certification through the ASR is certainly an achievement to be proud of - the future is bright!

Finally, thanks to the ASR Board of Directors, the committee chairs and members, our corporate sponsors, and Jim Manke and Kathi Schlieff. "Alone we can do so little; together we can do so much." – Helen Keller

It is with great pleasure and excitement that I welcome you to Clearwater Beach and our 35th annual meeting!

Jennifer Sheehan
2019 ASR President

2019 ASR

PRESIDENT

Jennifer Sheehan, BS, SRS, LATG

Director, Toxicology Operations
Covance Laboratories

Jennifer Sheehan is the Director of Toxicology Operations at Covance Laboratories in Somerset, New Jersey. She earned her Bachelors of Science degree in Animal Science at Rutgers University and started as a Surgical Technician shortly thereafter. Throughout her career, Jennifer has been involved in the development and refinement of surgical models in multiple species, and for many years led a global team focused on promoting best practice in surgical research. She is certified as a Laboratory Animal Technologist (LATG) and obtained her Surgical Research Specialist (SRS) certification in 2003.

Jennifer has been an active member of the Academy of Surgical Research since 2001 and was the Chair of the Communications Committee for 4 years. She has served on the Board of Directors since 2015 and is currently the President for 2019.

Welcome

It is with great pleasure and pride that I extend a heartfelt welcome to the 2019 Academy of Surgical Research annual meeting in Clearwater, Florida. Welcome to the Sunshine State! Get out those sunglasses because this year's theme is 'The Future is Bright: Medical Advancements, Growth and Opportunity." As we gather, I urge all to reflect on the foundations of the Academy's success, how we as an organization and surgical research community have grown throughout the years, what we have accomplished, and what we have yet to dream.

In the next few days, I hope you will take advantage of every opportunity to expand your knowledge by attending a variety of lectures, networking with the field's leading professionals and re-invigorating your career through continuing education hours. The Program Committee has worked hard to create an agenda consisting of stimulating and informative content. We have 4 excellent keynote speakers, expert instructors for wet and dry labs and inspired lecture topics. Make sure to take part in round table discussions, meet our ASR Mentors, and become acquainted with the exhibitors to view products essential to the research we conduct. Also, be on the lookout for opportunities to unwind. Join us at the reception and take part in the auction. Enjoy 'America's #1 beach" while you network and take advantage of the new ASR photo backdrop with friends and colleagues.

I want to express my sincere gratitude to the Program Committee, our generous sponsors, exhibitors, key note speakers, lab instructors and all others involved in this year's program.

It's an exciting time for ASR as we continue to grow and adapt. Thank-you for attending our annual conference and bringing your expertise to our gathering. You are the surgical research leaders that will pave the way into the future.

Jenifer Sweet

2019 Academy of Surgical Research Program Chair

PROGRAM

CHAIR

Jenifer Sweet, BA, SRS, LAT

Charles River Laboratories , Mattawan

Jenifer Sweet is a highly driven Associate Director/Senior Surgical Scientist at Charles River Laboratories, Mattawan. She has a Bachelor of Arts degree in Science from Kalamazoo College, and maintains SRS and LAT certifications. Jenifer has over 19 years of surgical research experience and is often described as a soft-spoken, 'sweet" perfectionist. Her focus and passion for surgery has allowed her to excel in an array of specialties ranging from rodent microsurgery to large animal orthopedics. Outside of the operating room, Jenifer manages a group of 7 skilled SRS-certified surgical scientists, drafts surgical protocols, manages internal pilot protocols and spends as much time as possible enjoying the outdoor wonders of Michigan with her family and dogs.

Jenifer was introduced to the Academy of Surgical Research (ASR) by colleagues in 2003 and was awarded the Barry Sauer award for her SRS certification in 2004. In the years following, Jenifer continued to be highly involved in ASR through posters, lectures, lab instruction, and behind the scenes organization. She held a position on the certification committee from 2006-2014, was elected director at large in 2017, and is currently the Membership Committee Chair. Jenifer truly believes she would not be where she is today without ASR and is excited for the opportunity to contribute as much as possible to help advance the organization in progressive times, cultivate new members, and continue sharing knowledge within the field.

Program Committee

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

Randy Pielemeier, LVT, BS, SRS, LATG
Charles River Laboatories, Mattawan

Susan Fleming
Colonial Medical Supply

Tracy Ziegelhofer, SRS, LATG, BS
Covance

Jose Negron-Garcia, SRS
Cook Medical Inc.

Leslie J. Stoll, SRS, LATG, RVT, AS
Charles River Laboratories

Lisa Johnson, SRS, RLATG, BA
Toxikon Corporation

Jon Ehrmann, SRS, SRA, LATG BS
Bristol Meyer Squibb Company

Heather DeLoid, DVM
Wake Forest Innovations

Heather Bogie, BS, SRS, RLATG, CVT
Data Sciences International

Brad Gien, BSc
Envigo

Jennifer Sheehan, SRS, LATG, BS
Covance

Scott Stoll, Pre-Press Technician
Fort Dearborn Inc.

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Directors at Large (2017-2020)
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Jen Sweet, SRS, BS, LAT

Directors at Large (2018-2021)
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Heather DeLoid, DVM, BS

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Jen Sweet, SRS, BS, LAT

Strategic Planning Committee
Jennifer Sheehan, SRS, LATG, BS

Journal Editor
Dr. Marc Basson, MD, PhD, MBA

Education Foundation
Lisa Johnson, SRS, RLATG, BA

A S R

ASSOCIATION MANAGER

Jim Manke, CAE

Association Solutions, Inc. (ASI)

Jim Manke is owner and founder of Association Solutions, Inc. (ASI) since 1998. ASI is headquarted in Minneapolis and has a client portfolio of seven associations. Jim started in the association business in 1977. He served for 14 years as Executive Director of the Minnesota Association of REALTORS, a 12,000 member association.

In 1996 he was selected by the National Association of REALTOR, the largest trade association in the country, to serve as their Chairman of the Executive Officers Committee. That role led him to working with numerous REALTOR associations around the country on developing strategic plans to boost their value propositions to the membership. It eventually culminated in his working with the startup of the Russion REALTORS Guild to introduce free market thinking and processes into their members' business operations.

Back in 2002, Association Solutions Inc., became the management arm of the Academy of Surgical Research.

A S R

SENIOR ACCOUNT MANAGER

Kathi Schlieff

Association Solutions, Inc. (ASI)

Kathi serves as senior account manager at ASI. She has supported ASR since 2004. She is responsible for all aspects of the Annual Meeting, the Certification Program and responding to membership questions.

Prior to that she worked 15 years with the Minnesota Independent Insurance Agents and Brokers Association as their Director of Education.

In that role, Kathi was responsible for all aspects of the CIC certification Program. During her tenure, the CIC program achieved an all time high in participation and profitability.

Jim and Kathi are married, have five daughters and five grand-babes.

KEYNOTE

SPEAKER

Dr. David Serota , Ph.D., D.A.B.T.

President and Principal Scientist, 7th Inning Stretch Consulting LLC

David G. Serota, Ph.D., D.A.B.T. is president and owner of 7th Inning Stretch Consulting LLC, an independent consulting organization established in late 2016, which focuses primarily on drug safety testing and best practices in working with preclinical contact research organizations (CROs) in the conduct of the required safety testing to bring a compound into clinical testing. He received a B.S. in pharmacy from Auburn University in 1969 and a Ph.D. in toxicology from the University of Tennessee Medical Center in Memphis in 1976. He became a diplomate of the American Board of Toxicology in 1981 and has re-certified seven times.

Prior to setting up his consulting organization, Dr. Serota spent almost his entire 40-year career within the preclinical CRO industry, serving as both a senior scientist (study director) and as a corporate leader. From 1976-1991, he served at Hazleton Laboratories in Vienna, VA as both a senior staff scientist and director of laboratory operations. From 1991-1997, he served at Southern Research Institute in Birmingham, AL as director of toxicology, and from 1997-2016, he served at MPI Research in Mattawan, MI in multiple scientific and senior leadership roles, culminating with the position of senior vice president and director of research. Dr. Serota has served as the study director on over 1,000 technical reports for commercial and government sponsors relating to toxicity and safety studies at all three organizations that he has been associated with. He has authored 14 scientific publications and two book chapters, he has chaired 3 different symposia at scientific meetings, he has been an invited speaker at two dozen scientific meetings, and he was the commencement speaker of the Auburn University graduating pharmacy class in 2016.

Dr. Serota has been a member of the Society of Toxicology for over 30 years, serving as a committee member on both the public communications and placement committees. He is a 28-year member of the American College of Toxicology where he has held numerous elected and appointed positions, including serving as its president in 2012. In 2015, the American College of Toxicology recognized his contributions to the organization by awarding him its prestigious distinguished service award. Dr. Serota served as a member of the board of trustees of AAALAC International from 2010-16, serving as a member of the global 3Rs committee in 2015-16, and nominations committee chair in 2016. Since 2009, he has served as a member of the dean's advisory council of the School of Pharmacy at Auburn University.

Dr. Serota has been engaged in numerous philanthropic endeavors over his lifetime and, since 2012, he has been a member of the board of directors of the Southwest Michigan SPCA, currently serving as board president. From 1985-2005, he served on the board of directors of Camp Virginia Jaycee in Roanoke, VA a camp dedicated to providing summer training and recreational activities to mentally handicapped children – serving as board president from 1989-91. He has contributed financially to numerous worthy organizations over the years and currently contributes to numerous organizations including Auburn University, St. Jude Children's Hospital, the American College of Toxicology, Hannah's Hope Foundation, SPCA of Southwestern Michigan, Wounded Warriors, Smile Train, The National WWII Museum, WWII Veterans Committee, National WASP WWII Museum, and the USO.

KEYNOTE

SPEAKER

Robert J. Munger, D.V.M., DACVO

American College of Veterinary Ophthalmologists

Dr. Munger is a Diplomate of the American College of Veterinary Ophthalmologists (ACVO) and owner of the Animal Ophthalmology Clinic with clinics in Dallas and Grapevine, Texas. He obtained his DVM degree from the College of Veterinary Medicine, Texas A&M University in 1973. After completing a residency in veterinary ophthalmology at The Veterinary Medical Teaching Hospital, University of California, Davis California, in 1978, he established the Animal Ophthalmology Clinic in Dallas, Texas and became board certified in 1979. He served as Assistant Professor in Veterinary Ophthalmology at the College of Veterinary Ophthalmology, University of Tennessee School of Veterinary Medicine from 1979-1983. In addition to his work with his patients, he has served as a consultant in Lab Animal Ophthalmology, Surgery and Toxicology with Alcon Laboratories, Allergan, Charles River Laboratories, and Altasciences since 1979. He has twice been President of the ACVO and presently serves on the American Board of Veterinary Ophthalmology.

KEYNOTE

SPEAKER

Dr. Elizabeth Nunamaker, PhD, DVM, DACLAM

Assistant Director and Clinical Assistant Professor, Animal Care Services

University of Florida

Dr. Elizabeth Nunamaker received the PhD degree in Biomedical Engineering in 2006 from University of Michigan, and the DVM degree from Purdue University in 2010. From 2010-2013 she was a Post-Doctoral Fellow in the Biologic Resources Laboratory at the University of Illinois at Chicago and Abbvie, Inc. During this time she developed as a laboratory animal veterinarian and focused her research on analgesia and anesthesia and humane endpoints for a variety of animal models. She became a Diplomate in the American College of Laboratory Animal Medicine in 2015. Dr. Nunamaker is currently an Assistant Director and Clinical Assistant Professor with Animal Care Services at the University of Florida. She has spent the past 10 years of her career focused on the welfare of laboratory animal species and has numerous publications on the study of pain and its alleviation in a wide variety of laboratory species. When not focused on improving the lives of research animals, Dr. Nunamaker loves to spend time with her family at the beach.

KEYNOTE

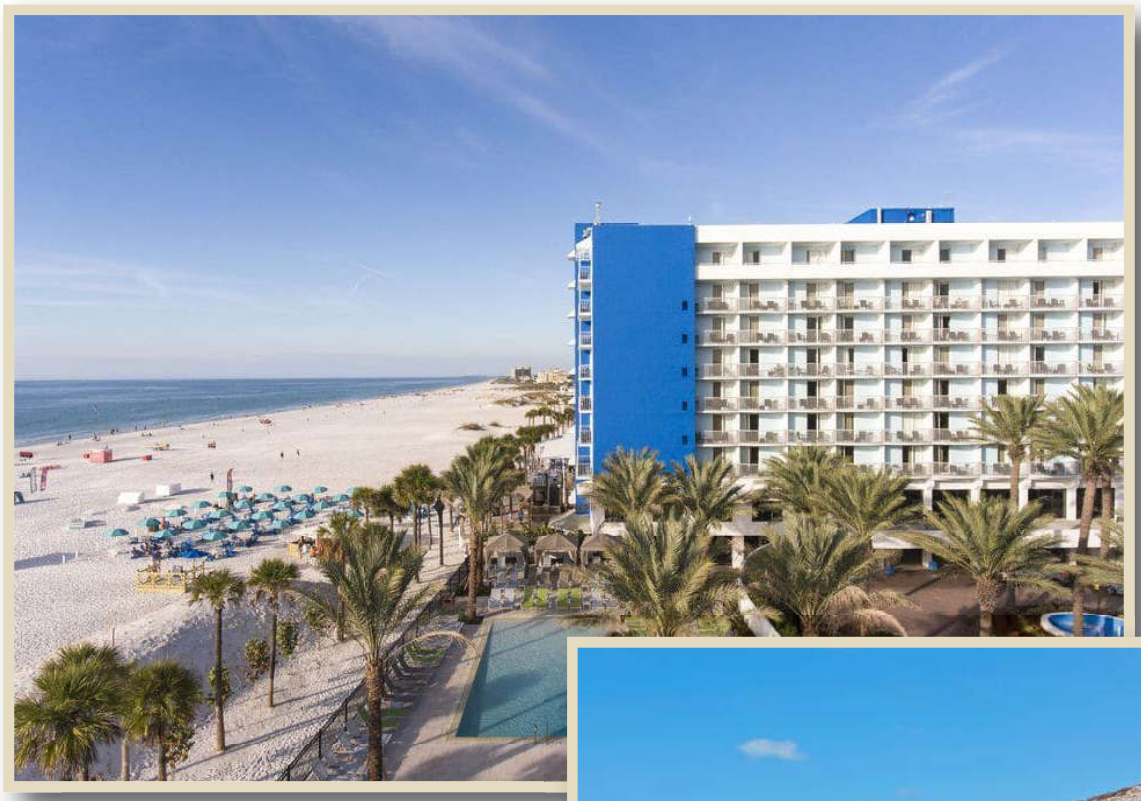
SPEAKER

Dr. William G. Rodkey

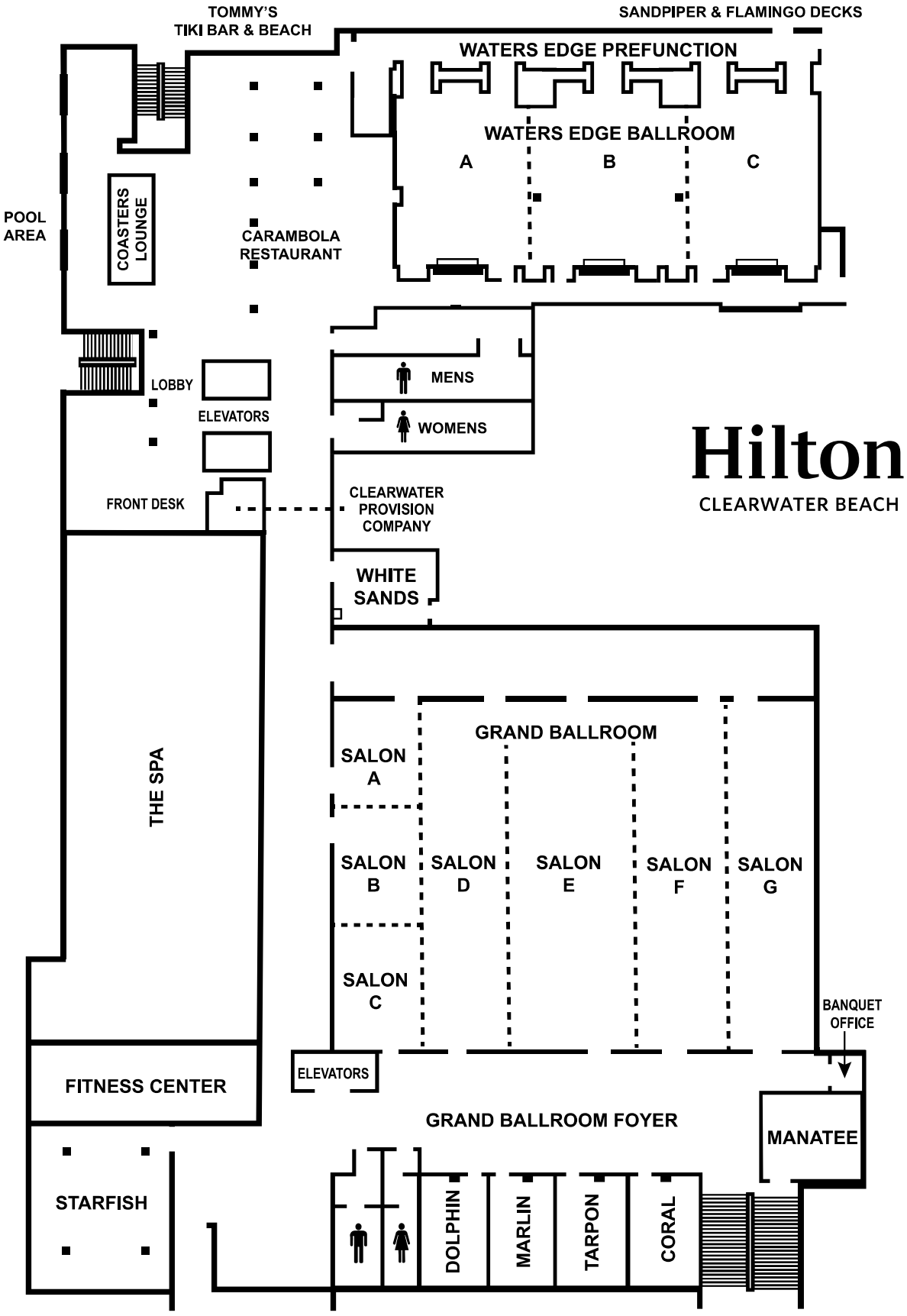
Consulting Senior Scientist, Center for Regenerative Sports Medicine
Steadman Philippon Research Institute
Vail, Colorado USA

Dr. Rodkey, now mostly retired, is formerly the Chief Scientific Officer and Director of the Center for Translational and Regenerative Medicine Research at the Steadman Philippon Research Institute in Vail, Colorado. He currently serves as Chairman Emeritus of the Scientific Advisory Committee and is the Consulting Senior Scientist in the Center for Regenerative Sports Medicine. Dr. Rodkey's research is focused on tissue regeneration with scaffolds and cellular therapy with an emphasis on articular cartilage, meniscus, and ligaments. He has been with the Steadman Philippon Research Institute since 1990. Prior to joining Dr. Steadman in Vail in 1990, Dr. (Colonel, U.S. Army, retired) Rodkey was Chairman of Military Trauma Research at Letterman Army Institute of Research in San Francisco and earned numerous awards and military decorations including the United States of America Legion of Merit Medal, Meritorious Service Medal, U.S. Army Commendation Medal (with 5 oak leaf clusters), Humanitarian Services Medal, Order of Military Medical Merit, and the U.S. Secretary of the Army Research and Development Achievement Award. He has authored 200 published works and has made 500 presentations at national and international meetings. Dr. Rodkey has received numerous awards including the Excellence in Research Award from AOSSM, the Cabaud Memorial Award from AOSSM twice, the Albert Trillat Award from the International Knee Society (now ISAKOS), and GOTS-Beiersdorf Research Award 2000. He received undergraduate and Doctor of Veterinary Medicine degrees from Purdue University in his native state of Indiana and completed his medical education and surgical and orthopaedic residency training in the US Army and at University of Florida. He is a member of AAOS, AOSSM, ISAKOS, ESSKA, ICRS, OARSI, EFORT, and is an Affiliate Professor of Clinical Sciences at Colorado State University. He currently serves on the editorial boards of three major Orthopaedic Sports Medicine journals. He remains active as a snow skier, hiker, fly fisherman, and mountain biker.

Venue



Floor Plan


TOMMY'S
TIKI BAR & BEACH
SANDPIPER & FLAMINGO DECKS
WATERS EDGE PREFUNCTION
WATERS EDGE BALLROOM
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POOL
AREA
COASTERS
LOUNGE
CARAMBOLA
RESTAURANT
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OFFICE
ELEVATORS
FITNESS CENTER
GRAND BALLROOM FOYER
MANATEE
STARFISH
DOLPHIN
MARLIN
TARPON
CORAL

Meeting Overview

Registration Hours	
Wednesday, September 25	06:00 am – 05:00 pm
Thursday, September 26	07:00 am – 05:00 pm
Friday, September 27	07:00 am – 12:00 pm
Tuesday, September 24	
02:00 PM – 05:00 PM	ASR Board Meeting - Salon A
Wednesday, September 25	
06:00 AM – 08:00 AM	Registration for Test Takers and Morning Wet Lab Attendee's - Foyer A&B
06:00 AM – 08:00 AM	Light Continental Breakfast for Test Takers and Boxed Breakfast Pick-up for Morning Wet Lab Attendee's
06:15 AM	Bus 1 Departs from Hotel to Morning Wet Labs at the University of South Florida
08:00 AM – 12:00 NOON	ASR Examinations - Salons A & B
08:00 AM – 11:00 AM	Wet Labs - The University of South Florida - Stereotaxic Delivery in Mice - Ototox Dosing Techniques in Rats and Mice - Intubation and Ventilation of Rats and Mice - Surgical Implantation of the M11 Device in Ferrets to Collect Blood Pressure, ECG and Temperature
12:00 NOON – 05:00 PM	Poster Set Up - Grand Ballroom Foyer
10:00 AM	Bus 2 Departs for Afternoon Wet Labs
11:00 AM – 12:00 NOON	Lunch at USF - **Sponsored by Instech Laboratories**
12:00 NOON	Bus 1 Returns to Hilton, Clearwater
12:30 PM – 03:30 PM	Wet Labs - The University of South Florida - Non-Sterotaxic Delivery in Rats - Intravitreal and Subretinal Dosing in Rats - Myocardial Infarction in the Rat Model
04:00 PM	Bus 2 Returns to Hilton, Clearwater
05:30 PM – 07:00 PM	Welcome Reception with Exhibitors- **Sponsored by SAI Infusion Technologies-** Salons F & G

Meeting Overview

Thursday, September 26	
08:00 AM – 08:45 AM	Continental Breakfast with Exhibitors/Vendor Bingo/Photo-Op - **Sponsored by DRE Scientific** - Salons F & G
08:45 AM – 09:00 AM	Opening Remarks - ASR President - Jennifer Sheehan- Salon E
09:00 AM – 10:00 AM	Keynote Speaker - Dr. David Serota "Do You Have a Face in Research?"- Salon E
10:00 AM – 10:30 AM	Break with Exhibitors / Vendor Bingo / Photo Op- Salons F & G
10:30 AM – 12:00 NOON	Track 1 Scientific Session - Salon E
10:30 AM – 12:00 NOON	Track 2 Scientific Session - Salon D
10:30 AM – 12:00 NOON	Dry Lab - Advanced Suturing - Vince Mendenhall - Pre-Surgical Services - Salons F&G
12:00 NOON – 01:00 PM	Lunch With Exhibitors / Vendor Bingo / Photo Op - **Sponsored by emka Technologies** - Salons F & G
01:00 PM – 02:00 PM	Keynote Speaker - Dr. Robert J. Munger "Considerations in Veterinary Ophthalmic Surgical Research" - Salon E
02:00 PM – 03:30 PM	Dry Lab - Introduction to Large Animal Stereotaxic Surgery- Eric Adams, Northern Biomedical , Randy Pielemeier, Charles River Laboratories, Mattawan - Coral Room (Pre-Registration Required, Class Full)
02:00 PM – 03:00 PM	Track 1 Scientific Session - Salon E
02:00 PM – 03:00 PM	Track 2 Scientific Session - Salon D
03:00 PM – 03:30 PM	Break with Exhibitors / Vendor Bingo / Photo Op - Salons F & G
03:30 PM – 04:30 PM	Track 1 Scientific Session - Salon E
03:30 PM – 05:00 PM	Track 2 JIS Surgical Writing Workshop - Marc Basson- Salon D
04:30 PM – 05:30 PM	Poster Judging - Grand Ballroom Foyer
05:30 PM – 07:30 PM	Reception & Foundation Auction - **Sponsored by Data Sciences International and Lomir Biomedical Inc.** - Flamingo Deck
Friday, September 27	
08:00 AM – 08:45 AM	Continental Breakfast - **Sponsored by Colonial Medical Supply** - Salons F & G
08:45 AM – 09:00 AM	Opening Remarks - ASR President Jennifer Sheehan - Salon E
08:00 AM – 01:00 PM	Poster Board Tear Down
09:00 AM – 10:00 AM	Keynote Speaker - Dr. Elizabeth Nunamaker -"Current Considerations to Balance Animal Welfare and Science As We Move Into The Future" - Salon E
10:00 AM – 10:30 AM	Break / Photo Op - Salons F & G
10:30 AM – 01:00 PM	Track 1 Scientific Session - Salon E
10:30 AM – 12:00 NOON	Track 2 Scientific Session - Salon D
12:30 PM – 01:00 PM	Track 2 Round Table: Identifying and Troublshooting Common Anesthetic Issues - Salon D
01:00 PM – 03:00 PM	Business Lunch/ASR Awards Presentations - Dr. William Rodkey - "Standing on the Shoulders of Giants to See a Bright Future" - Salon F
03:00 PM	Meeting Adjourned
03:00 PM – 05:00 PM	Board of Directors Meeting - Salon A

35 YEARS

Lab Descriptions

Wet Lab Instructors

Richard Mills
Stoelting Co.

Bonnie Lyons
Thomas Perekslis
Andree Lapierre
The Jackson Laboratory

Gayle Nugent
Janelle Gesaman
Porsha Osborne
Dr. Ryan Boyd
Charles River Laboratories

Brad Gien
Envigo

Heather Bogie
Kathryn Nichols
Kimberly Holliday-White
Data Sciences International

Wet Lab Volunteers

Randy Pielemeier
Charles River Laboratories, Mattawan

Dry Lab Instructors

Eric Adams
Northern Biomedical

Richard Mills
Stoelting Co.

Vince Mendenhall
Consultant, Pre-Clinical Services

Thank you to the University of South Florida and CBSET personnel for hosting our wet labs and all of your support!

Wet Lab Sponsors

charles river | every step of the way.

DSI™
a division of
Harvard Bioscience, Inc.

ENVIGO

Kent Scientific
CORPORATION

Lab Supply
DFW•HOUSTON•ORLANDO•DURHAM

MARSHALL
BioResources

NBR
Northern Biomedical Research, Inc.

Stoelting
SINCE 1886

Wet Labs

University of South Florida

Wednesday, September 25, 2019 (Morning)

8:00 AM - 11:00 AM

Stereotaxic Delivery in Mice

Richard Mills-Chief Scientific Officer - Stoelting Co.
Bonnie Lyons DVM, DACLAM, Thomas Perekslis BS, SRS, Senior Technologist,
Andree Lapierre BS, LATG, CMAR, SRS - The Jackson Laboratory

This workshop will provide basic instruction on how to prepare a mouse for stereotaxic surgery and perform a brain injection. Participants will learn how to operate and understand a Stoelting Just for Mouse Stereotaxic Instrument how to read a Vernier scale, and how to place the mouse in the ear bars and snout clamp properly. Participants will also be instructed on how to expose the skull of the mouse and identify bregma. During the final portion of the workshop, participants will perform a brain injection; they will learn how to position the manipulator arm to specific coordinates, use a micro motor drill to prepare the skull for insertion of the Hamilton syringe needle in order to perform an injection directly into the brain of the mouse.

8:00 AM - 11:00 AM

Ototox Dosing Techniques in Rats and Mice

Gayle Nugent BA, LATG, SRS, Janelle Gesaman LATG, SRA, SRS - Charles River Laboratories

A variety of drugs can affect auditory and/or vestibular function. This workshop will provide guided, hands-on instruction in intra-aural dosing techniques used to evaluate the ototoxicity of compounds. Attendees will perform trans-tympanic and semicircular canal administration in rats and mice and be able to verify dose accuracy post-surgery. All will leave with an enhanced understanding of ear anatomy.

8:00 AM - 11:00 AM

Intubation and Ventilation of Rats and Mice

Brad Gien BSc - Envigo

Effective outcomes in cardiothoracic surgical research in rodents are dependent upon adequate techniques for intubation and mechanical ventilation. This workshop will provide hands-on instruction on rodent intubation and use of rodent ventilators.

8:00 AM - 11:00 AM

Surgical Implantation of the M11 Device in Ferrets to Collect Blood Pressure, ECG and Temperature

Heather Bogie BS, SRS, RLATG, CVT, Kathryn Nichols MS, SRS, Kimberly Holliday-White BS, SRS - Data Sciences International

Telemetry has become the gold standard of physiologic monitoring due to its ability to monitor numerous physiologic traits without the need for anesthesia or restraint. This decreases stress to the animals, increases the accuracy of the data and allows for a reduction in numbers of animals used and refinement of study design. Telemetry is used in multiple fields of biomedical research such as basic science, discovery and safety pharmacology. Ferrets are a useful species to study various respiratory diseases and function and cardiovascular data collection is an important addition to these studies. The steps for surgical implantation of this M11 telemetry device will first be demonstrated by an expert telemetry surgeon. Attendees will then have the opportunity to work individually, under the guidance of experienced surgeons to surgically implant devices in ferrets. Each attendee will implant a functional telemetry device so the live, physiologic signals can be viewed in real time. Emphasis will be placed on proper microsurgical technique and appropriate handling of the telemetry device. Prior surgical experience is strongly recommended, but not required. Surgical loupes and light sources or a microscope will be provided.

Wet Labs

University of South Florida

Wednesday, September 25, 2019 (Afternoon)

01:00 AM - 04:00 PM

Non-Stereotaxic Targeted Delivery in Rats

Gayle Nugent BA, LATG, SRS, Janelle Gesaman LATG, SRA,, SRS, Porsha Osborne SRS, SRA, LATG - Charles River Laboratories

The rat is a widely used model in surgical and toxicological research due to small size and physiology similar to humans. Non-stereotaxic dosing enables the surgeon to target a number of tissues without the cost and complexity of using stereotaxic equipment. Skill is necessary to accurately and consistently dose the intended target. This workshop will provide guided, hands-on instruction in injecting the kidney, prostate, urethral sphincter, Achille's tendon, myocardium and left ventricle of the heart. Attendees will learn to utilize appropriate equipment and techniques to overcome challenges of non-stereotaxic dosing in a small animal model.

01:00 PM - 04:00 PM

Intravitreal and Subretinal Dosing in Rats

Dr. Ryan Boyd MS, DVM, DACVO - Charles River Laboratories

This workshop will provide information and instruction on intravitreal and subretinal injections in rodents via a posterior trans-scleral approach. Participants will be provided with a list of necessary instruments and equipment, as well as instructional diagrams for each procedure. Direct supervision and instruction will be provided during the hands-on portion of the workshop, in which each participant will have the opportunity to perform multiple intravitreal and subretinal injections in rats. Preparation of the eye for injection, placement of the lens for visualization, and tissue and needle handling during the injection will be covered. Only rats will be utilized for the laboratory, with methods covered being directly translatable to mice with additional practice.

01:00 PM - 04:00 PM

Myocardial Infarction (MI) in the Rat Model

Brad Gien, BSc - Envigo

The induction of myocardial infarction in animal models is becoming increasingly important in research. This workshop provides an opportunity to create myocardial infarction in the rat model while receiving hands-on instruction from surgeons very experienced in this procedure.

Dry Lab Opportunities

Thursday, September 26th

02:00 - 03:30 PM, - Coral Room

Introduction to Large Animal Stereotaxic Surgery

Eric Adams SRS, MS , LAT, Northern Biomedical
Randy Pielemeier, LVT, BS, SRS, LATG - Charles River Laboratories, Mattawan

This hands-on laboratory experience will introduce attendees to stereotaxic procedures and the equipment necessary to conduct stereotaxic surgery in large animal species. Canine and non-human primate skull models will be utilized to describe the basic techniques and nuances of performing stereotaxic surgical approaches commonly used in an academic or research setting. Attendees will have the opportunity to familiarize themselves with use of the stereotaxic frame and will be provided with an overview of various modalities to allow for successful targeting of common stereotaxic targets and cartography (e.g. lateral ventricle, putamen, caudate, hippocampus).

10:30 - 12:00 - Salons F&G

Advanced Suturing

Vince Mendenhall, DVM, PHD
Consultant - Pre-Clinical Services

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. Using a skin simulator and manufactured vessels, participants will practice varying suturing techniques including simple and straight lacerations, deep-layer closure, skin closures, tying knots using hand and instrument ties, and vascular anastomosis using loupes. Didactic information as well as a hands-on component will be available.

35 YEARS

Program Schedule

Tuesday, September 24th

2:00 PM - 5:00 PM	ASR Board of Directors Meeting - Salon A

Wednesday, September 25th

06:00 AM - 08:00AM	Registration for Wet Lab Attendee's - Foyer Salon A
06:00 AM - 08:00 AM	Registration for Exam Takers
08:00 AM - 12:00 PM	Certification Exams **-** Salons A & B
06:00 AM - 05:00 PM	Wet Labs - University of South Florida **- Lunch Sponsored by Instech Laboratories**
05:30 PM - 07:00 PM	Welcome Reception with Exhibitors - **Sponsored by SAI Infusion Technologies -** Salons F & G

ACADEMY OF SURGICAL RESEARCH

Thursday, September 26th

Track 1

08:00 – 08:45 AM	Continental Breakfast with Exhibitors / Vendor Bingo/Photo Op – **Sponsored by DRE Scientific** - Salons F & G	
08:45 – 09:00 AM	Opening Remarks – ASR President Jennifer Sheehan- Salon E	
09:00 – 10:00 AM	**Keynote Speaker** – Dr. David Serota "Do You Have a Face in Research?" - Salon E	
10:00 – 10:30AM	Break with Exhibitors / Vendor Bingo/Photo-Op - Salon F & G	
TRACK 1 – Salon E		
MODERATOR	Leslie Stoll	
10:30 – 11:00 AM	Surgical Services Role in Delivery of Gene and Cell Therapies	Randall Pielemeier
11:00 – 11:30 AM	The Role of Lymphatic Clearance in Alzheimer's Disease: Studies in a Microsurgical Rat Model	Heidi Phillips
11:30 – 12:00 PM	Development of a Novel Expandable Graft for Repair of Congenital Heart Defects	John P Carney
12:00 – 01:00 PM	Lunch with Exhibitors / Vendor Bingo / Photo Op – **Sponsored by emka Technologies** - Salons F & G	
01:00 – 02:00 PM	**Keynote Speaker** - Dr. Robert J. Munger "Considerations in Veterinary Ophthalmic Surgical Research" - Salon E	
MODERATOR	Jose Negron	
02:00 – 02:30 PM	Urology Animal Model Generation for Lithogenesis Potentiation	Darcy H Gagne
02:30 – 03:00 PM	Developing a Non-metestatic Orthotopic Bladder Cancer Model in Mice	Devra Olson
03:00 – 03:30 PM	Break with Exhibitors / Vendor Bingo / Photo Op – Salons F & G	
MODERATOR	Melanie Graham	
03:30 – 04:00 PM	Early-stage Characterization of an Endovascularly - induced Model of Renal Insufficiency in the Yucatan Miniature Swine	Jose Negron
04:00 – 04:30 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
04:30 - 05:30 PM	Poster Judging - Grand Ballroom Foyer	
05:30 - 07:30PM	Reception / Foundation Auction - **Sponsored by Data Sciences International (DSI) and Lomir Biomedical Inc.** - Flamingo Deck	

Thursday, September 26th

Track 2

08:00 – 08:45 AM	Continental Breakfast with Exhibitors / Vendor Bingo/Photo Op – **Sponsored by DRE Scientific** - Salons F & G	
08:45 – 09:00 AM	Opening Remarks – ASR President Jennifer Sheehan- Salon E	
09:00 – 10:00 AM	**Keynote Speaker** – Dr. David Serota "Do You Have a Face in Research?" - Salon E	
10:00 – 10:30 AM	Break with Exhibitors / Vendor Bingo/Photo Op - Salon F & G	
TRACK 2 – Salon D		
MODERATOR	Heather Bogie	
10:30 – 11:00 AM	Proper Implantation Technique is Critical for Quality Signals in Longitudinal Studies Using Telemetry Devices	Chelsea Richardson
10:30 – 12:00 PM	Dry Lab - Advanced Suturing - Vince Mendenhall - Salons F&G	
11:00 – 11:30 AM	A Ferret Telemetry Model to Monitor Multiple Physiological Endpoints	Michael Horsman
11:30 – 12:00 PM	Malignant Hyperthermia in Swine: Overview and Case Study	Heather DeLoid
12:00 – 01:00 PM	Lunch with Exhibitors / Vendor Bingo / Photo Op – **Sponsored by emka Technologies** - Salons F & G	
01:00 – 02:00 PM	**Keynote Speaker** - Dr. Robert J. Munger "Considerations in Veterinary Ophthalmic Surgical Research" - Salon E	
MODERATOR	Lisa Johnson	
02:00 – 02:30 PM	Establishment of Therapeutic Dosing Ranges of Methadone for Moderate to Severe Pain in Cynomolgus Macaques	Amy Martunas
02:00 – 03:30 PM	Dry Lab - Introduction to Large Animal Stereotaxic Surgery- Eric Adams, Randy Pielemeie Coral Room (Pre-Registration Required, Class Full)	
02:30 – 03:00 PM	Vascular Button Implantation in the Rabbit	Jon Ehrmann
03:00 – 03:30 PM	Break with Exhibitors / Vendor Bingo / Photo Op– Salons F & G	
03:30 – 05:00 PM	JIS Surgical Writing Workshop	Marc Basson
04:30 – 05:30 PM	Poster Judging - Grand Ballroom Foyer	
05:30 – 07:30 PM	Reception / Foundation Auction - **Sponsored by Data Sciences International (DSI) and Lomir Biomedical Inc.** - Flamingo Deck	

Friday, September 27th

08:00 – 08:45 AM	Continental Breakfast - **Sponsored by Colonial Medical Supply -** Salons F & G	
08:45 – 09:00 AM	Opening Remarks – ASR President Jennifer Sheehan - Salon E	
09:00 – 10:00 AM	**Keynote Speaker** - Dr. Elizabeth Nunamaker - "Current Considerations to Balance Animal Welfare and Science As We Move Into The Future" - Salon E	
10:00 – 10:30 AM	Break / Photo Op - Salons F & G	
Track 1 – Salon E		
MODERATOR	Fred Emond	
10:30 – 11:00 AM	Evolution and the Use of Rat Vascular Access Buttons	Steven Kreuser
11:00 – 11:30 AM	Central Venous Catheters in Swine - Trails and Tribulations	Amanda Klenoski
11:30 – 12:00 PM	Patience is a Virtue....The Importance of the Post-operative Period for Port and Catheter Systems	Jan Bernal
MODERATOR	Jon Ehrmann	
12:00 –12::30 PM	Developing a Rodent Surgery Training Program	Monica S Torres
12:30 – 01:00 PM	Cranial Access for the Delivery of Biotinylated Dextran Amine (BDA) Neural Tracers into the Motor Cortex Following a T10 Hemicompression of the Spinal Cord to Produce a Spinal Cord Injury (SCI) in the Caribbean Green Monkey	David Moddrelle
01::00 – 03:00 PM	Business Lunch/ASR Awards Presentations - Dr. William Rodkey - "Standing on the Shoulders of Giants to See a Bright Future" - Salon F	
03:00 PM	Meeting Adjourned	
03:00 – 05:00 PM	Board of Directors Meeting – Salon A	

Track 2

Friday, September 27th

08:00 – 08:45 AM	Continental Breakfast - **Sponsored by Colonial Medical Supply -** Salons F & G	
08:45 – 09:00 AM	Opening Remarks – ASR President Jennifer Sheehan - Salon E	
09:00 – 10:00 AM	**Keynote Speaker -** Dr. Elizabeth Nunamaker **-** "Current Considerations to Balance Animal Welfare and Science As We Move Into The Future" **-** Salon E	
10:00 – 10:30 AM	Break / Photo Op - Salons F & G	
Track 2 – Salon D		
MODERATOR	Leslie Stoll	
10:30 – 11:00 AM	Meet the Mentors	Jon Ehrmann
11:00 – 11:30 AM	Corneal Xenotransplantation in the Nonhuman Primate	Heather B. DeLoid
11:30 – 12:00 PM	Developing a Robust Program to Promote the Academy of Surgical Research in Your Organization	Gayle Z Nugent
12:00 – 01:00 PM	Round Table : Identifying and Troubleshooting Common Anesthetic Issues	Jan Bernal, Steven Kreuser, Angie Lewis, Amy Martunas
01:00 – 03:00 PM	Business Lunch/ASR Awards Presentations - Dr. William Rodkey - "Standing on the Shoulders of Giants to See a Bright Future" - Salon F	
03:00 PM	Meeting Adjourned	
03:00 – 05:00 PM	Board of Directors Meeting – Salons A	

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35 YEARS

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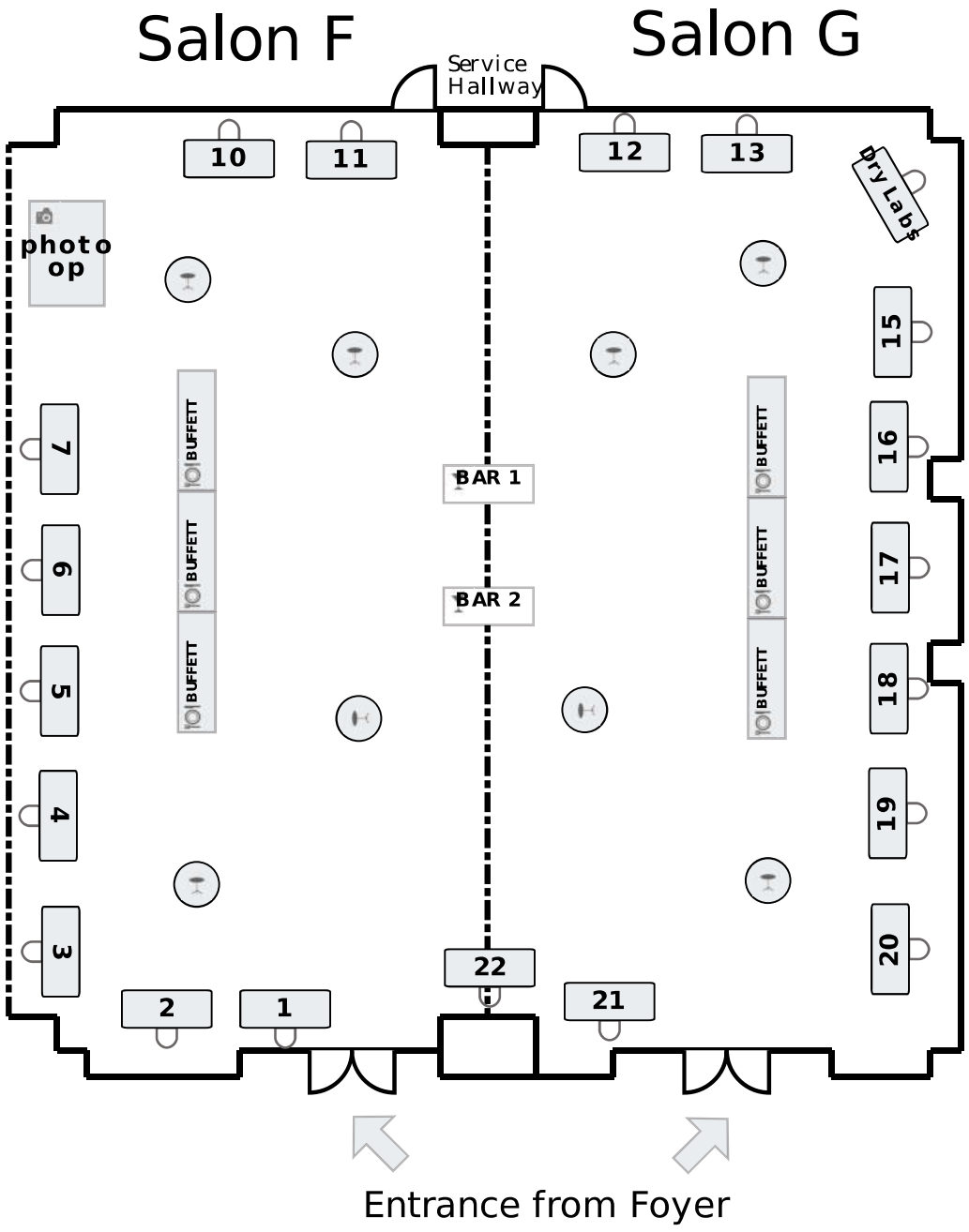

Access Technologies

BOOTH 17

www.norfolkaccess.com

Founded in 1981, Access Technologies is a global company that designs, manufactures, and markets innovative infusion devices that provide solutions to meet the needs of our customers in the ever changing world of biomedical research and veterinary medicine. We design and manufacture innovative and reliable infusion equipment including: a full line of Vascular Access Ports, Huber Needles, Infusion and Extension Lines, Custom Catheters, and offer Bulk Tubing and Accessories for all species from mice to non-human primates

AVA Biomedical, Inc.

BOOTH 13

www.avabio.com

AVA Biomedical, Inc. is a leading manufacturer of cutting-edge infusion/sampling devices for laboratory animal research. With over 23 years experience designing and manufacturing products we provide researchers with complete, customized infusion/sampling systems designed to give you results you can trust. AVA Biomedical designs and manufactures a unique variety of products including; New Conventional Ports for all species, Cath-In-Cath 2 Port systems, the gold standard for long-term access and sampling, the FastTether2 modular rodent infusion system and state of the art infusion pump systems for tethered or ambulatory applications. Come see what makes us different.

Bio-Serve

BOOTH 7

http://www.bio-serv.com

Bio-Serv Delivers Solutions! With 50 years of experience, we have developed a wide range of products designed to meet the unique requirements of research animals. Our comprehensive product line includes Custom and Medicated Animal Diets, Reward Pellets, Enrichment Devices and Edibles Treats for all species and a Special Care Product line to help laboratory animals with critical needs.

Colonial Medical Supply

BOOTH 18

susan@colmedsupply.com

For 40 years, Colonial Medical Supply has been dedicated to delivering the highest standard in medical equipment, personalized customer service and on-site anesthesia machine maintenance to the animal health community. We take pride in the equipment we sell, support and service to run as smoothly as possible every day.

Data Sciences International (DSI)

BOOTH 15

http://www.datasci.com

Data Sciences International (DSI) has been committed to life science research for over 30 years and is the global leader in pre-clinical physiologic monitoring. DSI offers a broad portfolio of solutions, ranging from implantable telemetry and respiratory systems, to the software used to acquire, analyze and report the data you collect. DSI continues to listen to the needs of the research community by developing innovate technology, like the stress-free way to collect continuous glucose via telemetry and the all new 6 level, 42 subject automated inhalation exposure system. Trusted by researchers, DSI technology has been cited in over 5,000 peer-reviewed publications.

Dejavi Innovations

BOOTH 10

https://emptechpro.com/

Our company - DEJAVI innovations, exhibiting our line of Micro current, skin healing devices

DRE Scientific

BOOTH 22

https://www.dreveterinary.com/scientific

DRE's Scientific Division is on the leading edge of technologies for the rapidly growing field of animal research. We offer full lines of new and professionally refurbished animal specific equipment that include: Anesthesia Machines, Vital Signs Monitors, Surgical Tables, ESU's, IV Pumps, Microscopes, Ventilators, Vaporizers, Surgical/Exam Lights and much more. DRE also offers clean and calibration of vaporizers along with a Field Service Division for install/set-up, training, and annual preventative maintenance.

emka Technologies

BOOTH 5

http://www.emkatech.com

emka TECHNOLOGIES has been providing integrated, easy to use systems for preclinical physiology, pharmacology & toxicology research for over 20 years. Our hardware and software are used daily, validated by major pharma companies and CROs, and cited in over 2,000 peer-reviewed scientific publications. We offer a broad range of implantable and external telemetry systems, instruments for invasive and non-invasive respiratory research, isolated organs, and general-purpose data acquisition. Our IOX2 and ecgAUTO Software provides unprecedented power and ease of use, providing neuro, cardiovascular, and pulmonary analysis, as well as fever detection capabilities

Envigo

BOOTH 20

www.envigo.com

Envigo provides the broadest range of standard research models to the pharmaceutical and biotechnology industries, government, academia and other life science organizations. As the largest organization that is solely dedicated to providing research models and related products and services, we are committed to helping researchers realize the full potential of their critical R&D projects as we fulfill our mission to work together to build a healthier and safer world.

Hilltop Lab Animals, Inc.

BOOTH 4

www.Hilltoplabs.com

Hilltop Lab Animals, Inc. produces research animals including rats, mice and guinea pigs. Hilltop also provides: contract housing including aged animals, precisely time-mated animals, tissues, blood products, and wide variety surgical procedures including catheter (vascular, bile duct, intra-gastric, urinary bladder) implants. Hilltop can also provide contract research options.
For more information call customer service at 724-887-8480.

Instech Laboratories Inc.

BOOTH 1

www.instechlabs.com

Founded in 1971, Instech Laboratories, Inc. is a privately-owned company focused on the design, development and manufacturing of instruments for biomedical research.We offer a range of products that evolved from the founder's experience in basic medical sciences, including laboratory animal infusion systems, miniature pumps and dissolved oxygen monitors. We are committed to our customers in university, government, and corporate laboratories by offering our products in standard and custom configurations, and by making them available directly from us and from a number of distributors worldwide.

Kent Scientific Corporation

BOOTH 11

https://www.kentscientific.com/

With 30 years of experience, Kent Scientific Corporation serves medical and research scientists as a worldwide provider of integrated solutions for pre-clinical research and drug discovery advancement. As the world leader in non-invasive blood pressure, physiological monitoring and anesthesia systems for mice and rats, we enable our customers to achieve results that are fast, consistent and exceedingly accurate. Customers can rely on our informative web site to effortlessly purchase research products through our online shopping cart. Choose from thousands of products in our online catalog. Enjoy the latest technological advances in research products at the best prices.

Lomir Biomedical Inc.

BOOTH 19

www.lomir.com

Lomir is the world's largest manufacturer of animal jackets, infusion products and restrainers. In depth knowledge enables Lomir to design and manufacture equipment with the exact precision to meet your objectives. Continued innovation in manufacturing and materials enable researchers to consider new applications and refinements to animal welfare and well-being as our priority.

Celebrating our 30th anniversary in 2019, come and discuss how working with the manufacturer can benefit your research. Check out the latest designs, materials and capabilities. Whether you need simple modifications to existing products or entirely custom items Lomir is here to work with you.

Marshall BioResources

BOOTH 21

www.marshallbio.com

Our mission is to be the premier source of animals and related services for biomedical and veterinary research. Our animal models include: conventionally raised and APD/SPF Marshall Beagles® and Cats, Influenza-free Marshall Ferrets®, Mongrels/Hounds, IFN knockout Mice (AG129 & A129), SPF Guinea Pigs, and Gottingen Minipigs® in North America.

Medline Industries, Inc.

BOOTH 2

http://www.medline.com/educationandresearch

Medline is a healthcare company: manufacturer, distributor and solutions provider focused on improving the overall operating performance of healthcare. Medline works with both the country's largest healthcare systems and independent facilities across the continuum of care to provide the clinical and supply chain resources required for long-term financial viability in delivering high quality care. With the size of one of the country's largest companies and the agility of a family-owned business, Medline is able to invest in its customers for the long-term and rapidly respond with customized solutions. Headquartered in Northfield, Ill., Medline has 20,000+ employees worldwide and does business in more than 90 countries. Learn more about Medline at www.medline.com/educationandresearch.

Patterson Scientific

BOOTH 3

http://www.pattersonscientific.com

Our mission is to be the researcher's first choice for inhalation anesthesia equipment and accessories, delivering products of outstanding quality and great service at a competitive cost through working smarter and together. We have the highest quality control standards for manufacture in the industry.

ReCathCo

BOOTH 16

http://www.recathco.com

ReCathCo small animal research catheters. Rat and Mouse catheters, jugular, carotid artery, femoral vein & artery, bile duct, portal 'T" and customer specific designs.Our expertise using high technology bonding and fusion, tipping, drilling, slitting, banding and printing. In-house capabilities are with state of the art equipment and materials used in medical device manufacturing settings. ReCathCo's extrusion capabilities for micro-bore tubing includes polyethylene (PE), polyurethane (PU), polypropylene (PP), silicone, Pebax, including ReCathCo Low Friction PU & ReCathCo PEBA soft flexible and chemical resistant tubing. All production in cleanroom environment and sterilization available to customer required configurations. ISO 13485 company.

SAI Infusion Technologies

BOOTH 6

http://www.sai-infusion.com

SAI creates systems for preclinical infusion and sampling, including pumps, ports, harnesses, buttons, swivels, catheters, and accessories. Many of our products are fully customizable for both small and large laboratory animal species. Our team of Toxicologists and Surgeons are eager to work for you to make your studies successful. SAI, delivering research solutions.

UID Identification Solutions

BOOTH 12

http://www.uidevices.com

UID provides a secure method for the identification of animals and other laboratory items using implantable and externals RFID Transponders. The UID Identification System included RFID implantable temperature transponders for mice, rats and large animals. In addition, we will showcase an RFID enabled Controlled Substance Inventory System for monitoring and tracking all narcotics volumes, users, and inventories for 100% accurate records!

35 YEARS

Keynote Speakers

"Do You Have A Face In Research?"

Dr. David Serota , Ph.D., D.A.B.T.

For those of us who are engaged professionally in the research, development, or testing of new drug compounds and medical devices, we normally focus on the processes and procedures involved in our daily job and often forget that there are real people or animals that need our efforts to be successful. We get so caught up in the details of the job that we neglect to think about those living things that would benefit when we are successful. Each of us needs to find a face to identify with, a face that personalizes the importance of what we do every day and a face that motivates us to be better than we think that we can be. I will be sharing with the audience "my face", how it came about, and how it also affected many others at MPI Research (now Charles River - Mattawan).

NOTES

Considerations in Veterinary Ophthalmic Surgical Research

Robert J. Munger, DVM, DACVO

American College of Veterinary Ophthalmologists

In today's discussion we will cover critical considerations and species variations in response to common surgical procedures performed on laboratory animals. We will discuss use of adjunctive antibiotic therapy and variations in inflammatory responses with different species. We will include discussion of recent advances in corneal transplantation, lens extraction, and monitoring of intraocular pressure.

NOTES

Current Consideration To Balance Animal Welfare and Science As We Move Itno the Future

Dr. Elizabeth Nunamaker, PhD, DVM, DACLAM

Asstant Director and Clinical Assistant Professor,
Animal Care Services University of Florida

One of the most significant challenges facing investigators, laboratory animal veterinarians, and IACUCs, is how to balance appropriate analgesic use, animal welfare, and analgesic impact on experimental results. Pain has a profound effect on animal well-being, and we expend significant time and energy considering how and when to best manage the pain that may occur in a particular study. Unfortunately, we often neglect to consider the potential confounding effects of unrelieved pain. We also fail to maintain consistency with the pain-relieving practices used to manage people with the very equivalent human conditions we are modelling. Even when the decision to use analgesics is made, the right analgesic dose might not be known or might be surmised incorrectly. This leaves our research animals with inadequate pain management and poor welfare. Fortunately there have been a number of advancements in both anesthesia and analgesia research to improve the welfare of laboratory animals. The field is also beginning to include more appropriate endpoint considerations and final animal disposition into the welfare conversation. Collectively, these modifications can be implemented today to push the field further and create a brighter future for research animals.

NOTES

"Standing on the Shoulders of Giants to See a Bright Future" (And Some Personal Philosophies Learned and Practiced)

Dr. William G. Rodkey

Chairman Emeritus, Scientific Advisory Committee
Consulting Senior Scientist, Center for Regenerative Sports Medicine
Steadman Philippon Research Institute, Vail, Colorado USA

Each of us strives for success, and we all want to make our own mark in our chosen profession. But we must never forget those who have gone before us, have paved the way for us, and upon whose shoulders we stand. After acknowledging some of the giants upon whose shoulders I have been honored to stand, this lecture will be divided into two sections. The first is to discuss one of my true passions: articular cartilage. The second part will include some personal philosophies on "Sailing the Seven C's (Plus Three) of Success".

Full-thickness articular cartilage defects in the knee are common. A single event, the shearing forces of the femur on the tibia, may result in trauma to the articular cartilage, causing the cartilage to fracture, lacerate, and separate from the underlying subchondral bone or separate with a piece of the subchondral bone. Alternatively, chronic repetitive loading in excess of normal physiological levels may result in the fatigue and failure of the articular surface, especially in the face of meniscus deficiency or axial malalignment. Articular cartilage defects that extend full thickness to subchondral bone rarely heal without intervention. The microfracture technique was first described by Steadman in the early 1980s as a new method for cartilage restoration. The primary goal of surgery was to make a series of controlled 'microfractures" perpendicular to the base of the defect. Our extensive research has proven that this procedure augments the healing process by stimulating an inflammatory response as a result of subchondral bone fracture, making access channels that cross the subchondral plate, disrupting subchondral capillaries to allow blood and marrow-derived multipotent progenitor cells to travel through these access channels into the base of the defect, producing small fracture fragments that promote both clot formation and its adherence, and using a minimally-invasive, single-stage technique. Over time, the resulting fibrin-rich 'superclot" is reorganized and remodeled into a scaffold upon which recruited undifferentiated progenitor cells can differentiate and proliferate until a new articular surface is formed. The microfracture technique, or some variant of it, is today the most commonly used method to treat articular cartilage defects. The focus of this presentation is on microfracture, including the historical aspects, surgical techniques, clinical outcomes, and the evolution that has led to today's techniques.

"Success is to be measured not so much by the position that one has reached in life as by the obstacles which he has overcome." (Booker T. Washington) I have learned a number of qualities and characteristics (Seven C's Plus Three) from others and through many of my own mistakes that have allowed me to achieve at least a modicum of success, and that is the second part of my presentation. And I have been blessed to be able to stand upon the shoulders of giants to see a bright future.

NOTES

35 YEARS

Presentation Abstracts

Thursday, Track 1

Surgical Services Role in Delivery of Gene and Cell Therapies

Presenter: Randall Pielemeier LVT, SRS, BS, LATG

Charles River Laboratories

FDA expects to see 200 Investigational New Drug (IND) applications per year for cell and gene therapies beginning in 2020 1. According to Coherent Market Insights, a market research and consulting firm, the global cell and gene therapy market was valued at US $6,020.0 million in 2017 and is projected to exhibit a compound annual growth rate (CAGR) of 21.9% over the forecast period of 2018 – 2026.2 Early cell and gene therapy products were administered by traditional routes of drug administration – IV, IM, SC, etc. The limitations of these traditional routes has become evident with lack of gene expression or integration of cells in the region of interest necessary to treat disease. This has increased demand for targeted delivery to specific tissues. As targeted delivery to specific tissues becomes more clinically accepted, increased demand for these routes of administration in preclinical animal studies has intensified as well. Some targets include the renal pelvis, cricopharyngeal muscles, spinal cord, cerebellum, putamen and other specific structures in the brain, myocardial injections, retrograde coronary sinus, coronary artery, and subretinal Injections. A variety of imaging modalities can be employed to increase the accuracy and reduce invasiveness of these doses, including MRI, CT, fluoroscopy, surgical microscopy, laparoscopy, cystoscopy, and endoscopy. Some individuals consider these simple dosing techniques and not surgery, but the surgery department is typically most familiar with the anatomy and techniques required to perform these procedures.

NOTES

The Role of Lymphatic Clearance in Alzheimer's disease: Studies in a Microsurgical Rat Model

Presenter: Heidi Phillips

University of Illinois College of Veterinary Medicine

Introduction: Lymphatic drainage pathways for clearance of cerebrospinal fluid (CSF) and macromolecules from the brain have been studied using transgenic rodent models. Although some investigators have quantified lymphatic drainage from the mammalian brain, the roles of the cervical and meningeal lymphatic systems in human health and disease merit additional study. We hypothesized that the cervical and meningeal lymphatic systems are linked and essential to brain clearance of amyloid beta (Ab) in Alzheimer's disease.

Methods: Primary lymphatic cells were isolated from TgF344-AD transgenic rat meninges and sorted for in vitro transport studies. Integrity of the lymphatic barrier was verified to confirm the relevance of key junctional proteins and lymphatic Ab transport. Cervical lymphatic ligation was then performed to evaluate effects on drainage of Ab from the brain. Rats were anesthetized with 1-3% isoflurane in 100% oxygen by mask. The ventral cervical region was clipped and aseptically prepared. A 3 cm midline incision was made after injection of 0.1-0.2 ml of 1% methylene blue (MB) in the rostral intermandibular skin. Microsurgical jewelers forceps were used to isolate the superficial cervical lymph nodes. Nodes not highlighted were injected with MB using an insulin syringe and 28-gauge needle to identify superficial and deep cervical lymphatic vessels and deep cervical nodes. Areas adjacent to the external jugular vein and common carotid arteries were dissected and all lymphatics were closed with 1-2 micro-hemoclips. Incisions were apposed with an intradermal pattern of 5-0 poliglecaprone-25 and skin glue. Complications were not observed, and rats received buprenorphine 0.05-0.1 mg/kg SC for analgesia q6-8h for 24-48 hours. Biochemical and IHC studies of Ab content in the meninges and other brain regions, analyzed using a GLM approach, were then performed.

Results:

Cell culture yielded findings consistent with confluent tight endothelial barriers, demonstrated by IHC to Z01 and TEM with cell-cell junctions including desmosomes. Meningeal lymphatic cells had cellular machinery to transport Ab evidenced by expression of clathrin and caveolin. Lymphatics expressed energy-dependent transporters such as MRP1, a known blood-brain barrier Ab transporter in vivo. Alzheimer's lymphatics had ultrastructural abnormalities such as inclusions not seen in wild-type cells. Lymphatic cells transported soluble Ab, and clearance capacity depended on age and Alzheimer's genotype. Ab transport in vitro occurred through active transcytosis, supporting the role of caveolin and clathrin-mediated endocytosis as a clearance mechanism. ATP-dependent transporters with high affinity for Ab were demonstrated. Meningeal lymphatic vessels accumulated pyroglutamate A(pE3-Ab) in small lymphatic capillaries along the transverse sinus. In ligated animals, pE3+ collecting ducts in lateral meninges (Fig 1; green) showed numerous CD68+ perivascular Mato cells (Fig 2; purple).

Conclusions:

Energy dependent transport is a key mechanism of Ab clearance, and lymphatic vessels are transport pE3-Ab one of the most highly neurotoxic forms of Ab. Lymphatic microvascular transport is necessary for Ab proteostasis since it is not adequately compensated by blood-brain barrier clearance when impaired. Obstruction of lymphatic drainage in the neck is sufficient to significantly increase amyloid deposition intracranially. Accelerated accumulation of Ab occurs in the meninges and in cortical brain regions involved in Alzheimer's disease.

NOTES

Development of a Novel Expandable Graft for Repair of Congenital Heart Defects

Presenter: John P Carney MBA
University of Minnesota

Introduction:

Patients born with complex congenital heart defects often require grafts to repair the heart. Over time, many of these patients will undergo repeat invasive open-heart operations due to cardiac outgrowth. A novel synthetic graft has been designed to be balloon expandable to accommodate a growing heart. To evaluate its long-term feasibility for heart repair in a growing model, we implanted the graft interpositionally in the pulmonary artery in juvenile sheep.

Methods:

Twelve sheep were implanted with the experimental graft, and three sheep were implanted with a control graft comprised of a commercially available synthetic material. Implants were performed using standard surgical, anesthesia and recovery techniques described in the literature. Transthoracic echoes were performed monthly to assess animal health. After implant, animals underwent interim interventional procedures at three, six or nine month time points. During these interim procedures, animals implanted with the experimental graft were either balloon expanded and recovered, or balloon expanded, implanted with a stent, and recovered. Concurrently, animals implanted with the control graft were catheterized to collect hemodynamic data and recovered. At the end of the study term, animals were humanely euthanized and underwent a full necropsy.

Results:

All fifteen graft implants were performed without complication, and all animals survived the surgery. Balloon dilations and stent placement procedures occurred without incident and animals recovered normally. Experimental graft diameters increased with each balloon dilation procedure, while control graft diameters decreased over the course of the study. Animals implanted with the control graft developed moderate to severe tricuspid regurgitation appreciable on transthoracic echo; this phenomenon was not observed in animals implanted with the experimental graft. At necropsy, all 12 experimental grafts were patent without evidence of clot formation, obstruction or infection. Stent migration was not apparent in animals implanted with a stent. One animal implanted with a control graft died at 129 days after implantation with signs of severe right heart failure and partial conduit obstruction. Intraluminal narrowing was observed in the remaining two animals implanted with control grafts.

Conclusion:

The results indicate that the novel experimental graft can be used as a cardiac conduit and be repeatedly expanded without deleterious effect. The experimental graft can also be used to reliably secure a stent. Moderate to severe tricuspid regurgitation observed in animals implanted with control grafts is suggestive of asymmetric right ventricular dilation due to cardiac growth and graft narrowing. Absence of this pathology in animals implanted with the experimental graft indicates the effectivity of the graft expansion in a growing heart. The ability to expand the experimental graft to accommodate a patient's cardiac growth, as well the graft's ability to hold a stent, has the potential to decrease the number of invasive surgeries necessary in treating patients with complex congenital heart defects. We propose that the experimental graft is a viable device to be used in reparative congenital cardiac surgery.

NOTES

Urology Animal Model Generation for Lithogenesis Potentiation

Presenter: Darcy H. Gagne ScM, SRS, CVT, RLATG

BD Interventional (Surgery)

Introduction:

Urinary stones affect 5-15% of the population, and their prevalence is rising. When surgery is required in the direct flow of urine in the bladder, biocompatible materials aimed to control surgical bleeding must be tested for urological indication to demonstrate safety and potentiation for stone formation. (46 words)

Materials & Methods:

Previous studies led to the selection of the female Yorkshire swine model (~55 kg) as the most appropriate. The current study utilized two devices (a test and control) and a sham group along with three time points (Day 0, 3, and 7). On Day 0, all animals received a midline laparotomy and implantation of test, control or no material and cystoscopy post-implantation. The animals were monitored for clinical and incision site observations, urinalysis, and body weight for the duration of the study. (82 words)

Results:

Animals were anesthetized and positioned in dorsal recumbency. The operative site was prepared for strict aseptic procedures and supportive intravenous fluids were administered. A midline skin incision was created in the lower abdomen through the linea alba to expose and externalize the bladder. Near the apex of the bladder, two sets of double, concentric ring patterns of purse-string suture were placed. A small stab cystotomy incision was created in the center of one of the double rings and a hemostat was passed through the lumen of the urinary bladder until visible at the center of the other set of rings and exteriorized through another stab incision. The device (except for the sham) was grasped and pulled through the cystotomies by retraction of the hemostat and secured by tightening each of the interior purse string suture rungs ensuring a proper seal. The outer ring of each cystotomy site was then closed by pushing toward the center while tightening the outer purse string suture closing the site and protecting the device stumps from the abdominal viscera. The bladder was returned to the abdomen and the laparotomy incision was closed in layers. Cystoscopy was performed and the animals were weaned off ventilatory support. Cystoscopy was repeated at interim timepoints to monitor device resorption and to note any visual evidence of lithogenesis. The animals showed no lithogenesis throughout the duration of the study.

Discussion:

The goal of this study was to determine if devices aimed at controlling surgical bleeding led to lithogenesis when implanted in the direct flow of urine. Careful planning, meticulous surgical procedures and pre-, intra-, and post-operative monitoring were the keys to success with this animal model. Urine was collected by urine collection bags daily or via cystoscope. While implanting material in the bladder this way may not be directly clinically relevant, this model will assist to determining the lithogenic potential of such devices in a safe and repeatable procedure using clinically-relevant tools (ie. cystoscopy).

Conclusion:

In summary, we describe a model of urinary bladder implantation for the evaluation of safety and of biomaterials in the direct flow of urine in pigs. Our experience indicates that this represents a robust model and clinically relevant approach to evaluating dynamic devices that may come into contact with urine.

NOTES

Developing a Non-metastatic Orthotopic Bladder Cancer Model in Mice

Presenter: Devra Olson BA, SRS, LATG

Seattle Genetics

Introduction

Bladder cancer is one of the most common cancers in the United States, affecting approximately 80,000 adults annually. Our goal is to create preclinical mouse models to better understand disease progression and tumor microenvironment within the organ of origin. To achieve these aims, we have explored various orthotopic implantation methods to model primary, non-metastatic bladder cancer.

Methods

A total of 25 female, athymic nude mice underwent a single procedure according to our approved IACUC protocol. The first method explored engrafting luciferase-expressing human bladder cancer cells on the inner lining, or urothelium, of the bladder. Transurethral instillation of cells required catheterization of the bladder using a lubricated 24-gauge IV catheter. The mice were sedated with Isoflurane, placed on a heat source and catheterized. The urine was removed, 100 µL of Poly-L lysine was incubated in the bladder for 20 minutes, then 50 µL cancer cells were incubated in the bladder for 45 minutes. The second model was attempted using 2 surgical approaches. Intramural implantation of cells is a direct injection of 20 µL cell suspension into the bladder wall, while luminal injection is 50 µL of cells injected into the lumen of the bladder, following cystocentesis. Both surgical procedures required a 1 cm, midline incision in the abdomen to access the bladder and was performed under aseptic conditions. Buprenorphine (0.05 mg/kg) was delivered pre-operatively and 24 hours later, and MediGel CPF® was provided for continued relief up to 7 days post-surgery. The mice were imaged weekly using the IVIS SpectrumCT to track engraftment and tumor progression of the luciferase-expressing cancer cells. Bladders were harvested at various time points and evaluated by histological analysis.

Results

All mice recovered well from each procedure and there were no surgical complications. The transurethral instillation of cells was not successful in nude mice, so we repeated the procedure in the SCID mouse strain which resulted in 100% tumor engraftment. Bioluminescence imaging confirmed cancer cell engraftment and growth in nude mice implanted via intramural and luminal injection methods. The luminal injection technique was less consistent (80% engraftment) and appeared to develop metastases in the kidneys and ureters, as confirmed by microCT 3-D imaging, gross necropsy, and histological analysis. All mice grew tumors after intramural injection and the cells remained within the bladder as the tumors progressed making it the preferred injection method. Our internal pathologist examined tumor location and stage of each orthotopic implantation method and confirmed the clinical relevance of disease pathology.

Conclusions

Orthotopic bladder models are well-established in rodents; however, this effort successfully validated the rate of engraftment and growth kinetics of a novel, luciferase-expressing bladder cancer cell line. In vivo bioluminescence imaging is advantageous when developing orthotopic cancer models, providing sensitive detection and rapid confirmatory results. The strain of mouse, optimal implantation method, and morphology of progressing bladder tumors were explored to further our understanding of primary bladder cancer.

NOTES

Early-stage Characterization of an Endovascularly-induced Model of Renal Insufficiency in the Yucatan Miniature Swine.

Presenter: Jose Negron MS , SRS

Cook Research Incorporated

Background: Various animal models of renal insufficiency have been described in the literature. These models generally require major surgical interventions and can be accompanied by significant complications. A porcine model of renal insufficiency produced by minimally invasive renal artery embolization is a more recent development that may facilitate evaluation of different modes of dialysis during ischemic renal nephropathy in a more clinically relevant model.

Purpose: In this pilot study we evaluated the ability to produce and manage renal insufficiency in the Yucatan miniature swine over a short (up to 5 day) period.

Methods: One week prior to renal insufficiency induction procedures the animals were anesthetized, the peritoneal cavity was insufflated, and two or three peritoneal dialysis catheters were implanted in the peritoneal cavity. A jugular catheter was also placed to facilitate multiple daily blood draws used to establish baseline values for blood serum levels of blood urea nitrogen (BUN), creatinine, and sodium. Catheter patency was maintained by daily flushes with heparinized saline for one week. On the day of the renal insufficiency procedures the animals were anesthetized, femoral artery access was obtained percutaneously, and baseline angiography of the renal arteries was performed. Renal artery branches were selected so that the blood supply to one entire kidney and one half of the other kidney (approximately 75% of total renal blood flow) was occluded with embolization coils and polyvinyl alcohol foam particles. The animals were recovered from anesthesia and blood serum and dialysate extract were collected for up to 5 days until follow up. At follow up, angiography was performed to confirm continued occlusion of the renal arteries, invasive blood pressure was recorded, and the animals were euthanized prior to submission for necropsy.

Results: A total of six animals successfully underwent peritoneal dialysis catheter implantation and one whole and one-half kidney in each animal were successfully occluded. During the follow-up period, animals showed an initial increase in blood BUN and creatinine levels, followed by reduction after dialysis. Necropsies indicated necrosis of the occluded portions of both kidneys.

Conclusions: Continued occlusion of the renal arteries through the follow up period, an increase in blood serum BUN and creatinine levels, and the expected necrosis of the renal parenchyma indicate creation of a state of renal insufficiency. Blood serum BUN and creatinine levels were shown to reduce following daily dialysis and analysis of the dialysate filtrate showed increased levels of BUN and creatinine, suggesting successful dialysis and removal of both BUN and creatinine was occurring through the peritoneal dialysis catheters.

NOTES

The Use of an Intervertebral Plate for Lumbar Vertebral Immobilization Following Either Posterolateral Fusions (PLF) or Posterolateral Intervertebral Body Fusions (PLIF) in Sheep

Presenter: Vince Mendenhall DVM, PhD

Preclinical Surgery Consultant

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

Thursday, Track 2

Proper Implantation Technique Is Critical For Quality Signals in Longitudinal Studies Using Telemetry Devices

Presenter: Chelsea Richardson

eMKA Technologies

Two dogs were implanted with emkaTECHNOLOGIES digital telemetry, easyTEL+_L_EPTA, for ECG, BP, temp., and activity monitoring. Implantation technique is critical for quality signals in longitudinal studies. Here we describe our method of ECG lead and catheter implantation, to demonstrate how surgical variations can affect the quality of signal over time.

Dogs received physical exams prior to surgical procedure. Animals were pre-medicated with 0.01mg/kg glycopyrrolate, 0.02mg/kg buprenorphine and 0.01mg/kg acepromazine, IM, 20 minutes prior to anesthesia. Antibiotics, Pen g (1.0ml) or cefazolin 20mg/kg, were given prior to surgery. 5mg/kg ketamine and 0.25mg/kg diazepam were given IV prior to intubation with endotracheal tube and maintained on 1-3% isoflurane. SpO2, Temp., HR, and RR were monitored during surgery. Surgical site was shaved and prepared for surgery following aseptic techniques. Animals were moved to surgical suite and placed on heated table, connected to fluids, and monitoring equipment. easyTEL+ digital telemeter was soaked in sterile saline solution prior to placement. Before incisions, local anesthetic of Bupivacaine 1mg/kg and Lidocaine 1 mg/kg was infiltrated into the incision area. The telemeter was placed subcutaneously in the right abdomen. Incisions were made at the 7th intercostal space left thorax, and the thoracic inlet on right thorax for ECG leads and right femoral area for blood pressure catheter placement. ECG leads were tacked to muscle bed while pressure catheter was passed into right femoral artery and secured. All sites were closed in two layers of sutures. 4 mg/kg carprofen was given, IM, post-surgery. Animals were kept warm and monitored continuously until endotracheal tube was removed and animal regained righting reflex. 2 mg/kg carprofen PO, SID 2-4 days and a second dose of buprenorphine 0.02 mg/kg were given 6 hours post-surgery. Animals were monitored daily for 5 days post-surgery. Recordings from during implantation and post-implantation in bi-weekly intervals were used to verify lead and catheter placement and to observe change in position of ECG leads or blood pressure catheter due to time and natural behavior.

Surgical recordings showed good ECG and BP recordings in both subjects' supine on the table. Over time the blood pressure catheter became compressed in one animal when the hind leg was extended causing distortion in recordings. It is difficult to understand how various techniques may be better or worst but through retroactive analysis of signal quality over time we can learn how best to implant for ECG and BP studies. Surgical implantation technique has a large impact on signal quality in longitudinal studies. The differences in surgical technique can create artifact or even data lose during collection. By understanding the implications of implantation and subject growth on lead placement we can adjust our surgical techniques to allow for better data quality in longitudinal studies.

NOTES

A Ferret Telemetry Model to Monitor Multiple Physiological Endpoints

Presenter: Michael S. Horsmon MS, SRS
US Army CCDC Chemical Biological Center

Introduction: The common ferret has become a preferred animal model for recent investigations of physiologic responses to high doses of opioid compounds. Ferrets are preferred since they are the most pharmacologically relevant small animal model. Inhalation toxicology investigations at our laboratory require data describing responses of the central nervous, cardiovascular, and respiratory systems function in free roaming animals exposed to a variety of chemical toxicants. There is no previous work describing a ferret model in which all these data can be obtained from a single, conscious, free roaming animal. The present study details the development of the surgical technique for collection of the electroencephalogram (EEG), electrocardiogram (ECG), diaphragmatic EMG (dEMG), and blood pressure in the common ferret; and the lessons learned along the way.

Methods: Five ferrets (Marshall BioResources, North Rose, NY) were implanted with F50-EEE and HD-S1-F2 telemetric transmitters (Data Sciences International, New Brighton, MN) under general anesthesia with isoflurane. Three ferrets were implanted with HD-X02 and HD-S11-F2 transmitters. The F50-EEE transmitter was utilized to collect the EEG, ECG and dEMG while the HD-S1-F2 Transmitter was utilized to collect blood pressure in a group of five ferrets. The HD-X02 transmitter was used to collect EEG and dEMG, while the HD-S11-F2 transmitter was used to collect ECG and blood pressure in a group of three ferrets. Following a recovery period of ten days, baseline data were recorded over a 24 hour period from each animal.

Results: The baseline mean heart rate was found to be 206.5bpm ± 9.9bpm the baseline average mean arterial pressure was found to be 98.2 mmHg ± 1.5mmHg. The EEG appears to be stable except in cases where electrodes became dislodged. The dEMG was present and stable in all cases with clearly discernable respiratory waveform when the animal is at rest, at the time of writing optimization of analysis of the dEMG is ongoing. The combination of HD-X02 and HD-S11-F2 was not successful for several reasons. Most importantly, the dEMG and ECG must be collected using the same transmitter for effective removal of ECG artifact from the dEMG signal. By providing an EEG useful for seizure detection, a dEMG useful for respiratory rate detection, and clean, stable ECG and blood pressure waveforms, the ferret model developed in this study using the F50-EEE and HD-S1-F2 transmitters will meet the needs of ongoing studies at our facility. The dEMG is the focus of further development with the goal of calibrating the dEMG signal to known tidal volumes, possibly allowing for the estimation of minute volumes without the need for plethysmography.

NOTES

Malignant Hyperthermia in Swine: Overview and Case Study

Presenter: Heather DeLoid DVM

Wake Forest Innovations

Malignant Hyperthermia (MH) is an inherited disorder of skeletal muscle that predisposes susceptible individuals to life-threatening adverse reactions after exposure to triggering agents such as volatile anesthetic gases, exercise, or stress. Malignant Hyperthermia is generally thought to be a sudden, rapidly progressive, fatal event. However multiple environmental and genetic factors can contribute to the clinical syndrome of malignant hyperthermia, therefore the presentation may vary from subtle and unrecognizable to the classic fatal episode.

This presentation will review the pathophysiology of malignant hyperthermia, including clinical findings, treatment, diagnosis, and prevention. This presentation will also discuss a case study of a Yorkshire/Landrace cross pig suspected to have malignant hyperthermia or other abnormal metabolic disorder that survived four anesthetic events. The animal was later confirmed to be homozygous for the malignant hyperthermia mutation. Emphasis will be placed on the adverse reactions observed, clinical management of the animal, and different anesthetic protocols attempted in an effort to mitigate the reactions.

NOTES

Establishment of Therapeutic Dosing Ranges of Methadone for Moderate to Severe Pain in Cynomolgus Macaques

Presenter: Amy Martunas CVT, RLATG, SRA, SRT

Pfizer

Background: Methadone is a synthetic opioid mu agonist which has gained popularity as an analgesic for surgical procedures and chronic pain as it provides a longer effective duration compared to common opioids for moderate to severe pain. Longer-duration analgesics are ideal for use in laboratory animal settings, though options for these drugs are limited. Furthermore, therapeutic dose ranges for many medications used in nonhuman primates are often anecdotal or are obtained from other species. Pharmacokinetic (PK) data of Methadone in dogs and humans have demonstrated therapeutic duration for 12-14 hours. This study investigated the pharmacokinetics of methadone at 2 dose levels in Cynomolgus Macaques for use as extended duration opioid for surgical procedures involving moderate to severe pain post-operatively.

Methods:

8 Mauritius origin Cynomolgus Macaques were administered 0.2mg/kg and 0.5 mg/kg Methadone hydrochloride intramuscularly (IM) and plasma and urine were collected utilizing the following time points and methods:

Plasma collection - 1-2 mL of blood collected via peripheral vein into 2 mL purple-top K3EDTA vacutainers and stored on wet ice (or refrigerated at 4 degrees C), then centrifuged for 10 minutes at 3000 rpm to obtain plasma. Approximately 0.5 mL of plasma was then transferred to polypropylene 1.2 mL Marsh tubes in a 96-well plate, capped, and then stored frozen at -80 degrees C until analysis. Plasma was collected at the following time points: 0.25, 0.5, 1, 2, 4, 6, 8, 12, 24, 48, & 72 hours.

Urine collection – a metabolism pan was placed under animals for collection and collection containers were surrounded with wet ice that was periodically changed throughout the day. Urine volume was measured, and total volume was documented at each time point. Approximately 0.5 mL was transferred into polypropylene 1.2 mL Marsh tubes in a 96-well plate, capped, and then stored frozen at -80 degrees C until analysis. Urine was collected at the following time points: 0-8 hours, 8-24 hours, 24-48 hours, 48-72 hours.

Results: After IM administration, Methadone administered at 0.2 mg/kg dose reflected a terminal half-life of 3.61 hrs and therapeutic plasma levels within 15 minutes of administration for a duration of 8 hours. Methadone administered at 0.5 mg/kg dose reflected a terminal half-life of 21.3 hrs and reached therapeutic plasma levels within 15 minutes of administration for a minimum duration of 12 hours.

Conclusion: This study has established dosing ranges and effective duration for Methadone in nonhuman primates to effectively relieve moderate-severe pain.

All study related activities and animal use were approved by Pfizer's local Institutional Animal Care and Use Committee

NOTES

Vascular Access Button Implantation in the Rabbit

Presenter: Jon Ehrmann BS, SRS, SRA, LATG
Bristol Myers Squibb

Introduction

Rabbits are commonly used for pharmacokinetic (PK) studies in the research setting. The auricular vein and/or artery is commonly used to collect blood samples for these studies. However, due to the delicate nature of these vessels it can be challenging to collect multiple blood samples for a typical PK study from a conscious rabbit. This process can also be very stressful to the rabbits. In an effort to be consistent with our commitment to the 3Rs, we implanted a cohort with vascular access buttons to reduce their stress while on study and have a reliable method for blood collection.

Materials and Methods

Six female, one year old New Zealand white rabbits were surgically instrumented with a vascular access button (VAB). A 3.0 French polyurethane catheter was placed in the femoral artery with the tip of the catheter ultimately resting in the abdominal aorta. This catheter was then subcutaneously tunneled to an incision just caudal to the shoulder blades. A hole was made on the dorsal aspect of the neck with an 8 mm biopsy punch through the skin for the button. The catheter was cut to length and secured to the button. The button was passed under the skin so the access hub came out through the hole created by the biopsy punch. This procedure was approved by the site governing Institutional Animal Care and Use Committee and performed within an AAALAC accredited facility.

Results

Surgery was successful, and all six rabbits recovered well with no post-operative complications. The buttons have been patent for eight weeks thus far with patency meaning the ability to aspirate blood. The buttons are maintained via flushing and administering a lock solution monthly or after each time it is accessed.

Conclusion

Since the button is externalized, it provides a very efficient and low stress method of collecting serial time points for PK studies. The planned presentation will focus on the surgical techniques necessary to implant the device, comparison to a vascular access device (VAP), and how to maintain the VAB for chronic patency.

NOTES

Surgical Writing – From Protocol Development, Conception of the Research Hypothesis, Data Collection, Manuscript Preparation through Publication

Dr. Marc Basson
University of North Dakota

An interactive workshop on surgical writing with the new Editor-in-Chief of the Journal of Investigate Surgery. The session will include an overview of the process from hypothesis and experimental design through manuscript writing and submission and handling peer review and interaction with journals. The most common reasons for rejection of manuscripts will be discussed. In addition to a Q&A session, there will be an opportunity to participate in guided peer review of your own manuscript or someone else's manuscript

NOTES

Friday, Track 1

Evolution and the Use of Rat Vascular Access Buttons

Presenter: Steven Kreuser SRA, SRS, LATG

Pfizer

Introduction

Many novel compounds are administered intravenously, whether it be a bolus, prolonged or continuous infusion. In order to maximize translatability of infusion models, current technology is frequently evaluated to ensure that they meet the following criteria: animal welfare, social housing, ambulatory infusion, and reducing resources required to maintain the model. We will discuss the history, and evaluations completed of various vascular access buttons to ensure that Pfizer's portfolio needs are met.

Background

Vascular Access Buttons (VAB) or skin buttons were created to improve tethering and eliminate complications with externalized catheters and harnesses. Vascular Access Buttons or skin buttons are built around miniature externalized ports that are connected to an implanted catheter. Historically, skin buttons or vascular access buttons were manufactured in house to meet needs that could not be realized with vascular access ports. These buttons were rigid and had a negative effect on the surrounding skin and vasculature, such as skin erosions and accumulation of necrotic tissue cells. Clinical issues led to a significant loss of animals on study. Due to anticipated clinical issues, fifty percent more animals needed to be produced to meet the number of animals required for study completion. Due to the number of issues that were seen with this model, the investigator was encouraged to work with the surgical group to improve animal health and the performance of the buttons. In response, active discussions were initiated to better understand complications and identify potential solutions for improvement. The evolution of vascular access buttons has improved dramatically. This has significantly improved animal welfare by reducing clinical issues and long-term patency has improved. Initially the Instech VAB 95 was the preferred button, however that model was discontinued for the current versions. Current VAB's now have the ability to connect from one to four catheters for wide range of surgical procedures. The evolution of vascular access buttons has improved significantly. This has significantly improved animal welfare by reducing clinical issues and long-term patency has improved.

Discussion

This initial work led us to seek continuous improvement in our infusion models. Numerous devices were investigated, and continuous improvement measures were implemented. This has successfully improved model performance and the welfare of the implanted animals, significantly reducing the number of animals required for study. Furthermore, this work has led to active partnerships with both internal customers and external vendors to trouble-shoot, identify and eliminate complications seen with these models.

All animal use was approved by the local Institutional Animal Care and Use Committee.

NOTES

Central Venous Catheters in Swine – Trials and Tribulations

Presenter: Amanda Klemoski, BS, SRA, LATG
Charles River Laboratories

Blood samples from Swine are routinely collected from the vena cava for diagnostic sampling, toxicokinetic sampling, pharmacokinetic sampling and other required collections. Collections are possible through manual restraint of the animal with or without using a snare (snout tying with a rope). The aforementioned practices are stressful for both the animal and personnel. Placing a central venous catheter (CVC) line using the Seldinger technique is a less stressful method alternative. This minimally invasive technique allows large volumes of blood to be collected via the cranial vena cava while reducing the number of personnel required for collection. Using the Seldinger technique to place the central venous lines is well published with step by step instructions but for our purposes we have found that to have the best, long term success for sampling line longevity was to modify the initial entry points and have variable length of catheters based on animal size and breed. This was crucial in the success of longer-term patency. We discovered that there are increased chances of clotting, kinking, loss of patency, and infections due to different methods, locking solutions, and/or line size and length. The intent of this work is to identify optimal conditions for efficient, reproducible placement and care of CVC lines in different strains of swine. Three strains of swine have thus far been used: Domestic-Yorkshire crossbred, Gottingen minipigs, and Yucatan minipigs. Multiple trials have been conducted to date. Variables tested surround catheter specifications, placement methods, and after care during the duration of implantation. Through the research conducted thus far, we have encountered various tribulations that we aim to share and resolve with future research.

Evidence based Medicine Consult, Anthony J. Busti, MD, PharmD, FNLA, FAHA, September 2015, Seldinger Technique for Intravenous (IV) Line Placement

NOTES

Patience is a virtue.....The Importance of the Post-Operative Period for Port and Catheter Systems

Presenter: Jan Bernal DVM

Pfizer

Description (What the audience will learn): Implantation of a medical device results in tissue injury that initiates host defense systems (inflammatory, healing and foreign body responses). The degree to which the homeostatic mechanisms are disrupted, the extent and the timing of the of the disruptions impact the success of the medical device. Within one day following implantation of a medical device, the healing response is initiated by the activation of monocytes and macrophages. Fibroblasts and vascular endothelia cells proliferate and begin to form granulation tissue. Approximately 3-weeks post implantation, the end results of the host defense systems is fibrosis or fibrous encapsulation of the medical device. Presentation is an overview of the classic biocompatible foreign body reaction using a Catheter in Catheter (CIC) system in nonhuman primates (Macaca Fasicularis) and the complications of disturbing the classic biocompatible foreign body reaction with respect to clinical signs, animal wellbeing and device success. A comparison of two cohorts' device success and clinical complications based upon the duration of the post-operative recovery and the timing of the use and handling of the CIC systems.

NOTES

Developing a Rodent Surgery Training Program

Presenter: Monica S. Torres MA, LATG, SRT, CMAR
Bayor College of Medicine

Currently our animal program consists of approximately 300 active rodent surgical protocols with approximately 800 research staff performing surgery. Ensuring surgical proficiency is quite a challenge in any laboratory animal program, but with such a large number of research personnel requiring training, the Center for Comparative Medicine (CCM) had to approach this task creatively. In 2016 we rolled out our Rodent Surgical Techniques course that would allow us to train and deem proficient a training ambassador (TA) from every lab. Each TA would then go be required to train other lab members (trainees) conducting surgery. The course was developed as a basic introduction to proper surgical technique for both survival and non-survival procedures. The course focuses on ensuring that 'good surgical technique" is practiced, as required by the Guide, and includes aseptic technique, anesthesia, post-surgical monitoring and pain recognition. Our course modalities include: online training, hands on training, preoperative, intra-operative and post-operative procedures as well as a final proficiency assessment. To ensure compliance moving forward, after the TA has trained their lab members, these trainees are audited by CCM training staff. Trainees who pass their audit are deemed proficient. Those who do not are routed back to the CCM for re-training. A surgical training database was also created to track the completion status of these components and facilitates scheduling of all hands on labs and proficiency assessments. To date, 187 of 298 TAs have been deemed proficient and 208 of 506 trainees have passed their proficiency exams.

NOTES

Cranial Access For the Delivery of Biotinylated Dextran Amine (BDA) Neural Tracers into the Motor Cortex Following a T10 Hemicompression of the Spinal Cord to Produce a Spinal Cord Injury (SCI), in the Caribbean Green Monkey

Presenter: David Moddrelle, SRS

Senior Director for Surgical Services - Medical Devices; Medical Device Testing Center;
WuXi AppTec, Suzhou, China

Background: The Caribbean vervet (Chlorocebus Sabaeus), an Old World nonhuman primate sharing similar anatomic, physiologic, immunologic and genetic homology to humans as cynomolgus and rhesus monkeys, has been widely used in biomedical research. Their use and value in modeling and understanding neurodegenerative diseases such as Parkinson's and Alzheimer's is particularly well documented.

Purpose: The benefits of using this species and Old World nonhuman primates more broadly in spinal cord injury (SCI) research has been highlighted previously, guiding our development of an experimental model of SCI based on hemicompression of the cord at T9-10. This model limits post-injury deficits to minimize pain, distress and discomfort to animals. Biotinylated dextran amines (BDA) are organic compounds used as anterograde and retrograde neuroanatomical tracers. They can be used for labeling the source as well as the point of termination of neural connections and therefore, to study neural pathways, and have been used extensively in various species including the primate. In this presentation we will explore several different techniques for opening the calvera (use of drills, trephines, various drill bitts, etc.), dural opening and closure, replacing the bone flap (MRI compatible loops vs screws and plates), dental adhesives and their use. The presentation will follow each step of the procedure (pre, intra, and post-operatively) with all anesthetic, analgesic and antibiotic therapies employed and discuss the pitfalls associated. Application of these techniques for BDA injection into the motor cortex following SCI will be discussed.

Methods: After completion of the craniotomy and with the use of a stereotaxic frame, manipulator arm and a microinjector the tracers were injected into the motor cortex tracking along the central sulcus and the superior sagittal sinus. The injections varied as to depth with some sites receiving 3 injections (6mm, 4mm and 2mm), some receiving 2 injections (4mm and 2mm) and some receiving 1 injection at 2mm. Up to 44 injections were performed along the tract. All injections were delivered over a 1 minute period with a 2 minute period in between each dose. Animals were euthanized approximately 11 weeks after BDA injections, allowing sufficient time for the tracer to reach and potentially extend beyond the SCI defect. Histology analysis of this project is not yet complete but will be presented during the presentation.

Conclusions: The successful conclusion of this 3 month study exhibited no post-operative problems associated with either the procedure or the BDA injections and shows that Chlorocebus sabaeus is a viable primate species for projects involving major cranial procedures.

NOTES

Friday, Track 2

Meet the Mentor Session

In the summer of 2018, the Academy of Surgical Research launched a Mentorship Program to further enable ASR members, both those starting out as well as seasoned individuals, to grow and lead as effective professionals by providing meaningful one-on-one mentoring relationships. The program was developed to provide an opportunity for members to increase networking amongst industry leaders and peers as well as provide additional assistance to individuals planning to sit for one of the certification exams.

Each Mentee and Mentor pair will design a shared goal/outcome for their partnership to be completed during a period of up to a one year mentorship. A few examples of possible goals for a mentorship could be:

- A mentee that is new to the field of surgical research and seeking guidance on development and career paths.
- A mentee planning to sit for one of the certification exams and seeking guidance from a certified member on the process from the application, what/how to study and taking the exam itself.
- A mentee looking to develop a new surgical model and seeking guidance from a certified surgeon with significant experience in that particular model or area of surgery.

Our Mentors have a broad base of experience. To provide a high quality program, Mentee and Mentor pairs will be matched according to their fields, experience and goals as outlined in the application process. This session will discuss the criteria for the Mentee and Mentor, the application process, the commitment expected from each side and a review of current Mentors. Additionally, there were three Mentor/Mentee pairs established this year to assist individuals with the certification process; we will provide feedback on each of these relationships and how we plan to build and improve the program moving forward.

NOTES

Corneal Xenotransplantation in the Nonhuman Primate

Heather B. DeLoid, DVM – Wake Forest Innovations

Introduction: Corneal transplantation is the most common form of tissue transplantation with approximately 47,000 surgeries performed annually in the US. The overall risk for transplant rejection after 2 years is 15%, while in high risk patients, the rejection rate increases to an alarming 50-70%, despite frequent use of immunosuppressive medications. The goal of this project is to prevent inter-species corneal graft rejection by exploiting a natural method of immune-tolerance.

Methods: Two African Green (vervet) monkeys underwent unilateral corneal transplantation of pig corneal tissue that was pre-treated with either a test or control compound. One monkey received a test graft and one monkey received a control graft. The animals underwent periodic eye examinations that included Schirmer tear test, intraocular pressure, central corneal thickness, Hackett-McDonald inflammatory scores (slit lamp biomicroscopy), and photographs. Blood, urine, and feces were collected prior to surgery then weekly until necropsy. The animals were monitored until graft rejection, which was defined as when the graft corneas became vascularized and cloudy. Upon graft rejection, the animals were euthanized and tissues collected for analysis.

Results: The control graft reached rejection before the test graft, however both grafts developed corneal vascularization and cloudiness.

Conclusion: This pilot study developed the surgical procedure, clinical care and management, and in-life evaluations of corneal xenotransplantation in nonhuman primates. Future studies will continue to refine the methods of graft preparation to prevent inter-species corneal graft rejection.

NOTES

Developing a Robust Program to Promote Academy of Surgical Research in Your Organization

Presenter: Gayle Z. Nugent BA, SRS, LATg
Charles River Laboratories – Mattawan

Description: Holding ASR certification is an important way to meet training requirements mandated in animal research regulation. Developing a program to encourage ASR certification in your institution will encourage high standards for animal care and quality research.

What participants will learn: Tips on how to develop a program to encourage ASR certification in your organization.

Target audience: Administrators, managers, mentors, senior research and surgical staff

Abstract:

The Guide for the Care and Use of Laboratory Animals mandates training for researchers conducting surgical procedures. The Guide specifically cites the Academy of Surgical Research as a resource that provides training guidelines to assist institutions in developing appropriate training programs for research surgery commensurate with staff background1. Technical staff who hold ASR certifications should be considered competent in the areas of expertise associated with the certification they hold2. As such, encouraging ASR certification is a key component to maintaining appropriately trained staff, ensuring high quality animal welfare, and producing excellent data.

ASR certification is an asset for several reasons. The Academy commands rigorous standards for those seeking certification, including maintaining logs demonstrating proficiency, submission of surgical narratives and outcomes that are reviewed and verified by trained people familiar with their work, and passing a certification exam2. Holding ASR certification shows your organization, colleagues, clients and others in the surgical research field that you have knowledge, skills, and ambition. Encouraging ASR certification improves the quality of our science, the care of our animals, and helps hold the industry accountable to high standards.

Clearly ASR certification is advantageous, however, developing a program to encourage participation in ASR presents several challenges. How do you convince your company or institution to invest in training and sending staff for certification? How do you motivate staff to get certified and recognize them once they do? How do you help staff prepare and get the resources they need? How do you keep people interested in continuing education and encourage participation in the association?

This presentation will explore considerations associated with establishing an ASR certification program at your facility and help answer some of these questions.

1National Research Council. 2011. Guide for the Care and Use of Laboratory Animals: Eighth Edition. Washington, DC: The National Academies Press. https://doi.org/10.17226/12910.

2Journal of Investigative Surgery. 2009. Guidelines for Training in Surgical Research with Animals. 22:218-225. https://doi.org/10.1080/08941930902904542

NOTES

Identifying, Preventing and Troubleshooting Common Anesthetic Issues

Presenters:
Jan Bernal DVM
Steven Kreuser RLATG, SRA, SRS
Angie Lewis RVT, LAT, SRA
Amy Martunas CVT, RLATG, SRA, SRT

The ability to address anesthetic complications is essential for anyone involved in the induction, maintenance and recovery of animals undergoing anesthesia & surgery. This discussion will address common complications that can occur with surgical procedures performed in research, complications related to specific anesthetics/analgesics, and species-specific considerations. We will discuss best practices, advanced monitoring techniques and research-related challenges for a variety of species used in surgical research. Additional topics may include: local and regional analgesia, improving anesthetic monitoring for rodents, surgical complications specifically related to swine and the importance of building anesthesia protocols to improve surgical outcomes. Species covered will be: nonhuman primates, swine, dogs, rabbits, mice and rats.

Please bring your curiosity, knowledge & experience to help us learn together!

NOTES

35 YEARS

Poster Abstracts

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ACADEMY OF SURGICAL RESEARCH

Rat Surgical Wound Closure Refinement

POSTER 1

Presenter: Katina McDonald Senior Scientist, BS, CVT

Merck

Refinement of peri-operative care should be explored and included in all rodent surgical programs. Refining wound closure techniques in rodents is an important component of a successful surgery program, with the potential to result in faster surgical wound healing time and limiting potential clinical issues, which could delay important study timelines in biomedical research. The closure technique for a major intra-abdominal surgery involving trans-diaphragmatic approach to the heart historically included the use of a continuous suture pattern for the muscle layer and wound clips for the large, ventral abdominal skin incision. Rats have the ability to easily remove abdominal wound clips, causing dehiscence. Additional anesthetic procedures and analgesia for incision repairs are required for most of these occurrences delaying post-operative healing. An alternative method of subcuticular suture closure was explored to evaluate the rate of dehiscence and other postoperative complications compared to the wound clip closure method. A total of 450 animals underwent the described surgical procedure. Out of these, 317 of the incisions were closed with wound clips and 133 were closed with subcuticular, absorbable suture. Forty-one animals, or 13%, receiving wound clips experienced post-operative complications such as dehiscence, seromas, excessive granulation tissue, and/or healing by second intention relating to wound closure. However, 8 animals, or 5.5%, receiving subcuticular closure experienced the post-operative complication of dehiscence only. In addition, every animal receiving wound clips for incisional closure required anesthesia for wound clip removal, whereas animals with subcuticular closure only had an additional anesthetic event for dehiscence repair. Utilizing this subcuticular suture closure method reduces postoperative complications while avoiding increases in perioperative time.

Evaluating the Outcomes in Porcine Renal Ischemia with Two Surgical Approaches

POSTER 2

Presenter: Porsha Osborne SRS, LATG

Charles River Labs

Introduction

Investigating the differences in interventional radiology vs an incisional approach of surgically induced renal ischemia to evaluate post-operative recoveries in Landrace cross swine.

Method

The first compared method of induced renal ischemia was achieved in Group 1, with an open incisional approach. A ventral midline incision approximately 30cm long including significant abdominal retraction was used, one kidney was ligated and removed, and the contralateral kidney was totally occluded with reperfusion after 60(±2) minutes. The second method in Group 2, used an interventional radiology approach via the femoral artery with an incision of approximately 5cm long. An arterial femoral catheter was placed and a guide catheter was used to administer medical grade, commercially available microbeads to create a total occlusion in one kidney and a commercially available balloon was used on the contralateral kidney with a total occlusion and reperfusion after 60(±2) minutes. Both methods used similar anesthesia except for the open method animals were administered additional NSAID's for 3 days post-operatively for analgesia. Creatinine and blood urea nitrogen levels were compared between the two methods for a minimum of 2 collections over 48 hours post occlusion. Post-operative limb impairment, activity levels, and incision site evaluations were evaluated.

Results

A total of 2 groups were compared that satisfied criteria and reported outcomes for 7 animals. The open method surgery was approximately 1 hour longer than the interventional approach due to opening and closing the much longer incision. Both methods resulted in similar blood and creatinine levels rising at approximately the same time range after surgery. Group 1 animals showed no significant decreases in hindlimb function or activity post-surgery with incision site observations showing mild dermal irritation including erythema and erythema with edema through day 6. Group 2 showed mild to severe hindlimb impairment immediately post-surgery with improvement by day 2 in 3 of the 4 animals with slight decreases in activity with mild dermal irritation incisional calls including slight edema and erythema. Post operatively, Group 2 had 1 animal receiving additional opioids on day 2 due to showing clinical signs of pain.

Conclusions

The data showed similar values of creatinine and blood urea nitrogen levels post-operatively with both methods seeming to adequately cause renal impairment to make this a reproduceable animal model. Based on the severity of hindlimb impairment of Group 2, and other references from papers documenting human's perspectives undergoing a similar surgery, the possibility of significant pain due to the total occlusion from the atrophying kidney may be worse than just initially removing the organ; but may be justified with the reduced incision size and reduction of anesthesia time. Additional studies with a larger sample size may improve the determination of which surgical approach is superior for animal welfare. The interventional method uses significantly more specialized supplies and the need for a fluoroscopic machine increases the amount of specialized equipment needed to preform the surgery.

Tip Matters: Jugular Vein Catheter Patency in Sprague-Dawley Rats

POSTER 3

Presenter: Haley Roeder MS
Bioanalytical Systems Inc

Introduction:

Surgical implantation of jugular vein catheters (JVCs) facilitates central venous access in preclinical models. Use of JVCs can enhance animal welfare and potentially reduce the number of animals needed, along with refining study design to get better, translatable data. Patency, or bi-directional flow, defines the functional life of a JVC; therefore, it is important to examine potentially contributing factors, such as catheter tip shape and maintenance. Rat JVCs are widely accepted and used, however, design and manufacturing process vary among institutions with limited scientific evidence surrounding the efficacy of either factor.

Methods:

This study compares patency of JVCs from three different manufacturers. Each JVC is made of 3-french polyurethane (PU); two have a rounded tip, one has a bullet tip, and one has a straight-cut tip. 34 male 280g Sprague-Dawley rats were randomly assigned to one of four groups. Subjects received prophylactic analgesia in the form of a subcutaneous injection of meloxicam (5mg/ml) at 1 mg/kg. Anesthesia was induced using 2.5% isofluorane anesthesia in 100% oxygen at 1.0 L/min in an anesthetic chamber. Subjects were then transferred to the surgical station nose cone and anesthesia was maintained with 2.0–2.5% isofluorane via nose cone and the right jugular vein was catheterized. The catheter was exteriorized between the shoulder blades and locked with 500 U/mL heparin/glycerol. Catheter patency was evaluated every 3-4 days for 28 days. Catheters were deemed fully patent if blood was withdrawn during the initial attempt. If blood was not immediately withdrawn, 0.1 ml saline infusion was followed by a second attempt. If successful, catheters were considered partially patent. If unsuccessful, catheters were considered non-patent.

Results:

After 28 days, 70% of one rounded tip (N=10), 60% of the other rounded tip (N=10), 89% of the bullet tip (N=9), and 0% of the straight-cut (N=5) catheters were considered fully or partially patent.

Conclusions:

The rounded and bullet styles were originally designed to decrease inflammation, trauma, and fibrin accumulation at the site of implantation, thereby potentially increasing patency longevity. During necropsy, where straight-cut JVCs were used, there were larger tissue accumulations at the catheter tip point near the heart than in the bullet or rounded tip styles. It is possible that this accumulation significantly reduced patency rates in the straight cut catheters. The final patency rate does not capture all of the pertinent information, however. A detailed look at the bullet tip JVC revealed sporadic patency performance that was not seen in the other designs. Many researchers who use manual sampling methods will not find concern with this because they can manipulate the catheter by hand to acquire a sample. Conversely, those who use automated blood sampling methods may be better suited to a rounded tip design which had similar performance, but were more consistent.

Urology Animal Model Generation for Lithogenesis Potentiation

POSTER 4

Presenter: Darcy H. Gagne ScM, SRS, CVT, RLATG

BD Interventional (Surgery)

Introduction:

Urinary stones affect 5-15% of the population, and their prevalence is rising. When surgery is required in the direct flow of urine in the bladder, biocompatible materials aimed to control surgical bleeding must be tested for urological indication to demonstrate safety and potentiation for stone formation. (46 words)

Materials & Methods:

Previous studies led to the selection of the female Yorkshire swine model (~55 kg) as the most appropriate. The current study utilized two devices (a test and control) and a sham group along with three time points (Day 0, 3, and 7). On Day 0, all animals received a midline laparotomy and implantation of test, control or no material and cystoscopy post-implantation. The animals were monitored for clinical and incision site observations, urinalysis, and body weight for the duration of the study. (82 words)

Results:

Animals were anesthetized and positioned in dorsal recumbency. The operative site was prepared for strict aseptic procedures and supportive intravenous fluids were administered. A midline skin incision was created in the lower abdomen through the linea alba to expose and externalize the bladder. Near the apex of the bladder, two sets of double, concentric ring patterns of purse-string suture were placed. A small stab cystotomy incision was created in the center of one of the double rings and a hemostat was passed through the lumen of the urinary bladder until visible at the center of the other set of rings and exteriorized through another stab incision. The device (except for the sham) was grasped and pulled through the cystotomies by retraction of the hemostat and secured by tightening each of the interior purse string suture rungs ensuring a proper seal. The outer ring of each cystotomy site was then closed by pushing toward the center while tightening the outer purse string suture closing the site and protecting the device stumps from the abdominal viscera. The bladder was returned to the abdomen and the laparotomy incision was closed in layers. Cystoscopy was performed and the animals were weaned off ventilatory support. Cystoscopy was repeated at interim timepoints to monitor device resorption and to note any visual evidence of lithogenesis. The animals showed no lithogenesis throughout the duration of the study. (229 words)

Discussion:

The goal of this study was to determine if devices aimed at controlling surgical bleeding led to lithogenesis when implanted in the direct flow of urine. Careful planning, meticulous surgical procedures and pre-, intra-, and post-operative monitoring were the keys to success with this animal model. Urine was collected by urine collection bags daily or via cystoscope. While implanting material in the bladder this way may not be directly clinically relevant, this model will assist to determining the lithogenic potential of such devices in a safe and repeatable procedure using clinically-relevant tools (ie. cystoscopy). (94 words)

Conclusion:

In summary, we describe a model of urinary bladder implantation for the evaluation of safety and of biomaterials in the direct flow of urine in pigs. Our experience indicates that this represents a robust model and clinically relevant approach to evaluating dynamic devices that may come into contact with urine. (50 words)

A Sensitive Seizure Derisking Assay Necessitates the Need for An Alternative Surgical Approach To The Telemetric Rat EEG Model

POSTER 5

Presenter: James Destefano Associate Principal Scientist Experimental Surgery
Merck & Co; Inc

Surgical methods of electroencephalographic (EEG) radiotelemetric implantation in small animals have advanced over time to provide surgeons with various technical approaches for implanting telemetry devices. A long-standing method of EEG telemetry implantation utilized at Merck West Point known as the 'direct wire" method involves the direct placement of electrodes on the surface of brain tissue. Recent studies revealed that this method resulted in rat models with excessive electrical artifacts that limited the ability to identify seizure activity despite being still suitable for polysomnography (PSG) and general quantitative EEG (qEEG) analysis. In addition to telemetry implantation, study design dictated that Wistar Han rats be used as opposed to Sprague Dawley rats and that the animals also be instrumented with a vascular access catheter and button (VAB) to permit chronic compound infusion. Using a 'screw and wire" method wherein screws are used as anchors for wires serving as electrodes, we have designed a robust, vascularly cannulated rat model for collection of data from multiple EEG channels with greatly reduced EEG artifact. Animals were subjected to a chronic intravenous administration study after EEG signal quality control (QC),and tether acclimation period. During the acclimation period, visual identification of rat behavior such as scratching and stretching were correlated with time stamped EEG signal data. Rats were dosed with vehicle for four consecutive days followed by compound for seven consecutive days. Data were analyzed and improved signal quality provided confidence in analysis to detect seizure events. Our new model was a novel in-house combination of intraperitoneal telemetry, subcutaneous wires and catheters and an open system (VAB). Study results indicate that this new implant procedure greatly reduces confounding electrical artifacts, is sensitive, durable, reproduceable over several channels and across multiple surgeons and also reduces data analysis time.

A Comparison of Catheterization Methods in an Ovine Fetus for Serial Blood Draws

POSTER 6

Presenter: Elizabeth A. Pollack BA
Boston Children's Hospital

Background:

The goal of our study was to determine the best catheterization method for serial fetal blood samples to determine plasma drug concentrations after maternal dosing.

Purpose:

The study required blood collection from the fetus for a minimum of 7 d.

Methods:

Pregnant Dorset sheep at a gestational age range of 95-120 days were used. Two methods of fetal catheterization were performed, both accessed via hysterotomy. In group 1 (n=3 fetus), the fetus was positioned and the head and neck exteriorized allowing for visualization of the external jugular vein and carotid artery. A small cut down was performed and the jugular and/or carotid were catheterized using a 4Fr sheath-introducer kit. In group 2 (n=3 fetus), the fetus's posterior limbs were located prior to making uterine incision and then the limbs were exteriorized from the uterine horn to allow for catheterization. The femoral vessels were exposed via the cut down method and a 3Fr PICC was placed and secured. In both groups, an extension line was placed and tunneled through the uterus and maternal abdominal wall and secured via purse string. The uterine wall was closed with consideration for cotyledon and caruncle using a TA uterine stapler. The uterine horn was placed back in the abdominal cavity, maternal laparotomy was closed. Fetal blood was sampled every 4-12 h and the extension line was heparin locked with 25 u/mL at a minimum of every 12 h.

Conclusions:

Femoral catheterization was highly favorable and more successful with a 100% fetal viability and consistent reliable blood draws. The method of jugular/carotid line placement did not reliably allow for blood sampling over the duration of 7 days. There were a variety of reasons for this including inability to properly secure the lines, fetal rotation with entanglement, and the natural bend of the neck of the fetus which would impede sampling. With femoral catheterization, the line was secured to the leg which eliminated patency issues. Additionally, the length of the catheter was much greater allowing for it to be seated in the abdominal aorta/vena cava for improved sampling and overall patency of the catheter.

Development of a Novel Expandable Graft for Repair of Congenital Heart Defects

POSTER 7

Presenter: John P Carney MBA
University of Minnesota

Introduction:

Patients born with complex congenital heart defects often require grafts to repair the heart. Over time, many of these patients will undergo repeat invasive open-heart operations due to cardiac outgrowth. A novel synthetic graft has been designed to be balloon expandable to accommodate a growing heart. To evaluate its long-term feasibility for heart repair in a growing model, we implanted the graft interpositionally in the pulmonary artery in juvenile sheep.

Methods:

Twelve sheep were implanted with the experimental graft, and three sheep were implanted with a control graft comprised of a commercially available synthetic material. Implants were performed using standard surgical, anesthesia and recovery techniques described in the literature. Transthoracic echoes were performed monthly to assess animal health. After implant, animals underwent interim interventional procedures at three, six or nine month time points. During these interim procedures, animals implanted with the experimental graft were either balloon expanded and recovered, or balloon expanded, implanted with a stent, and recovered. Concurrently, animals implanted with the control graft were catheterized to collect hemodynamic data and recovered. At the end of the study term, animals were humanely euthanized and underwent a full necropsy.

Results:

All fifteen graft implants were performed without complication, and all animals survived the surgery. Balloon dilations and stent placement procedures occurred without incident and animals recovered normally. Experimental graft diameters increased with each balloon dilation procedure, while control graft diameters decreased over the course of the study. Animals implanted with the control graft developed moderate to severe tricuspid regurgitation appreciable on transthoracic echo; this phenomenon was not observed in animals implanted with the experimental graft. At necropsy, all 12 experimental grafts were patent without evidence of clot formation, obstruction or infection. Stent migration was not apparent in animals implanted with a stent. One animal implanted with a control graft died at 129 days after implantation with signs of severe right heart failure and partial conduit obstruction. Intraluminal narrowing was observed in the remaining two animals implanted with control grafts.

Conclusion:

The results indicate that the novel experimental graft can be used as a cardiac conduit and be repeatedly expanded without deleterious effect. The experimental graft can also be used to reliably secure a stent. Moderate to severe tricuspid regurgitation observed in animals implanted with control grafts is suggestive of asymmetric right ventricular dilation due to cardiac growth and graft narrowing. Absence of this pathology in animals implanted with the experimental graft indicates the effectivity of the graft expansion in a growing heart. The ability to expand the experimental graft to accommodate a patient's cardiac growth, as well the graft's ability to hold a stent, has the potential to decrease the number of invasive surgeries necessary in treating patients with complex congenital heart defects. We propose that the experimental graft is a viable device to be used in reparative congenital cardiac surgery.

Subcutaneous Implantation of Multiple Lead Telemetry Devices in the Cynomolgus Monkey

POSTER 8

Presenter: Brett Megrath BS
Alta Sciences

Introduction:

A study was conducted using 8 Cynomolgus monkeys (Macaca fascicularis) in order to compare the feasibility of a new telemetry implantation location. By the manufacturer's recommendations, non-human primates less than 5 kilograms should be implanted intraperitoneal, but in an effort to reduce invasiveness and length of surgical procedure, comparison animals on this study were implanted subcutaneously. Ease of implantation, healing progress, telemetry signal, and long term viability would be evaluated.

Methods:

Animals were implanted with DSI M11 telemetry devices, capable of remotely collecting blood pressure, biopotential (ECG), temperature, and activity. Four animals received intraperitoneal device implantation anchored to the left side body wall, and 4 comparable animals received subcutaneous implantations over the left hip area. Each test group contained 2 female (~3 kg) and 2 male (~5 kg) Cynomolgus. Weekly telemetry data collections, blood, bodyweights, and exams were performed to evaluate the test groups over a 12 week duration following implantation. Surviving animals were returned to a telemetry colony following study.

Results:

Subcutaneous implantation in males proceeded without complications, however in the smaller females, there was some difficulty creating a subcutaneous pocket large enough to house the telemetry device appropriately. Intraperitoneal implantations were routine. Telemetry data, blood values, and bodyweights were comparable between the implantation locations. Approximately four weeks following surgery, one subcutaneous implanted female experienced skin erosion at the site of implantation, over a corner of the device. A surgical repair was made, and the device was relocated slightly cranially. This surgical repair healed, but several weeks later, skin erosion was observed at the new site of implantation, and with the device being exposed, the decision was made to terminate this animal. No other animals experienced complications.

Conclusion:

While one of the two smaller (female) subcutaneous implanted animals experienced issues with the implantation site, the two larger (male) subcutaneous implanted animals completed the 12 week study without complication, and with data similar to intraperitoneal implantation. Given the difficulty in smaller (~3 kg) animals finding subcutaneous space during implantation, and the animal experiencing ongoing issues with the implantation site resulting in early termination, animals of this size will not be considered in future studies. Larger (~5 kg) animals proved to be good candidates for subcutaneous telemetry device implantation, having comparable data across collected parameters when compared to intraperitoneal implantations.

Model Creation, liver biopsy in Ob/Ob mice for Non-alcoholic Steatohepatitis (NASH) Studies

POSTER 9

Presenter: Kimberly Bayer BS, CVT, RLATG, SRS

Charles River Laboratories

Introduction:

Non-alcoholic steatohepatitis (NASH) is caused by excessive caloric intake and metabolic syndrome. Due to lack of approved treatment, diet modification is the most common recommendation in the clinic. Several animal models have been used in pre-clinical research to understand and treat NASH. In this work, we used the choline deficient defined amino acid diet (CDAA) to induce NASH in mice and hypothesized if changing to regular diet can reverse the NASH phenotype.

Methods:

55 C57BL/6J male mice of approximately 8 weeks of age were placed on study. Following acclimation 43 animals were placed on a choline deficient, defined amino acid diet (CDAA Dyets #518753) for 18 weeks (Groups 1-3). 12 animals (Group 4) were maintained on PMI Nutritional International Certified Rodent chow (No. 5CR4). Group 3-was switched from CDAA to regular chow diet for 8 weeks after liver biopsy.

A liver biopsy was collected 3 weeks prior to dosing from all animals. Aseptic techniques were employed throughout the following procedure. Animals were pre-medicated with 0.1 mg/kg buprenorphine administered subcutaneously (SC). The animals were anesthetized with isoflurane in induction chambers then placed on cone. Ocular lubrication was applied. Fur was removed from the ventral aspect. A ventral midline incision was made just caudal to the xyphoid cartilage and extended to allow visualization of the liver. The left lateral lobe was exposed and a cone-shaped wedge biopsy obtained (~100 -150 mg). The tissue was collected in 10% NBF. Electrocautery was used as needed to manage hemostasis. The abdomen was lavage with warm saline prior to closure. The abdominal muscle was closed using monofilament suture and skin incision closed with staples. Site observations were done daily for 5-7 days following surgery until the site was healed. Buprenorphine was continued following surgery at 0.1mg/kg SC twice a day totaling 6 injections. Liver samples were processed to slides, stained and given NAS scores.

Results:

The liver biopsy procedure resulted in 10% mortality. The histopathology performed on biopsy tissue confirmed advanced steatosis and minimal fibrosis after 15 weeks of CDAA diet feeding, overall NAS score 3.9 (groups 1-2). Terminal histopathology NAS scores were diet switch 2.5 (Group 3) and chow control 0.1 (Group 4).

Diet change resulted in lowering body weight within first week and was accompanied by small increase in food intake the switch to chow diet significantly reduced liver triglycerides (TG) which was independently confirmed by histopathology.

Conclusion:

Liver biopsy lowered the number of required animals and allowed to use each animal as its own control. Our data showed that within 4 weeks of switching to laboratory chow, all liver function tests returned to normal and the NASH phenotype was completely reversed, thus proving that diet change recommended in clinical is also effective in the CDAA diet induced model of NASH.

Simultaneous Monitoring of Cortical Potentials and Cerebrovascular Responses Using Hybrid-modal Neuroimaging System

POSTER 10

Presenter: Han-Chi Pan Ph.D.

National Laboratory Animal Center, National Applied Research Laboratories

Neurological functions can be evaluated not only with measuring neuronal electrical signals, but also by observing hemodynamic responses caused by neurovascular coupling. Neurovascular coupling is a mechanism linking neuronal activation and subsequent cerebral blood flow by complex coordination of neurons, glial cells and vascular cells. In the evaluation of the brain activity state, each of the neurological parameters, such as electrical potentials, cerebral blood flow (CBF) and blood oxygen saturation, provides only partial information. To collect comprehensive information concerning brain state simultaneously, we developed a real-time hybrid-modal neuroimaging system, the ECoG-LSCI neuroimaging system. This system enabled us to monitor the electrocorticography (ECoG) signals and hemodynamic responses by laser speckle contrast imaging (LSCI) at the same time. The laser speckle raw images can be further processed and converted into two-dimensional time-lapse relative CBF (rCBF) images and hemoglobin oxygen levels from the selected region of interests (ROIs).

We utilized the ECoG-LSCI neuroimaging system in the evaluation of rat photothrombotic ischemia PTI model. The PTI minor stroke was induced by tail-vein injection of 20 mg/kg rose bengal and illuminated with 532-nm focused laser (10 mW) on the blood vessel over sensorimotor area for 20 minutes. By applying peripheral sensory electrical stimulation, we observed differences in rat before and after PTI insult in local blood perfusion of sensorimotor cortex, levels of stimulated somatosensory evoked potential (SSEP), rCBF change, and hemoglobin oxygenation of contralateral S1FL. Furthermore, the capillary flow waves of stroke-elicited peri-infarct depolarizations (PIDs) caused by energy supply mismatch were also detected. Our results indicated that this ECoG-LSCI neuroimaging system could simultaneously provide more comprehensive neurological parameters, including cortical potentials, rCBF and hemoglobin oxygenation with single instrument to monitor the brain state of the rats in real time.

Certifications

SRA

Bozena G. Antil
Jessica N. Barnhart
Nina Bishop
Courtney Bogins
Shane Borchers
Stephen J. Bruhn Cital
Maria Carbajo
Denise A. Corliss
Teresa Cunio
Michele L. Danielson
Arlene de Castro
Marcie J. Donnelly
Jon Ehrmann
Marissa Erickson
Tricia Galassi
Audrey Germond
Janelle E. Gesaman
Mary Ellen Goldberg
Renae D. Hall
Renee Hlavka
Jillian M. Horvath
Lesa N. Howell
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Erin Jeannotte
Amanda Klenoski
Andrea Knipe
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Katrina Lau
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Michele M. Nichols
Vanessa K. Nieves
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Julie Sentz
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Stephanie Ventura
Alexandria Waller
Nathaniel Wheat
Amy Jo Williams
Christina Williams
Amanda Wilsey

SRT

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Jay Budrewicz
April Carlson
DeVon DeLoach
Loise Gichuru
Hannah Grothues
Jennipher M. Herlihy
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Kerry D. Hoffman
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Joanne C. Kuziw
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Brianna Marie LaViolette
Haley Legato
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James Eric McCloud
Gerald McDermott
Sarah Nowlan
Mary Jane Perkins
Janelle Pierce
Amanda Repka
William Rinaldi
Jay Simmons
Tom Tlusty
Monica Torres
Christina Williams
Adrian Zeltner

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SRS

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Antoinette K. Alderfer
Daniel S. Allen
Sheila M. Alonzo
Margi K. Baldwin
Kimberly Bayer
Corinna Beale
Mark Beckel
Stephen Bell
Oscar A. Bermeo Blanco
Renee Bodinizzo
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Ashleigh Bone
Deborah Braatz
Mike Bravo
John D. Carey
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Teresa Cunio
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Amy Davidson
James A. Destefano
Jennifer J. DeVries
Jon Ehrmann
Frederick Emond
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Debra C. Ferguson
Darcy Gagne
Janelle E. Gesaman
Teresa Gleason
Chelsey Gosman
Sara Green
Christina Gross
Hyking Haley
Whitney Hartz
James C. Hausamann
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Michael Horsmon
Darla L. Jacob
Dana Jansen
Lisa Johnson
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Ken Kirk
Connie M. Kliwinski
Steven Kreuser
Angela Kruse
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Kathryn Nichols
Gayle Nugent
Mary Jo Numerick
Jason S. Ogle
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Allison S. Parlapiano
Maria L. Pedersen
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Liane Pinkos
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Stacy L. Porvasnik
Diane J. Posavec
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John Resendez
Lara Reyelt
Sheila J. Russell
Tiah Marie Schwartz
Vicki Sekiguchi
Mandy N. Sexton
Jennifer Sheehan
Allan Shuros
Julianne Siegel
Nikki Sternberger
Nichole L. Stewart
Leslie J. Stoll
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Jenifer Sweet
Jennifer Tavares
John P. Tessmer
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Makki Jo Walton
Wendy Watson
Staci N. Way
Alissa Welling
Dennis Werner
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Angela Zeoli
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The Academy of Surgical Research Educational Foundation is a 501 (c) (3) nonprofit organization supporting the education of preclinical experimental surgical candidates.

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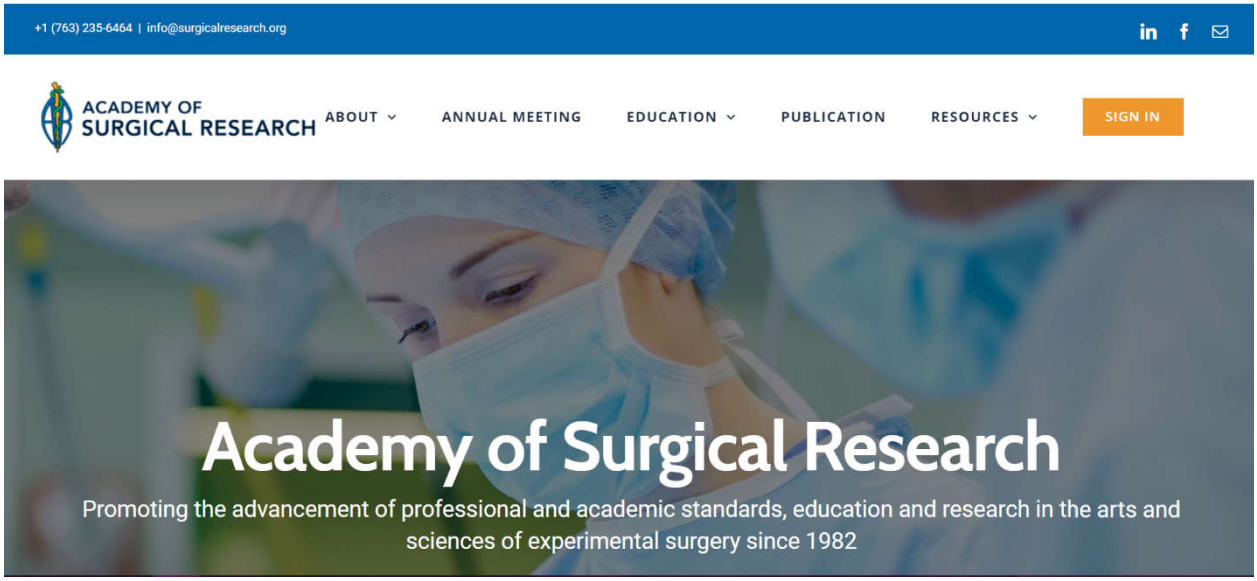
Our website has been redesigned! Have you checked it out yet?



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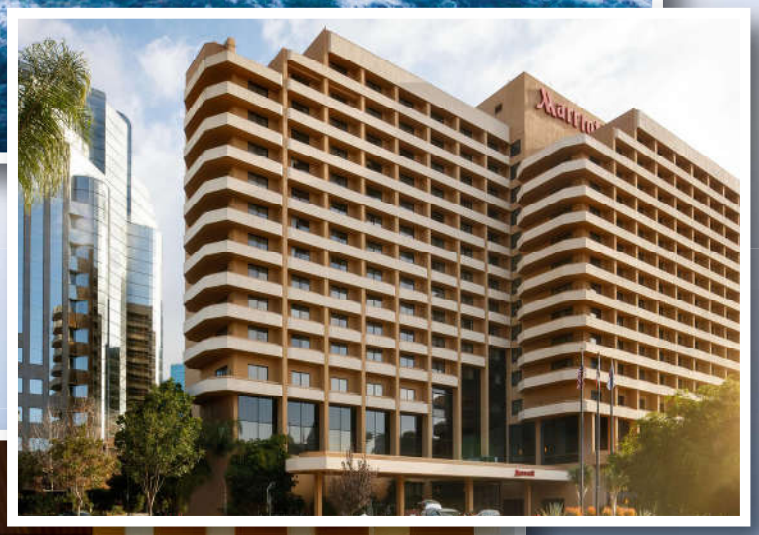

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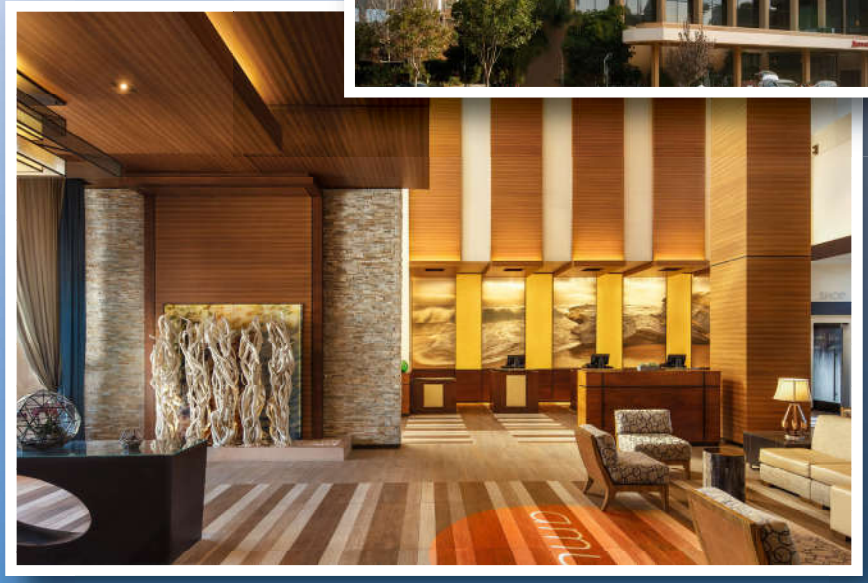

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