8th Annual

Department of Otolaryngology Research Day

UNIVERSITY OF COLORADO | SCHOOL OF MEDICINE

Friday, June 12, 2015
7 a.m. – 1 p.m.
Hensel Phelps West Auditorium
Anschutz Medical Campus
Welcome to the Department of Otolaryngology Resident Research Day at the University of Colorado School of Medicine. The major educational function of the Department is to train the complete otolaryngologist – head and neck surgeon. Under supervision of the medical staff, residents participate in all phases of patient care, education and research.

Patient care discussions go on every day. However, today the residents will have the opportunity to present their scholarly research activities to the group. We are aware that most are not going to do hands-on research in the future, but must be consumers of research in their daily practice. Developing critical judgment promotes better patient care. Understanding the basic scientific method principles is the first step. Most of the projects today were begun in the 2nd year of residency and completed over the course of the training.

We are fortunate to have been awarded a NIH T-32 research training grant that is now completing its second year. Trainees on the grant will be presenting their work today as well as the residents and fellows in the program.

We would like to acknowledge the hardworking efforts of our administrative, research and office assistant support staff for their contributions towards this successful event.

Thank you for participating in our program today and we look forward to seeing everyone in June 2016 for the 9th Annual Resident Research Day.

Herman A. Jenkins MD
Professor & Chair
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Research Day 2015
University of Colorado School of Medicine
Department of Otolaryngology

Schedule

6:30am  
Breakfast
1st Floor Atrium, Hensel Phelps Auditorium, Research Complex 1

7:00am  
Jonathan R. Skirko, MD, MHPA, MPH: Impact of Velopharyngeal Mislearning on the Effects of VPI Surgery

7:15am  
Jonathan C. Kopelowich MD: Practice Variation in Preventing and Treating Infection after Cochlear Implantation

7:30am  
Katherine K. Green MD, MS: Prognostic Factors in the Outcome of Invasive Fungal Sinusitis in a Pediatric Population

7:45am  
Brook K. McConnell MD: Suppurative Complications of Pediatric Acute Sinusitis

8:00am  
Geoffrey R. Ferril MD: Outcomes in Rhinoplasty Using PDS Plate

8:15am  
Carly J. Stewart MD: The Lateral Nasal Sidewall and Its Relationship to the Midface

8:30am  
Justin T. Casey MD: Novel Device for Measuring Ossicular Chain Compliance

8:45am  
Leah J. Hauser MD: Investigation of Bacterial Repopulation after Sinus Surgery and Perioperative Antibiotics

9:00am  
Benjamin M. Milam MD: Validity of pH Impedance Probe Testing Prior to Pediatric Airway Reconstruction

9:15am  
Jameson K. Mattingly MD: Effects of Skin Thickness on Cochlear Input Signal using Transcutaneous Bone Conduction Implants

9:30am  
S. Craig Quattlebaum MD: Methylated MicroRNAs in Saliva as a Biomarker for Head and Neck Cancer

9:45am  
BREAK & RESIDENT GROUP PHOTOS

10:15am  
Herman A. Jenkins MD: Chiefs’ Special Presentation in Memory of Dr. Clayton Mammel

10:20am  
Richard J. Smith MD: Genetic Testing for Deafness – Revolutionizing Care of Persons with Hearing Loss Professor of Otolaryngology and Neurological Surgery, University of Iowa, Carver College of Medicine Director, Iowa Institute of Human Genetics Director, Molecular Otolaryngology and Renal Research Laboratories

11:00am  
Fiyin Sokoya MD: A Rare Collision Tumor: Tracheal Sarcomatoid Carcinoma Invading a Papillary Thyroid Carcinoma

11:15am  
Carissa M. Thomas MD, PhD: Retropharyngeal Goiter Resulting in Laryngeal Compressive Symptoms

11:30am  
Anne K. Maxwell MD: Stereotactic Radiosurgery for Glomus Jugulare Tumors: Long-Term Tumor Control, Hearing Outcomes and Complications

11:45am  
Renee Banakis Hartl MD, AuD: Auditory Brainstem Response and Age-Related Changes in Speech Perception in Background Noise

T32 Trainees

12:00pm  
Nathaniel T. Greene PhD, Research Assistant Professor: Middle Ear Function During Low Frequency and High Intensity Sound Stimulation

12:15pm  
Hannah Glick BA, PhD Candidate: Cortical Neuroplasticity in Single-sided Deafness Before and After Cochlear Implantation

12:30pm  
Elizabeth Gould BS, PhD Candidate: Regeneration in the Human Nasal Epithelium

12:45pm  
Closing Remarks & Transition to Poster Display Q & A Session
2nd Floor Atrium, Hensel Phelps Auditorium, Research Complex 1

1:00pm  
Lunch
1st Floor Atrium, Hensel Phelps Auditorium, Research Complex 1

2:00pm  
Visiting Professor Case Discussions with Richard J. Smith, MD
AO1 Building, Room 3101
Richard J. Smith  MD

Professor of Otolaryngology and Neurological Surgery, University of Iowa, Carver College of Medicine
Director, Iowa Institute of Human Genetics
Director, Molecular Otolaryngology and Renal Research Laboratories

Richard Smith is Director of the Iowa Institute of Human Genetics and is a world leader in the human genetics of hearing loss, with over 490 peer-reviewed publications. He is also director of the Molecular Otolaryngology and Renal Research Laboratories (MORL), which he created in 1991. The MORL has Clinical Diagnostics and Basic Research Divisions. The Clinical Diagnostics Division is staffed by ten research assistants. It was CLIA certified in 1999 and accredited by the Joint Commission on Accreditation of Healthcare Organizations in 2001, and is recertified very two years, most recently in 2013. Mutation screening is offered for deafness. This type of molecular diagnostic service has changed the clinical evaluation of the deaf person. The MORL is also a world leader in applying massively parallel sequencing methods to deafness and translating this technology to the clinical arena.

The Basic Research Division of the MORL has made many significant contributions to our understanding of the biology of hearing/deafness. At the current time, five graduate students, five post-graduate students and one research scientist are doing research. In the area of hearing/deafness, scientists in the MORL have mapped 19% of all known non-syndromic hearing loss loci and cloned 22% of all genes implicated in deafness; for many of these genes, they have also completed functional studies. This research has been continuously supported by the NIH for the past 25 years. As a reflection of these accomplishments, Dr. Smith has been elected to the National Academy of Medicine and the Association of American Physicians. He has also received numerous other honors.
Mona M. Abaza MD, MS
Associate Professor & Program Director
Department of Otolaryngology
Clinical Interests:
Laryngology, voice, airway, and swallowing

Patricia J. Yoon MD, FACS
Associate Professor & Fellowship Director
Department of Pediatric Otolaryngology
Clinical Interests:
Pediatric Otolaryngology, hearing loss, cochlear implantation, Breathing and airway problems

Cristina Cabrera-Muffly MD, FACS
Assistant Professor & Associate Program Director
Department of Otolaryngology
Clinical Interests:
General Otolaryngology
Sue C. Kinnamon PhD
Professor & T32 Co-Principal Investigator
Department of Otolaryngology Research Division, Department of Cell & Developmental Biology, and Department of Physiology & Biophysics

Dr. Kinnamon received her PhD from Kansas State University and completed postdoctoral fellowships at the University of Colorado Health Sciences Center. In 1985 she joined the faculty at Colorado State University, Department of Biomedical Sciences. In January, 2009, she became a tenured Professor at the UC Department of Otolaryngology, with joint appointments in Physiology & Biophysics and Cell & Developmental Biology. She is also a member of the Neuroscience Graduate Faculty at UC Denver.

Research Interests:
Dr. Kinnamon’s research focuses on the gustatory system and the common chemical sense. Her lab focuses on how taste cells detect chemical stimuli, how stimuli are transduced into receptor potentials, and how this information is transmitted to gustatory afferent fibers. Studies on the common chemical sense include the function of solitary chemoreceptor cells in the nasal respiratory epithelium. These cells are innervated by the trigeminal nerve and detect noxious chemicals and the presence of bacteria in the airways. Activation of these cells provokes protective airway reflexes. Current studies are focusing on their role in human nasal tissue.

Publications:

Awards:
Dr. Kinnamon has been continuously funded by the NIH since 1987. Currently she has an R01 & R21 from NIDCD to study mechanisms of taste transduction & signaling, is Co-PI with Dr. Tom Finger on the role of solitary chemoreceptor cells in the detection of pathogenic bacteria, and is Co-PI with Dr. Jenkins on the Otolaryngology T32 grant. Dr. Kinnamon has served on NIH and NSF study sections and was awarded the Association for Chemoreception Sciences Award for Outstanding Achievement in 2001. She has been invited to serve on the NIDCD Council starting September 2015.
Shi-Long Lu MD, PhD  
Associate Professor  
Department of Otolaryngology Research Division, Department of Dermatology, and Department of Pathology

Dr. Lu received his PhD from Tokyo Medical and Dental University, and his MD from China Medical University. He completed his post-doctoral training in the Howard Hughes Medical Institute Lab at the Case Western Reserve University. He was a Research Assistant Professor of Otolaryngology and Dermatology at the Oregon Health & Science University. He is currently an Associate Professor of Otolaryngology, Dermatology, Pathology, and a member of the Cancer Biology Graduate Faculty, and the Cell and Developmental Biology at UCD. He is also a faculty member of the Head and Neck Cancer Research Program, and the Regenerative Medicine & Stem Cell Biology Program.

Research Interests:
Dr. Lu’s research interest is on head and neck squamous cell carcinomas. The goal is to understand the molecular mechanisms underlying the development and progression of HNSCC. It is hoped that these studies will lead to identification of novel molecular markers for future clinical diagnosis and experimental therapy.

Publications:

Awards:
Dr. Lu is currently funded by a R01 from NIDCR to study the role of PI3K pathway in head and neck cancer invasion and metastasis, and a Whedon Cancer Detection Foundation grant to study biomarkers in head and neck cancer. Dr. Lu has also received grant awards from the American Cancer Society; the Thyroid, Head and Neck Cancer (THANC) Foundation; the Dermatology Foundation; Cancer League of Colorado; and the Oregon Medical Foundation. He is also a recipient of a Research Career Development Award from the Dermatology Foundation.
Katherine J. Rennie PhD
Associate Professor & Resident Research Director
Department of Otolaryngology Research Division, and Department of Physiology & Biophysics

Dr. Rennie received her PhD from the University of Bristol, Avon, U.K. and completed a post-doctoral fellowship in the Department of Otolaryngology at the University of Texas Medical Branch in Galveston. She is currently an Associate Professor of Otolaryngology, Physiology & Biophysics, and a member of the Neuroscience Graduate Faculty at the University of Colorado.

Research Interests:
Dr. Rennie’s research is focused on the peripheral vestibular system. The goal is to identify ion channels present in vestibular cells in order to understand how signals are transformed from a mechanical stimulus at the hair cell bundle into electrical activity of the primary vestibular neurons. Electrophysiological (patch clamp), molecular and mathematical modeling approaches are used. Her Lab has identified several different types of potassium channels in vestibular cells and is currently assessing synaptic mechanisms and regional variations. It is hoped that results from these studies will clarify some of the mechanisms underlying vestibular disorders.

Publications:
Katherine J. Rennie PhD (cont)

Awards:
Dr. Rennie has received several grant awards from the NIH (R03, R29 FIRST Award and R01). She has also received funding from the American Hearing Research Foundation, Deafness Research Foundation, the American Otological Society, NSBRI and the National Organization for Hearing Research Foundation and is a former recipient of a Research Career Enhancement Award from the American Physiological Society. Dr. Rennie has reviewed grants for the NIDCD (NIH), National Science Foundation, Wellcome Trust, RNID and Deafness Research Foundation and reviewed articles for Acta Pharmacologica Sinica, American Journal of Physiology-Cell Physiology, Experimental Neurology, Hearing Research, JARO, JoVE, Journal of Comparative Neurology, Journal of Experimental Zoology, Journal of Neurophysiology, Journal of Neuroscience, Journal of Physiology, Journal of Visualized Experiments, Neurochemical Research and PLoSOne.
Aurelie Vandenbeuch PhD
Instructor
Department of Otolaryngology Research Division

Dr. Vandenbeuch received her PhD from University of Paris, Denis Diderot in 2006. She completed a postdoctoral fellowship at Colorado State University (2006-2009) and at the University of Colorado Denver (2009-2011). In January 2011, she was appointed Instructor in the Department of Otolaryngology.

Research Interests:
Taste transduction mechanisms. Design and conduct research projects on cellular signalling pathways and neuroscience related to the taste system in mammals.

Publications:

Panel of Judges

Cristina Cabrera-Muffly MD, FACS
Assistant Professor & Associate Program Director

Matthew S. Clary MD
Assistant Professor

Anne E. Getz MD
Assistant Professor

Katherine J. Rennie PhD
Associate Professor

Richard J. Smith MD
Professor of Otolaryngology and Neurological Surgery
University of Iowa – Carver College of Medicine

Awards

There will be 1st and 2nd place awards given for “Outstanding Resident Research Presentation” for best demonstration of either basic science or clinical research. The criteria for selection will be based upon the significance of the research finding to the field of Otolaryngology, the quality of work performed and the quality of presentation. At the judges’ discretion, awards may also be given for “Best Case Review” and “Honorable Mention.”

Chief Resident Annual Textbooks

The graduating Chief Residents receive an annual award in memory of Dr. Clayton Mammel. They are presented with a textbook of their choice that applies to their field of interest.
Research Day Award Recipients

2014 Outstanding Resident Research Presentation
1st Place – Justin Casey MD
2nd Place - Leah Hauser MD
Honorable Mention – Ben Milam MD

2013 Outstanding Resident Research Presentation
1st Place - Katherine Green MD, MS
2nd Place - Sarah Cooper MD
Honorable Mention - Leah Hauser MD

2012 Outstanding Resident Research Presentation
1st Place – Scott Mann MD
2nd Place - Henry Barham MD
Best Case Review - Katherine Green MD, MS
Honorable Mention - Justin Wudel MD

2011 Outstanding Resident Research Presentation
1st Place - J. Eric Lupo MD, MS
2nd Place - Justin Wudel MD
Best Case Review - Matthew Whinery MD
Honorable Mention - Scott Mann MD

2010 Outstanding Basic Science Research
Jacob Minor MD
Outstanding Clinical Research
Marcia Eustaquio MD

2009 Outstanding Basic Science Research
Adam Terella MD
Outstanding Clinical Research
Henry Chen MD, MBA

2008 Outstanding Basic Science Research
Henry Chen MD, MBA
Outstanding Clinical Research
Melissa Scholes MD
Impact of Velopharyngeal Mislearning on the Effects of VPI Surgery

Jonathan R. Skirko MD, Kathleen C.Y. Sie MD, Emily L. Jensen BS, Dexiang Gao PhD, Kenny H. Chan MD

1Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
2Department of Pediatric Otolaryngology, Children’s Hospital Colorado, Aurora, CO.
3Department of Otolaryngology-Head & Neck Surgery, University of Washington, Seattle, WA.

Objective:
Velopharyngeal mislearning (VPM), or compensatory misarticulations, results from abnormal valving of airflow in the vocal tract. While surgery is considered for management of velopharyngeal insufficiency (VPI), VPM requires speech therapy. Children with VPI may also have VPM. There is a paucity of information regarding the benefit of VPI surgery in these patients. The goal of this study was to assess whether presence of VPM predicted changes effect of VPI surgery.

Methods:
Children with VPI and their parents completed the VPI Effects on Life Outcomes (VELO instrument; higher score is better quality-of-life) before and after VPI surgery (Furlow palatoplasty or sphincter pharyngoplasty, n=41). Follow up was conducted greater than 12-months postoperatively. Misarticulation was graded by speech language pathologists and subjects were categorized by presence (n=18) or absence (n=23) of VPM. Change in VELO was analyzed with paired t-test for within group change and with t-test for between group change. Speech was assessed primarily with speech intelligibility and secondarily with VPI severity. Change in degree for speech intelligibility errors and VPI severity were tested with the sign rank test for subjects with and without misarticulations.

Results:
The baseline mean (SD) VELO scores were significantly lower in subjects with misarticulation 50 (8) than without misarticulation 60(12), p<0.01. Subjects with and without misarticulation experienced improvement at 12-months after surgery (p<0.001). Change in VELO was no different after surgery in those without misarticulation (change 20 [16]) than those with misarticulation (change 16 [13], p=0.45). By one year follow up, both subjects with and without misarticulation by follow up had improvement in their speech intelligibility (p<0.001) and their VPI severity. Subjects with baseline misarticulation had worse intelligibility (p<0.001) and VPI severity (p<0.01) at baseline and at follow up than those without misarticulation. Of the 11 subjects having misarticulation at baseline, seven (67%) had resolved their misarticulation at follow up.

Conclusion:
While patients with VPI and VPM have worse speech measures and VPI specific quality of life, they experience similar improvement...
Practice Variation in Preventing and Treating Infection after Cochlear Implantation

Jonathan Kopelovich MD1,2, Patricia Yoon MD1,2

1Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
2Department of Pediatric Otolaryngology, Children’s Hospital Colorado, Aurora, CO.

Objective:
Infections related to cochlear implantations may range from minor to severe. Current pre-operative practices to prevent such infections, including vaccination are well-established (Rubin & Papsin, Pediatrics, 2010). There is, however, considerable practice variation in peri-operative, intra-operative and post-operative care amongst cochlear implant surgeons. These practices have been surveyed with respect to the use of tympanostomy tubes in surgeons associated with the American Neurotology Society (Kennedy & Shelton, Otol Neurotol 2006). Many surgeons still oppose the use of tympanostomy tubes in the setting of a cochlear implant and utilize other means, including mastoid obliteration and blind sac closure of the external ear, to address infectious risk (Baranano et al Otol Neurotol 2013). This survey study is intended to look beyond tympanostomy tubes to assay current peri-operative, intra-operative and post-operative practices to prevent infection used by implant surgeons across otolaryngology subspecialties.

Methods:
A cross-sectional survey was distributed to US implant surgeons currently listed with Cochlear Americas.

Results:
85 surveys have been completed to date. Data collection is still underway.

Conclusion:
Practices to prevent or treat cochlear implant associated infections may vary depending on surgeon, institution, training and experience.
Prognostic Factors in the Outcome of Invasive Fungal Sinusitis in a Pediatric Population

Katherine K. Green MD, MS¹, Henry P. Barham MD¹, Gregory C. Allen MD¹,², Kenny H. Chan MD¹,²
¹Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
²Department of Pediatric Otolaryngology, Children’s Hospital Colorado, Aurora, CO.

Objective:
Pediatric invasive fungal sinusitis (IFS) is rare and its prognosticators are poorly understood. The aim of this study is to determine important factors affecting outcome.

Methods:
A 10-year retrospective review at a tertiary academic children’s hospital was performed using an ICD-9 and procedure-based search following institutional review board approval. All relevant demographic and clinical information was collected.

Results:
Fourteen immune-compromised patients (M:F= 7:7, mean age= 10 years, range 2-16) were identified that included hematologic malignancies (11), diabetes mellitus (2) and unknown (1). Fungal species included: aspergillus (5), mucor (5), alternaria (2), rhizopus (1) and scopulariopsis (1). The cohort underwent an average of 6.1 (median= 5) endoscopic sinus surgeries (ESS) and were treated with aggressive anti-fungal therapy. A total of four deaths occurred in the study population, 2 significant difference in the median absolute neutrophil count (ANC) at follow-up after treatment of IFS between the survival and mortality sub-groups, with ANC being 4290.5 and 169, respectively (p<0.001).

Conclusion:
Despite the small sample size, this study represents the largest case series in the literature on pediatric IFS. Age, gender, underlying cause for immunodeficiency and mycologic agent were not significant prognosticators. ANC appears to be the only factor responsible for survival. The role of endoscopic sinus surgery in survival is indeterminate.
Suppurative Complications of Pediatric Acute Sinusitis

Brook McConnell, MD1, Patricia Yoon, MD1,2
1 Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
2 Department of Pediatric Otolaryngology, Children’s Hospital Colorado, Aurora, CO.

Objective:
The aim of this study is to identify the predominant causative organisms in orbital and intracranial complications of pediatric acute sinusitis. Retrospective review of medical records of pediatric patients treated for suppurative orbital and intracranial complications of acute sinusitis.

Methods:
All pediatric patients treated surgically for orbital or intracranial complications resulting from acute sinusitis at Children’s Hospital Colorado from January 1, 2012 to June 30, 2014 were reviewed. Data collected included age, gender, microbiology, medical treatment administered, and surgical intervention.

Results:
Forty-five total cases were identified, twenty-five of which occurred with orbital abscesses and twenty with intracranial infections. All patients represented in this study were managed with a combination of medical and surgical treatment. Culture specimens were obtained in all cases resulting in 41 positive cultures. The most common organism isolated from each group was Streptococci anginosus (50% of orbital cases and 55% of intracranial cases). Staphylococcal species were the second most commonly isolated group of organisms followed by β-hemolytic streptococcal species. MRSA was an uncommon isolate occurring in 8% of orbital infections and none of the intracranial cultures. Streptococcus pneumonia and anaerobic organisms represented a minority of the culture isolates (7.3% and 4.8%, respectively for both groups combined). Similar studies have more commonly isolated organisms such as S. pneumoniae, H. influenzae, S. aureus, and anaerobic bacteria. Comparatively, S. anginosus was isolated in the majority of patients in this study.

Conclusion:
Unlike previous similar studies, S. anginosus is significantly more common in suppurative orbital and intracranial infections related to acute sinusitis. This likely represents a shift toward more virulent organisms as the causative organism isolated in orbital and intracranial complications of acute sinusitis
Outcomes in Rhinoplasty Using PDS Plate

Geoffrey R. Ferril, MD¹, Carly J. Stewart, MD¹, Andrew A. Winkler, MD¹
¹Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.

Objective:
Polydioxanone (PDS) plate is a resorbable alloplastic implant that is becoming increasingly utilized in rhinoplasty surgery. First popularized in the orthopedic literature, PDS plate was shown to have minimal interference with healing and provide an adequate fixation for bony regrowth. More recently, PDS has been found to be effective and safe in orbital floor repair. The aim of the current study was to better determine the efficacy of PDS plate when used in rhinoplasty.

Methods:
With IRB approval at a tertiary center, we identified patients in whom PDS plate was used during a rhinoplasty procedure performed by the senior author. An age-matched cohort of rhinoplasty patients was then selected based on demographic and historical data, with approximately one third of both groups comprised of revision cases. Functional outcomes, determined by the decrease from pre- to postoperative NOSE scores, and complication rate were recorded.

Results:
PDS plate was used in forty-five patients, of which twenty-one were revision cases. The control cohort totaled 86 patients, with thirty-four revision cases. NOSE scores decreased by a mean of 59 in the alloplast group and 56 in the control group. Comparing these numbers revealed no statistical difference (p = 0.719). A complication was encountered in 15% of the PDS plate cases and 7% of the control cases.

Conclusion:
The current study sought to examine the safety and efficacy of PDS plate in rhinoplasty surgery. Although a higher rate of minor complications was encountered when PDS plate was used, functional outcomes were identical.
The Lateral Nasal Sidewall and Its Relationship to the Midface

Carly Stewart MD¹, Jacob Minor MD², Brian Downs MD³, Edward Labovitz MS⁴, Ruixin Guo PhD⁵, Andrew Winkler MD¹
¹Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
²Department of Otolaryngology, Wellstone Health Partners, Harker Heights, TX.
³Department of Otolaryngology, Wake Forest University School of Medicine, Winston-Salem, NC.
⁴Rocky Vista University College of Osteopathic Medicine, Parker, CO.
⁵Department of Biostatistics and Informatics, University of Colorado School of Public Health, Aurora, CO.

Objective:
Subunit boundaries are important for nasal reconstruction. The purpose of this observational study is to better define the lateral border of the lateral nasal sidewall by analyzing changes in brightness across subunit borders.

Methods:
Frontal images of 120 subjects who had not undergone nasal surgery were reviewed. Two lines were created: (1) a 45° diagonal from the nasion across the nasal sidewall and (2) a vertical line through the nasion. One hundred brightness points were collected along each line for each subject, which were then converted to “relative brightness.” Relative brightness data was plotted as a function of distance along drawn lines. The resultant curves at the regions of subunit borders were transformed to best-fit 2nd degree polynomials. Derivatives of these functions were undertaken to determine rate of brightness change along the lines at areas of subunit boundaries.

Results:
The average rate of brightness change is: dorsum-lateral nasal sidewall (0.11), lateral nasal sidewall-cheek (0.02), dorsum-tip (0.71), and columella-lip (1.64). There was significant difference in the brightness slope among the subunit transitions (rANOVA F-test P<0.0001).

Conclusion:
The rate of change from the sidewall to cheek is 5.5 times less rapid than from the next most gradual brightness transition indicating that no true subunit boundary exists at this location.
Objective:
Conductive hearing loss is a very common surgically treated entity. Despite this, we have no objective measures to assess stiffness and motion of the ossicular chain intraoperatively. This is a problem both for assessing the stiffness of the ossicular chain for diagnostic purposes when considering surgical repair, and also when assessing the integrity of surgical repair. The Otopen (patent pending) is a novel device for measuring ossicular chain compliance, which has the potential to be used intra-operatively both before and after surgical repair.

Methods:
Human cadaver heads with well preserved ossicular chains (in addition to well preserved external, middle, and inner ear structures) were prepared to expose the middle ear in the standard surgical fashion. The ossicular chain was then fixed with poly-methyl methacrylate in order to simulate ossicular chain fixation and/or conductive hearing loss.

Results:
Ossicular chain stiffness was assessed at several locations, and responses were consistent with prior reports. Stapes fixation increased ossicular chain stiffness at all locations tested.

Conclusion:
Early results demonstrate that the Otopen can collect data for forces required to displace the ossicular chain with repeatable force-displacement curves within and between cadaver heads. Additionally, it is able to sense the change in stiffness between normal and disease-simulated ears. Further testing is needed to determine its true diagnostic utility in different forms of conductive hearing loss, as well as its predictive capacity following surgical repair of conductive hearing loss.
Investigation of Bacterial Repopulation after Sinus Surgery and Perioperative Antibiotics

Leah J. Hauser MD, Todd T. Kingdom MD, Daniel N. Frank PhD, Vijay R. Ramakrishnan MD

1Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
2Division of Infectious Diseases, University of Colorado School of Medicine, Aurora, CO.
3The Microbiome Research Consortium, University of Colorado School of Medicine, Aurora CO.

Objective:
Endoscopic sinus surgery (ESS) enjoys high success rates, however, repopulation with pathogenic bacteria is one hallmark of poorer outcomes. There are many hypothesized sources of re-populating bacteria; however, this process remains largely unexplored. This study aimed to examine changes in the sinus microbiome following ESS and medical therapies to identify potential sources for post-surgical microbial repopulation.

Methods:
Samples from the anterior nares, ethmoid region, and nasopharynx were taken at the time of surgery from 13 subjects undergoing ESS for CRS. Patients were treated postoperatively with two weeks of broad-spectrum oral antibiotics and continued saline rinses. The ethmoid cavity was sampled at 2 and 6 weeks postoperatively and samples were also taken from the water used for irrigation, the faucet, and the rinse bottle. Microbiota were characterized using qPCR and 16S rRNA gene sequencing. The Morisita-Horn beta-diversity index (M-H) was used to compare similarity between samples.

Results:
6/13 subjects used distilled water, 6 used tap water, and 1 used well water for irrigations. The 6-week samples most closely represented the anterior nares and ethmoid samples taken at surgery (M-H = 0.58 and 0.59, respectively), and were least similar to the nasopharynx, the irrigation water, faucet, and bottle (M-H = 0.28, 0.15, 0.08, and 0.17, respectively). The bacterial burden of the ethmoid swab was higher at the 2-week time point (immediately after antibiotics) than at 6-weeks (p=0.01).

Conclusion:
Bacterial communities colonizing the ethmoid at 6-weeks postoperatively were most similar to anterior nasal cavity and pre-treatment sinus microbial profiles. Interestingly, postoperative antibiotic therapy did not reduce the bacterial burden, but merely shifted the microbial consortia. Irrigation appears to play little role in establishing the sinus microbiome. Although rinsing with tap water may never be formally recommended, it may be safe for patients in nonendemic areas where municipal water supply is appropriately treated.
Validity of pH Impedance Probe Testing Prior to Pediatric Airway Reconstruction

Benjamin Milam MD1, Amanda Ruiz BA1,2, Joel Friedlander MD3, Jeremy Prager MD1,2

1Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
2Department of Pediatric Otolaryngology, Children’s Hospital Colorado, Aurora, CO.
3Department of Pathology, University of Colorado School of Medicine, Aurora, CO.

Objective:
Gastroesophageal reflux disease (GERD) is a common disorder in the pediatric population and is suspected to play a role in airway reconstruction outcomes. Surgeons often request reflux evaluation prior to airway surgery due to concerns regarding poor outcomes. pH Impedance probe monitoring (pHI) is a diagnostic tool that measures acid and nonacid gastroesophageal reflux. Although the limitations of this tool have been documented in the literature, pHI is still routinely used to evaluate reflux in children. This study evaluated the effect of pHI results on the management of patients undergoing open airway surgery.

Methods:
Retrospective chart review of patients who underwent pHI prior to open airway reconstruction or endoscopic laryngeal cleft repair. Changes in medical and surgical management and post-operative outcomes were assessed.

Results:
Forty nine patients were identified. Twenty-seven (55.1%) patients underwent endoscopic laryngeal cleft repair and 22 (44.9%) open airway reconstruction. Forty (81.6%) patients had a negative pHI and 9 (18.4%) showed pathologic reflux exposure indicative of GERD. Thirty-four patients (69.4%) were receiving acid suppressor therapy for reflux and 26 (53.1%) were on acid suppressors at time of pHI study. Fifteen patients (30.6%) had undergone Nissen fundoplication prior to pHI and all had negative pHI studies. Fourteen (29.2%) patients saw a change in their anti-reflux therapy following pHI. Nissen fundoplication prior to airway procedure was recommended to two patients, both of which had positive pHI and underwent fundoplication prior to airway surgery.

Conclusion:
Eighteen percent of patients had a positive pHI study. None of those with a prior fundoplication had a positive pHI. Sixty-nine percent were being treated with acid suppressors and this increased to 79.2 % after pHI. In addition, two patients were recommended to undergo fundoplication. There is a small percentage of children with GERD who are discovered via pHI but a large percentage of medical management changes despite normal pHI, suggesting that pHI results are not particularly helpful in guiding clinical decision making.
Effects of Skin Thickness on Cochlear Input Signal using Transcutaneous Bone Conduction Implants

Jameson K. Mattingly MD, Nathaniel T. Greene PhD, Herman A. Jenkins MD, Daniel J. Tollin PhD, James R. Easter MSPE, Stephen P. Cass MD, MPH
1Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
2Department of Physiology and Biophysics, University of Colorado School of Medicine, Aurora, CO.
3Cochlear Boulder LLC, Boulder, CO.

Objective:
TCBCIs have recently been introduced as alternatives to DCBCIs. Clinical studies have demonstrated elevated high-frequency thresholds for TCBCIs as compared to DCBCIs; however, little data exists examining the direct effect of skin thickness on the cochlear input signal during bone conduction hearing. Intracochlear sound pressures (\(P_{IC}\)) and velocity measurements of the stapes, round window, and promontory (\(V_{S/RW/Prom}\)) will show frequency dependent attenuation using transcutaneous magnet-based bone conduction implants (TCBCI) in comparison to direct-connect skin-penetrating abutments (DCBCI).

Methods:
Seven full-cephalic human cadaveric specimens were prepared, and \(P_{IC}\) was measured in the scala vestibuli and tympani with fiber-optic pressure probes (FISO, Inc.) concurrently with \(V_{S/RW/Prom}\) via laser Doppler vibrometry (Polytec, Inc.). Titanium implants were placed bilaterally connected to a DCBCI or TCBCI. Soft tissue flaps with varying thicknesses (no flap, 3, 6, and 9 mm) were placed successively between the magnetic plate and sound processor magnet. A bone-conduction transducer coupled to custom software provided pure tone stimuli between 120 to 10,240 Hz.

Results:
Stimulation via the abutment produced the largest response magnitudes. The TCBCI showed similar \(P_{IC}\) and \(V_{S/RW/Prom}\) with no intervening flap, and non-linear reduction of magnitude with increasing flap thickness above 800 Hz, worse with increasing flap thickness. Phase is comparable to the acoustic baseline at low frequencies across flap thicknesses, but steepens at higher frequencies as flap thickness increases suggesting a longer group delay.

Conclusion:
These response magnitudes and phase effects should be taken into account when selecting patients for a BCI, and further suggest potential cues for sound localization.
Methylated MicroRNAs in Saliva as a Biomarker for Head and Neck Cancer

Craig Quattlebaum MD\(^1\), Benjamin Milam MD\(^1\), John I. Song MD\(^1\), Ted Leem MD, MS\(^1\), Shi-Long Lu MD PhD\(^1,2,3\)

\(^1\)Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.
\(^2\)Department of Dermatology, University of Colorado School of Medicine, Aurora, CO.
\(^3\)Department of Pathology, University of Colorado School of Medicine, Aurora, CO.

Objective:
It has previously been shown that certain microRNAs (miRNAs) can be silenced by epigenetic DNA methylation in the cell lines of head and neck squamous cell carcinoma (HNSCC) patients. Furthermore these miRNA can be reliably detected in saliva and predict the presence of HNSCC with a high sensitivity and specificity. Our goals in the present study were to further validate these markers with a larger population, to perform subset analysis on these patients for trends in the biomarker profile, to evaluate the biomarkers in the setting of post treatment surveillance, and to potentially find additional markers which would add to the strength of the collective.

Methods:
Tissue samples were collected from tumor specimens in the HNSCC group and from tonsillar tissue in tonsillectomy patients enlisted as controls. Similarly saliva was collected from both groups. Additional post-treatment saliva samples were collected from patients undergoing cancer surveillance at various time points following their definitive therapy. Bisulfite conversion was performed on genomic DNA isolated from all tissue and saliva samples. Quantitative methylation specific PCR was then used to quantify the methylated genomes of the five previously validated microRNAs: 9-1, 137, 124-1, 124-2, and 124-3, as well as newly identified targets. The sensitivity and specificity of each marker, and the assay as a whole were then calculated. Clinical demographics and pathology were reviewed to evaluate for microRNA specific trends among patient subsets.

Results:
These microRNA demonstrated a higher level of methylation in both tissue and saliva samples from HNSCC patients vs. normal controls. Malignancy could be detected at a high specificity and sensitivity. Methylation trends could be uncovered through subset analysis.

Conclusion:
Specific microRNAs are highly methylated in the tissue and saliva of HNSCC patients compared to control patients. Testing saliva for a combination of these methylated miRNAs offers the ability to detect malignancy with a high sensitivity and specificity. Salivary testing then, has the potential for utility as a non-invasive assay for head and neck cancer diagnosis and surveillance. Additionally there may even be correlates to prognosis, treatment planning, and risk of recurrence offered by larger scale subset analysis.
A Rare Collision Tumor: Tracheal Sarcomatoid Carcinoma Invading a Papillary Thyroid Carcinoma

Mofiyinfolu Sokoya MD¹, Ted H. Leem MD, MS¹
¹Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.

**Objective:**
Primary tracheal tumors are very rare and not widely reported in literature. The incidence of tracheal tumors has been reported to be 0.2 per 100,000 people per year, accounting for less than 0.1% of cancer deaths. Sarcomatoid carcinoma is a very rare variant of squamous cell carcinoma that accounts for less than 1% of all malignancies in the larynx, with the first case of tracheal involvement reported in 2009.

**Methods:**
Case report and review of literature

**Results:**
A 78-year-old female presented to the emergency department with a large neck mass and hoarseness. A fine needle aspiration biopsy performed at an outside hospital demonstrated papillary thyroid carcinoma. Imaging revealed a large thyroid mass involving the tracheal lumen with bulky lymphadenopathy. She was taken to the operating room for a total thyroidectomy with tracheal resection and central and right neck dissections. Final pathology showed sarcomatoid carcinoma of the trachea invading through the pretracheal fascia into the right thyroid with a central neck metastasis. The thyroid gland was also noted to have multifocal papillary thyroid carcinoma (PTC) with lateral neck metastases. The patient subsequently received adjuvant chemoradiotherapy and radioactive iodine.

**Conclusion:**
Sarcomatoid squamous cell carcinoma is a rare pathologic entity. Involvement of the trachea and thyroid gland in a patient with synchronous papillary thyroid carcinoma is exceedingly rare. Surgical resection is the mainstay of therapy. The role of radiation remains controversial. Patients with synchronous tumors of the head and neck suffer a worse prognosis. It is imperative to maintain a close follow up after treatment. New suspicious lesions should be aggressively investigated.
Retropharyngeal Goiter Resulting in Laryngeal Compressive Symptoms

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Objective:
The incidence of multinodular goiter is approximately 4% in developed countries. Compressive symptoms from a goiter are generally the result of substernal extension and compression on the trachea. This is a rare presentation of a retropharyngeal goiter causing laryngeal compressive symptoms.

Methods:
This is a 53-year-old, morbidly obese male presenting with dyspnea and dysphagia secondary to a slowly enlarging goiter. Flexible laryngoscopy revealed a retropharyngeal mass impinging on the supraglottic airway and obstructing visualization of the true vocal cords. Computed tomography scan revealed a massively enlarged thyroid with expansion into the retropharyngeal space and anterior displacement of the airway. The patient underwent an awake cricothyrotomy with revision to tracheotomy to secure the airway prior to total thyroidectomy.

Results:
The incidence of airway obstruction from a benign goiter is approximately 0.6%, with most cases the result of substernal extension through the thoracic inlet, resulting in tracheal compression. It is rare for a goiter to extend superiorly into the retropharyngeal space and cause obstruction on the upper airway. Typically, substernal goiters with compressive symptoms do not cause difficulty with direct laryngoscopy, visualization of the vocal cords and intubation with an endotracheal tube, and a tracheotomy is not needed to secure the airway. This case report is unique because of upper airway obstruction, which makes visualization of the glottis during a direct laryngoscopy very difficult. It was therefore necessary to secure the airway with a cricothyrotomy prior to thyroidectomy.

Conclusion:
Iodine supplementation has significantly decreased the incidence of multinodular goiter in the developed world, but the presentation of a goiter with compressive symptoms still occurs. Typically tracheal compression is from a substernal goiter, but in rare cases, retropharyngeal extension can cause compression of the upper airway. In these cases, it is important to use a surgical method to secure the airway.
Stereotactic Radiosurgery for Glomus Jugulare Tumors: Long-Term Tumor Control, Hearing Outcomes and Complications

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¹Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.

Objective:
Glomus jugulare tumors (GJT) are rare temporal bone paragangliomas that have traditionally been treated with surgical excision. More recently, single-fraction stereotactic radiosurgery (SRS) has gained popularity. This study evaluates long-term efficacy, hearing outcomes and complications of SRS for GJT.

Methods:
Between April 2003 and April 2013, thirteen patients (ages 35-74) with GJT who underwent SRS (Brainlab linear accelerator) met inclusion criteria. Each received 15-16 Gy in a single fraction.

Results:
Following SRS, all patients had resolution of their presenting symptoms. Mean follow up time was 4.4 years (range 10 months to 8.7 years). All patients had either stable (84.6%) or decreased (15.4%) tumor size on follow up MRI. Hearing was not affected in two-thirds of patients and worsened by 10 to 20 decibels in one-third. Transient complications occurred in 5 patients (38.5%). Two patients developed otitis media, with one requiring ventilation tube placement. Two patients developed transient vertigo, and one patient developed transient lower cranial nerve palsies. There were no long-term complications.

Conclusion:
Stereotactic radiosurgery is a relatively safe and effective treatment for glomus jugulare tumors with a mild impact on hearing.
Auditory Brainstem Response and Age-Related Changes in Speech Perception in Background Noise

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Objective:
The purpose of this study was to investigate the relationship between ABR changes and age-related changes in speech perception in noise. Presbycusis affects approximately 30% of middle-aged Americans and about half of adults 75 years and older. A subtype of presbycusis, known as central hearing loss, caused by changes in fast neural inhibition in the auditory brainstem results in speech perception difficulty in noise (Krenning et al, 1998; Milbrandt et al, 1995). Glycinergic inhibition to the auditory system originates from the medial nucleus of the trapezoid body (MNTB) (Grothe et al, 2010; Yost et al, 2008). With age, temporal precision and amplitude of the inhibition begin to decrease. Auditory brainstem response (ABR) wave III corresponds to activity of the superior olivary complex, which includes MNTB.

Methods:
Patients seen at the University of Colorado Audiology Clinic with normal hearing were invited to participate in this study. Inclusion criteria were age of 20-26 and ≥60 years and normal hearing sensitivity on puretone audiometry. Participants underwent ABR, modified speech perception in noise testing, and a questionnaire regarding subjective perception of hearing ability.

Results:
Eighteen subjects met inclusion criteria and were divided into two groups based on age. ABR wave III-V interlatencies were significantly different and wave III peak-to-peak amplitudes approached significance between subject groups. No correlation was noted between speech in noise testing and ABR data; however, significant differences in wave III peak-to-peak amplitude and wave III-V interlatencies were noted when subjects were grouped based on self-reported difficulty communicating in noisy environments.

Conclusion:
Age-related changes in speech perception in noise are related to changes in ABR and have the potential to serve as a marker of reduced glycineric inhibition to the auditory brainstem. Further investigation may describe this relationship and determine the clinical utility of ABR in assessment of central hearing loss.

References:
Middle Ear Function During Low Frequency and High Intensity Sound Stimulation

Nathaniel T. Greene PhD, Herman A. Jenkins MD, Daniel J. Tollin PhD, James R. Easter MSPE

1 Department of Physiology and Biophysics, University of Colorado School of Medicine, Aurora, CO
2 Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO
3 Cochlear Boulder LLC, Boulder, CO.

Objective:
High intensity sounds can cause profound sensorineural hearing loss. Measurements of ossicular motion have proven to be useful for the exploration of normal and pathological processes of ossicular transmission; however, previous studies have either relied upon measurements in animal models or measurements at lower sound intensities. Here, we report results from scanning LDV measurements on the ossicular chain simultaneously with intracochlear pressure measurements in human cadaveric temporal bones, during presentation of harmonic and impulsive stimuli in the ear canal at intensities exceeding 170dB peak SPL.

Methods:
Hemicephalic human heads were prepared by mastoidectomy and extended facial recess approach to expose the ossicular chain. Harmonic (20 Hz - 2.5kHz) and impulsive (simulated blast) stimuli, were presented using a custom designed closed-field, high-intensity acoustic system. Scanning laser Doppler vibrometry (sLDV) measurements of the ossicular chain were made simultaneously with recordings of the SPL in the ear canal during high intensity sound stimulation (115-165 dB SPL), and intracochlear pressure measurements made in the scala vestibuli and tympani with fiber-optic pressure sensors.

Results:
Rigid body motion of the ossicular components was approximated from out-of-plane motion recorded by the sLDV system. Displacement and axis of rotation were found for the incus, and complex motion of the stapes and stapes tendon were assessed, over a range of frequencies and intensities. Results show changes in the modes of ossicular motion at the highest frequencies tested consistent with prior results at lower intensities. Ossicular nonlinearities were observed at the highest intensities tested.

Conclusion:
These results are useful for characterizing the transmission of low frequency and high intensity sounds through the middle ear, suggest improvements to methods of auditory hazard prediction and provide reference data over a lesser-known regime of frequencies and sound pressures useful to future mathematical models of the human middle-ear.

Funding:
Research supported by University of Colorado Denver T-32 Institutional Training Grant in Otolaryngology Research: NIDCD: 1T32DC012280-01A1
Cortical Neuroplasticity in Single-Sided Deafness Before and After Cochlear Implantation

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¹Department of Speech, Language, and Hearing Science and Institute of Cognitive Science, University of Colorado, Boulder, CO.
²Department of Speech and Hearing Science, Arizona State University, Tempe, AZ
³Denver Ear Associates, 401 West Hampden Place, Englewood, CO.

Objective:
The extent to which sensory pathways reorganize in single-sided deafness (SSD) is not well understood. While cochlear implantation (CI) has proved beneficial in bilateral pediatric deafness, there is currently little evidence demonstrating the efficacy of CI in children with SSD. The purpose of this study was to examine changes in cortical development and neuroplasticity in adults and children with SSD before and after CI.

Methods:
High-density 128-channel electroencephalography (EEG) was used to collect cortical auditory, visual, and somatosensory cortical evoked potentials (CAEP, VEP, SSEP) in adults and children with SSD before and after implantation. Behavioral correlates of speech perception in noise were also measured.

Results:
Prior to implantation, high-density EEG showed abnormal auditory activation patterns and evidence of increased cognitive load and cross-modal re-organization. Post-implantation, there is clear evidence of morphological changes in the auditory cortical responses consistent with increases in auditory speech perception in noise with some residual evidence compensatory changes in neural resource allocation.

Conclusion:
While CI in SSD may reverse some of the maladaptive effects of unilateral auditory deprivation, residual cross-modal changes may persist. With further research, it is possible that markers of cross-modal re-organization or evidence of cognitive load may help predict CI outcomes and guide the intervention and rehabilitation process for SSD patients.

Research Support:
Research supported by University of Colorado Denver T-32 Institutional Training Grant in Otolaryngology Research: NIDCD: 1T32DC012280-01A1
Regeneration in the Human Nasal Epithelium

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\textsuperscript{1} Department of Physiology and Biophysics, University of Colorado School of Medicine, Aurora, CO.
\textsuperscript{2} Department of Cellular and Developmental Biology, University of Colorado School of Medicine, Aurora, CO.
\textsuperscript{3} Department of Otolaryngology, University of Colorado School of Medicine, Aurora, CO.

Objective:
Olfactory dysfunction is a common condition with an increasing prevalence with age. Impaired sense of smell leads to safety concerns and a decreased quality of life. Olfactory deficits can be classified as conductive, sensory, or neural, depending on the cause of dysfunction. If deficits are conductive, the few treatment options include surgery, steroids and smell retraining. If deficits are sensory or neural even fewer treatment options exist. Therefore, it is important to study how sensory neurons and the nasal epithelium respond to injury, in order to develop possible therapeutic strategies.

Methods:
We examined regeneration in the human nasal epithelium following three different insults, surgical removal of septal tissue, traumatic brain injury, and bullectomy. Following surgical removal of septal tissue, biopsies were taken at 5 or 8 weeks and examined using immunohistology.

Results:
Surgically removing epithelium initiates migration of cells into the lesioned area and repopulation by 5 weeks post lesion; however, reorganization of the epithelium was not observed until 8 weeks post lesion. No Ki67\textsuperscript{+} proliferating cells were found in the repopulated area, suggesting that the repopulation was only from migrating cells. Another injury model, traumatic brain injury, is known to disrupt sensory neuron axons and lead to a regenerative response in rodents. Consistent with rodent models, we observed a degeneration of the mature sensory neurons (OMP\textsuperscript{+}) and a proliferative response (Ki67\textsuperscript{+}), 6 weeks post lesion. In contrast to rodent models, sustained distal injury to the sensory neurons by removal of the olfactory bulb (bullectomy) leads to a reduction of the olfactory epithelium, indicating that the presence of the olfactory bulb is necessary to maintain the sensory neuron population in humans.

Conclusion:
The surgical model of nasal tissue regeneration could provide insight into the mechanisms of re-epithelialization after injury in humans. Humans and rodents exhibit differential responses in the olfactory epithelium following injury.

Funding:
Research supported by University of Colorado Denver T-32 Institutional Training Grant in Otolaryngology Research: NIDCD: 1T32DC012280-01A1
Jonathan C. Kopelovich MD, PGY-6

Education/Honors & Awards:

**Fellowship:**
University of Colorado SOM, Pediatric Otolaryngology – 2015

**Residency:**
University of Iowa, Otolaryngology - 2014

**T32 Research Fellowship:**
University of Iowa, Auditory Research - 2010
Children’s Hospital of Philadelphia, Auditory Research – 2006

**Medical School:**
Jefferson Medical College - 2007

**Undergraduate:**
University of Pennsylvania – 2000
Cum Laude

Abstracts/Presentations:

- **Office based safety- are you putting your patients at risk?** Mini-seminar presentation in concert with the Patient Safety and Quality Improvement Committee AAO-HNS. Vancouver BC September 2013.

- **Facioscapulohumeral dystrophy in the head and neck: a case report and review of the literature.** Poster presentation by S. Owen at the AAFPS/COSM Orlando FL April 2013.

- **Subtotal petrosectomy and mastoid obliteration in adult and pediatric cochlear implant recipients.** Oral presentation by Dr. C. BarananoANS/COSM Orlando FL April 2013

- **Is high intensity electrical stimulation excitotoxic in hearing cochleae? Evidence from the mouse model.** Oral presentation at ARO MWM, Baltimore MD February 2013

- **The effect of intracochlear electrical stimulation on intracellular apoptosis signaling in spiral ganglion neurons after deafening in vivo.** Oral presentation at AAO-HNS. Washington DC September 2012.

- **Hybrid cochlear implants: what have we learned about the auditory system.** Keynote presentation by Dr. Bruce Gantz at International Conference on Cochlear Implants. Baltimore MD May 2012.

Publications:


Jonathan C. Kopelovich MD, PGY-6 (cont)

Publications:


Jonathan R. Skirko  MD, MPH, MHPA, PGY-6

Education/Honors & Awards:

Fellowship:
University of Colorado SOM, Pediatric Otolaryngology - 2015

Residency:
University of Washington, Otolaryngology - 2014

Medical School:
University of Washington – 2007

Graduate:
University of Washington, MPH - 2010
Washington State University, MHPA – 2003

Undergraduate:
Gonzaga University - 2001

Abstracts/Presentations:

- *Impact of Velopharyngeal Mislearning on Quality of Life Improvement After VPI Surgery*. Combined Otolaryngology Spring Meetings (COSM) - American Society of Pediatric Otolaryngology (ASPO). Boston, MA, April 25, 2015.


- *Sleep Surgery Treatment Outcomes & Policy: Cost Effectiveness of Uvulopalatopharyngoplasty*. 2012 AAO-HNSF Basic & Translational Research


- *Change in Quality of Life with Velopharyngeal Insufficiency (VPI) Surgery*. Combined Otolaryngology Spring Meetings (COSM) - American Society of Pediatric Otolaryngology (ASPO). Arlington, VA, April 2012.
Jonathan R. Skirko MD, MPH, MHPA (cont)

Publications:


Geoffrey R. Ferril  MD, PGY-5

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology - 2015

Medical School:
The University of Mississippi SOM - 2010

Undergraduate:
B.A. The University of Mississippi - 2006
Magna Cum Laude
Phi Beta Kappa
Phi Kappa Phi

Abstracts/Presentations:

- Bacteriologic upper and lower airways associations in patients with chronic rhinosinusitis and bronchiectasis. Combined Otolaryngology Spring meeting in Orlando, FL, April 11, 2013.

Publications:

Katherine K. Green MD, MS, PGY-5

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology - 2015
Outstanding Resident Research Day - First Place - 2013
Outstanding Resident Research Day - Best Case Review - 2012

Medical School:
University of Southern California Keck SOM - 2010

Graduate:
M.S. Rush University - 2006

Undergraduate:
B.A. Northwestern University - 2004

Abstracts/Presentations:

- Death after adenotonsillectomy secondary to massive pulmonary embolism. 40th Annual SENTAC Meeting. November 2012, Charleston, SC.

Publications:

Katherine K. Green  MD, MS, PGY-5  (cont)

Publications:

Brook K. McConnell MD, PGY-5

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology - 2015

Medical School:
University of Colorado SOM - 2010
Alpha Omega Alpha

Undergraduate:
B.A. University of Colorado Boulder - 2005

Abstracts/Presentations:


- Chiang T, McConnell BK, Ruiz AG, Prager JD. Multidisciplinary approach to the diagnosis and management of Type I-II laryngeal clefts. American Society of Pediatric Otolaryngology Annual Meeting poster, 2013/


Publications:

- Chiang T, McConnell BK, Ruiz A, Prager JD. Surgical management of type I and II laryngeal cleft in the pediatric population. Laryngoscope. Submitted for publication.

Justin T. Casey MD, PGY-4

Education/Honors & Awards:

- **Residency:**
  University of Colorado SOM, Otolaryngology
  Outstanding Resident Research Day – First Place - 2014
- **Medical School:**
  Florida State University SOM - 2011
- **Undergraduate:**
  B.S. Rensselaer Polytechnic Institute - 2006

Abstracts/Presentations:

- **Obstructive sleep apnea in Trisomy 21 patients: Comparing adenotonsillectomy with and without supraglottoplasty.** Poster presentation at SENTAC Annual Meeting, St. Louis, MO; December 2014.
- **Novel chemosensory cells discovered in the Larynx.** Podium presentation at Fall Voice Meeting, San Antonio, TX; October 2014.
- **Immunohistochemical study of human vallate gustatory and laryngeal cell morphology and innervation.** Poster presentation at Annual Resident Research Day, University of Colorado, Aurora, CO; June 2014
- **Retropharyngeal Abscesses: surgical vs. medical management.** Poster presentation the SENTAC Annual Meeting, Cincinnati, OH; December 2010.
- **Pierre Robin Sequence & mandibular distraction:** Oral Presentation at SUNY Upstate Medical University, Syracuse, NY; September 2010.
- **Orbital Decompression:** Oral Presentation at Our Lady of the Lake Hospital/ Louisiana State University Dept of Otolaryngology, Baton Rouge, LA; October 2010.
- **Neck abscesses in the pediatric population.** Oral Presentation at Arnold Palmer Children’s Hospital, Orlando, FL; October 2010.

Publications:

- **Casey J, Kosko J. Retropharyngeal Abscesses: Factors in Medical Management Failure.** Accepted and pending publication in ENT Journal.
- **Casey JT., Maitland CG., Optic disc head metastases presenting without edema or visible mass. Journal of Neuro-Ophthalmology.** Pending publication in Journal of Neuro-Ophthalmology
- **Casey J, Lupo JE, Jenkins HA. Retained Dental Needle Migration across the Skull Base to the Cochlea Presenting as Hearing Loss.** Submitted to the White Journal.
- **Casey J, Lupo JE, Jenkins HA. Unique complication of migrating broken dental needle.** Submitted to Journal of the American Dental Association
Leah J. Hauser MD, PGY-4

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology
Outstanding Resident Research Day – Second Place - 2014
Outstanding Resident Research Day - Honorable Mention - 2013

Medical School:
Northwestern University, Feinberg SOM - 2011
Alpha Omega Alpha

Undergraduate:
B.S. University of Southern California - 2006
Cum Laude

Abstracts/Presentations:

- **Sinus Culture Poorly Predicts Resident Microbiota.** Oral presentation at Combined Otolaryngology Spring Meetings. Las Vegas, NV. May 2014.
- **Baseline “Core” Sinus Microbiome Predicts Postoperative Surgical Outcome.** Oral presentation at Combined Otolaryngology Spring Meetings. Las Vegas, NV. May 2014.
- **Sinus Microbiome in Health and Disease: Chronic Rhinosinusitis.** Poster presentation at Aspen Lung Conference. Aspen, CO. June 2013.
- **Microbiome and S. aureus in CRS: Bacterial prevalence and abundance in CRS, nasal polyps, and asthma.** Oral presentation at University of Colorado, Otolaryngology Resident Research Day. June 2013.
- **Microbiome and S. Aureus in Chronic Rhinosinusitis.** Oral presentation at Combined Otolaryngology Spring Meetings. San Diego, CA. April 2012.
- **Factors associated with CT status in patients presenting with a history of CRS.** Oral presentation presented at: American Rhinology Society; Boston, MA, September 2010.
Leah J. Hauser MD, PGY-4 (cont)

Publications:

- Hauser LH, Chiang T: *Acute Pediatric Airway*. In Scholes MA, Ramakrishnan VR (eds):
Benjamin M. Milam MD, PGY-4

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology
Outstanding Resident Research Day – Honorable Mention - 2014

Medical School:
University of Virginia SOM - 2011

Undergraduate:
B.S. University of Virginia - 2006
Phi Beta Kappa

Abstracts/Presentations:


- **Utility of pH Impedance Study in Patients Requiring Reconstruction of Airway Anomalies: Do results affect clinical management?** Poster presentation at the 2014 American Society of Pediatric Otolaryngology Meeting part of the Combined Otolaryngological Spring Meetings, Las Vegas, NV.

- **Improving Operative Flow During Pediatric Airway Evaluation: A Quality Improvement Initiative.** Poster presentation at the 2014 American Society of Pediatric Otolaryngology Meeting part of the Combined Otolaryngological Spring Meetings, Las Vegas, NV.

- **Office-Based Vocal Fold Injection with the Laryngeal Introducer Technique.** Oral presentation at the Triological Society 2014 Combined Sections Meeting, Miami, Fl.

- **Suprafascial harvest of the radial forearm free flap decreases the risk of postoperative tendon exposure.** Abstract presented at the American Head and Neck Society meeting which is part of the Combined Otolaryngological Spring Meetings in May 2011 in Chicago.

Publications:

- Clary MS, Milam BM, Courey MS. *Office-based vocal fold injection with the laryngeal introducer technique.* Laryngoscope. 2014; Feb 27. [Epub ahead of print]
Jameson K. Mattingly MD, PGY-3

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology

Medical School:
University of Louisville SOM - 2012
Summa Cum Laude
Gold Humanism Honor Society
Alpha Omega Alpha

Undergraduate:
B.S. Western Kentucky University - 2008
Summa Cum Laude

Abstracts/Presentations:

- Examination of cochlear input signal with bilateral stimulation of bone-conduction implants. Osseo 2015 5th International Congress on Bone Conduction Hearing and Related Technologies. Lake Louise, Canada, 2015. POSTER.
- Cochlear implant electrode effect on sound energy transfer within the cochlea during acoustic stimulation. American Neurotologic Society. Boston, MA, 2015. PODIUM.
- Effects of ipsilateral and contralateral placement of bone-conduction systems on cochlear input signal. ARO MidWinter Meeting. Baltimore, MD, 2015. POSTER.
- Some investigations into the mechanisms of bone conducted sound. ARO MidWinter Meeting. Baltimore, MD, 2015. POSTER.
Abstracts/Presentations:

- **Incarcerated femoral hernia and the McVay repair.** Poster presented at: Southeastern Surgical Congress; Chattanooga, TN, February 2011.
- **Examination of gene regulation in a clinically relevant model of peritonitis using mouse TLR superarrays and Ingenuity Pathway analysis.** Poster presented at: Research Louisville, KY, September 2009.
- **Characterization of fly ash deposits in downstream duct of a coal-fired utility by multiple thermal analysis techniques.** Poster presented at: North American Thermal Analysis Society Annual Meeting; Bowling Green, KY, August 2006.

Publications:

- Greene N, Mattingly J, Jenkins H, Tollin D, Easter J, Cass S. *Cochlear implant electrode effect on sound energy transfer within the cochlea during acoustic stimulation.* Otol Neurotol. 2015.
- Cheadle W, Lenz A, Carrubba C, Mattingly J: *Array analysis of macrophage tolerance in peritonitis.* Inflammation Research, 8th World Congress on TSIS, abstract. 2010 Mar;59(Supplement 1):S51
S. Craig Quattlebaum MD, PGY-3

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology

Medical School:
University of Oklahoma COM - 2012
Gold Humanism Honor Society
Alpha Omega Alpha

Undergraduate:
B.S. Harding University - 2008

Abstracts/Presentations:
- **Identifying patients at risk for OSA.** Poster presented at: Oklahoma Academy of Family Physicians Annual Scientific Assembly; Tulsa, OK, June 2010.
- **SCHIP (Stephens County Health Improvement Project): Low Dose Aspirin Therapy Awareness Project.** Oral presentation to the Oklahoma State Department of Health; Oklahoma City, OK, August 2009.

Publications:
Carly J. Stewart  MD, PGY-3

Education/Honors & Awards:

**Residency:**
University of Colorado SOM, Otolaryngology

**Medical School:**
Northwestern University, Feinberg SOM - 2012
Alpha Omega Alpha

**Undergraduate:**
B.S. Brown University - 2008
Magna Cum Laude
Phi Beta Kappa

Abstracts/Presentations:

- *Unaffected Women with BRCA 1/2 Mutations and Their Use of Family History in Making Decisions Concerning Prophylactic Surgery*. Poster presentation at the Central Association of Obstetricians and Gynecologists Annual Meeting, Las Vegas, NV. October 2010
- *Unaffected Women with BRCA 1/2 Mutations and Their Use of Family History in Making Decisions Concerning Prophylactic Surgery*. Poster presentation at Northwestern University for the Medical Student Summer Research Program, Chicago, IL. October 2009

Publications:

Renee Banakis Hartl MD, AuD, PGY-2
T32 Resident Trainee

Education/Honors & Awards:

- **Residency:**
  University of Colorado SOM, Otolaryngology

- **Medical School:**
  Northwestern University, Feinberg SOM - 2013
  Alpha Omega Alpha

- **Graduate:**
  Au.D. Northwestern University - 2008

- **Undergraduate:**
  B.S. Miami University - 2005

Abstracts/Presentations:


Publications:


Anne K. Maxwell MD, PGY-2

Education/Honors & Awards:

- **Residency:** University of Colorado SOM, Otolaryngology
- **Medical School:** University of Virginia SOM - 2013
- **Alpha Omega Alpha**
- **Undergraduate:** B.A. Emory University – 2004
  Summa Cum Laude

Abstracts/Presentations:

- **Objective voice outcomes following endoscopic treatment of subglottic stenosis.** American Laryngological Association, Combined Otolaryngology Spring Meetings, Boston, MA, April 2015.
- **Prevention of hypocalcemia with preoperative vitamin D supplementation.** Virginia Society of Otolaryngology, Virginia Beach, VA, May 2013.
- **The effect of pre-operative calcium and vitamin D supplementation in total thyroidectomy.** Triological Society, Combined Sections Meeting, Scottsdale, AZ, January 2013.
- **A cross-cultural look at the acculturation of refugees in Charlottesville.** University of Virginia 9th Annual Medical Student Research Symposium, Charlottesville, VA, October 2010.

Publications:

Fiyin Sokoya MD, PGY-2

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology
Diversity Travel Scholarship, 2014

Medical School:
University of Kentucky COM - 2013
Phi Kappa Phi

Undergraduate:
B.S. University of Louisiana - 2008
Magna Cum Laude

Abstracts/Presentations:

- **Tracheal Sarcomatoid Squamous Cell Carcinoma Invading a Thyroid Gland with Papillary Thyroid Carcinoma.** Poster presented at IFHNOS 2014 5th World Congress & AHNS Annual Meeting, New York, NY, July 2014
- **Posterior Septal Widening as a Cause of Nasal Airway Obstruction.** Poster presented at the Combined Otolaryngological Spring Meetings, Las Vegas Nevada, May 2014.
- **Assessing the Impact of a Student-Run Inter-Professional Lunch & Learn Series on Medical Student Core Inter-Professional Competencies.** Oral Presentation presented at: Jefferson Center for Interprofessional Education Conference; Philadelphia, PA, May 2012
- **Behavioral Sensitivity to Voice Onset Time in Dutch-Belted Rabbits.** Poster presented at: University of Kentucky AOA Student Research Day; Lexington, KY, March 2012

Publications:

Abstracts/Presentations:

- *Recommendations for decannulation protocols in pediatric patients with tracheostomy*. Texas Children’s Hospital, Baylor College of Medicine Surgical Research Day, Houston, TX, 2013
- *Folate derivatives contribute to TNF suppression by Lactobacillus reuteri through modulation of TAB1 and downstream MAPK pathways*. National MD/PhD Student Symposium, Keystone, CO, 2010
- *Probiotic Lactobacillus reuteri suppresses TNF through inhibition of TAB1 and downstream MAPK pathways*. International Scientific Association of Prebiotics and Probiotics Meeting, Barcelona, Spain, 2010.
- *Folylpolyglutamate synthase gene is important for the anti-inflammatory effect of probiotic Lactobacillus reuteri on human myeloid cells*. Baylor College of Medicine Graduate School Symposium, Houston, TX, 2010
- *Folate derivatives contribute to TNF suppression by Lactobacillus reuteri through modulation of MAPK pathways*. Baylor College of Medicine Interdepartmental Program in Cell and Molecular Biology Student Symposium, Houston, TX, 2010
- *Folate derivatives contribute to TNF suppression by Lactobacillus reuteri through modulation of MAPK pathways*. Texas Medical Center Digestive Disease Center Symposium, Houston, TX 2010
- *Folate derivatives contribute to TNF suppression by Lactobacillus reuteri through modulation of MAPK pathways*. Baylor College of Medicine MSTP Student Symposium, Houston, TX 2010
- *Potential role for adenosine A2A receptor in the suppression of TNF by Lactobacillus reuteri*. Keystone Symposia: Innate, Adaptive and Regulatory Immune Responses to Intestinal Microbiota, Taos, New Mexico, 2009
Carissa M. Thomas MD PhD, PGY-2 (cont)

Abstracts/Presentations:
- Potential role of folypolyglutamates in the suppression of TNF by probiotic Lactobacillus reuteri, Baylor College of Medicine Graduate School Symposium, Houston, TX 2009.
- Potential role for adenosine A2A receptor in the suppression of TNF by Lactobacillus reuteri, Texas Medical Center Digestive Disease Center Symposium, Houston, TX 2009.
- Activation of key immunoregulatory signaling pathways by probiotic Lactobacillus reuteri, Baylor College of Medicine Interdepartmental Program in Cell and Molecular Biology Student Symposium, Houston, TX 2008.
- Activation of key immunoregulatory signaling pathways by probiotic Lactobacillus reuteri, Baylor College of Medicine MSTP Student Symposium, Galveston, TX 2008.

Publications:
Emily C. Ambrose MD, PGY-1

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology

Medical School:
University of North Carolina SOM – 2014

Undergraduate:
B.S.P.H. University of North Carolina – 2009
Distinction and Highest Honors

Abstracts/Presentations:


➢ Does the type or duration of microsurgical experience affect outcomes in head and neck reconstruction? Southeastern Society of Plastic & Reconstructive Surgeons 57th Annual Scientific Meeting, Bahamas, June 8-12, 2014.


Emily C. Ambrose MD (cont)

Abstracts/Presentations:
- Urinary Metabolites of Polycyclic Aromatic Hydrocarbons and Markers of Inflammation. Oral Presentation presented at: University of North Carolina School of Medicine Student Research Day; Chapel Hill, NC, January 2011.

Publications:
Nathan D. Cass MD, PGY-1

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology

Medical School:
The Ohio State University COM – 2014
Alpha Omega Alpha

Undergraduate:
B.A. Stanford University – 2010

Abstracts/Presentations:

- **Pediatric Deep Neck Infections: Diagnostic Dilemmas.** Presented at The Ohio State University Department of Otolaryngology Grand Rounds, Columbus, OH. July 2013
- **Thyroid Ultrasound.** Presented for 2nd year medical student Endocrinology curriculum, The Ohio State University College of Medicine, Columbus, OH. October 2013

Publications:

Farshad N. Chowdhury MD, PGY-1
T32 Resident Trainee

Education/Honors & Awards:

- **Residency:**
  University of Colorado SOM, Otolaryngology
- **Medical School:**
  University of Southern California Keck SOM - 2014
- **Undergraduate:**
  B.A. Dartmouth College – 2009
  Cum Laude

Abstracts/Presentations:
- CTGF Is Down-Regulated in Locally Invasive HNSCC. Oral Presentation at the Annual Scientific Meeting of the Southern California Chapter of the American College of Surgeons, 2014.
- Subacute Delayed Lower Extremity Reconstruction: A Ten Year Review. Program of the Annual Scientific Meeting of the Southern California Chapter of the American College of Surgeons, 2012.
- Chowdhury FN, Hopkins ME, Bucci DJ. (2009, January). The Effects of Exercise on Impaired Object Recognition Memory in Rats. Poster presented at: Department of Psychological and Brain Sciences Honors Thesis Symposium; Hanover, NH.

Publications:
Nyssa F. Fox MD, PGY-1

Education/Honors & Awards:

Residency:
University of Colorado SOM, Otolaryngology

Medical School:
Medical University of South Carolina COM – 2014
Alpha Omega Alpha

Undergraduate:
B.S.E. University of South Carolina - 2010

Abstracts/Presentations:

- Differences in skull base thickness in patients with spontaneous CSF leaks. Poster presented at: Combined Otolaryngology Spring Meetings – American Rhinologic Society Section; Orlando, FL, 2013
- The inflammatory response of human sinonasal epithelial cells of patients with chronic sinusitis with nasal polyps to cigarette smoke extract and fungal exposure. Oral Presentation presented at: Medical University of South Carolina Rhinology Monthly Meeting; Charleston, SC, 2013.

Publications:

- Illing, E, Schlosser, R., Palmer, J., Cure, J, Fox, N., Woodworth, B. Spontaneous sphenoid lateral recess CSF leaks arise from intracranial hypertension not Sternberg’s canal. International Forum of Allergy and Rhinology. 4.3 2014.
- Gerry, D., Fox, N., Lentsch, E. Liposarcoma of the head and neck: An analysis of 318 cases with comparison to non-head and neck sites. Head and Neck. 36.3 2014.
Nathaniel T. Greene PhD, Research Assistant Professor

T32 Trainee
Department of Otolaryngology and Department of Physiology and Biophysics

Education/Honors & Awards:

Fellowship:
University of Colorado SOM, Physiology and Biophysics - 2015
NIH/NCRR Colorado CTSI Novel Methods Grant - 2013

Graduate:
PhD University of Rochester, Department of Biomedical Engineering - 2012
M.S. University of Rochester, Department of Biomedical Engineering - 2009

Undergraduate:
B.S. Wittenberg University, Department of Physics - 2004

Abstracts/Presentations:


- Cochlear Implant Electrode Effect on Sound Energy Transfer Within the Cochlea During Acoustic Stimulation. The American Neurotology Society 50th Annual Meeting. (Oral Presentation), April 24-25, 2015


Abstracts/Presentations:


- **Investigations into guinea pig sound localization ability**. Invited presentation, Northeaster Ohio Medical School, June 2014.


- **Spatial hearing capabilities of the adult guinea pig (Cavia porcellus)**. In APAN XI. Poster. 2013.


- **Greene NT and Davis KA. 2011. *Pharmacological evidence of a functionally segregated pathway from the lateral superior olive to the inferior colliculus*. In 41st annual meeting of the Soc. Neurosi. program/ poster 478.14/kk11.**

- **Greene NT and Davis KA. 2011. *Envelope coding differs along the pathway from lateral superior olive to inferior colliculus of decerebrate cats*. In Abstracts of the Thirty-Fourth Annual Mid Winter Research Meeting of the Association for Research in Otolaryngology (ARO). Vol 34.**

Nathaniel T. Greene PhD, Research Assistant Professor (cont)

Abstracts/Presentations:
- *Eye position signals are distributed throughout the primate inferior colliculus*. In APAN III, 2005. Poster.

Publications:
Hannah Glick BA, PhD Candidate
T32 Trainee

Education/Honors & Awards:

Graduate:
University of Colorado, Boulder

Undergraduate:
University of Colorado, Boulder – 2012

Abstracts/Presentations:


Publications:

Research Day 2015
University of Colorado | School of Medicine
Department of Otolaryngology

Elizabeth Gould BS, PhD Candidate
T32 Trainee

Education/Honors & Awards:
- **Graduate:** University of Colorado, Denver
- **Research Fellowship:** California Institute of Regenerative Medicine, Stanford University - 2009
- **Undergraduate:** B.S. Humboldt State University - 2009

Abstracts/Presentations:
- **Gould, E.**, Ngyuen, K., Macklin, W., Restrepo, D., Ramakrishnan, V. *Regeneration in the Human Olfactory Epithelium*. Poster session presented at: American Chemical Senses Annual Meeting; 2014 Apr 9-12; Fort Myers, FL.
- **Gould, E.**, Phillips, L., Chen, Z., Palmer, T., Martinez, O. *Neural progenitor cells are natural killer cell targets*. Poster session presented at: California Institute of Regenerative Medicine Bridges Program; 2010 June 10-12; Arcata, CA.

Publications:
Poster Display Session

1. **Applicant Characteristics Associated with Successfully Matching into Otolaryngology Residency**
   Leah J. Hauser MD, Grant M. Gebhard, Miranda J. Dally, David A. Weitzenkamp PhD, Cristina Cabrera-Muffy MD

2. **How Should Unmatched Otolaryngology Applicants Proceed?**
   Josianna Schwan, Mona M. Abaza MD MS, Cristina Cabrera-Muffy MD

3. **The Lateral Nasal Sidewall and Its Relationship to the Midface**
   Carly Stewart MD, Jacob S. Minor MD, Brian W. Downs, Edward N. Labovitz, Riuxin Guo, Andrew A. Winkler MD

4. **Determining Roles of Ionic Conductances in the Firing Characteristics of Vestibular Calyx Afferents**
   Matthew Kirk MD, Frances Meredith PhD, Tim Benke MD PhD, Katherine J. Rennie PhD

5. **Zonal Differences in Na⁺ Currents of Vestibular Calyx Afferent Terminals**
   Frances Meredith PhD, Katherine J. Rennie PhD

6. **Screening of Novel MiRNA Biomarkers for Head and Neck Cancer**
   S. Craig Quattlebaum MD, Liwei Gao MD, Ningning Li MD, John I. Song MD, Ted H. Leem MD MS, Shi-Long Lu MD PhD

7. **Objective Voice Outcomes Following Endoscopic Treatment of Subglottic Stenosis**
   Anne K. Maxwell MD, Julianna K. Litts CCC-SLP, James Tod Olin MD, Matthew S. Clary MD

8. **Radiographic Study for Rapid Identification of the Sphenopalatine Foramen**
   Anne K. Maxwell MD, Henry P. Barham MD, Vijay R. Ramakrishnan MD

9. **Effects of Ipsilateral and Contralateral Placement of Bone-Conduction Systems on Cochlear Input Signal**
   Jameson K. Mattingly MD, Nathaniel T. Greene PhD, Herman A. Jenkins MD, Daniel J. Tollin PhD, James R. Easter, Stephen P. Cass MD MPH

10. **Examination of Cochlear Input Signal with Bilateral Stimulation of Bone-Conduction Implants**
    Jameson K. Mattingly MD, Nathaniel T. Greene PhD, Daniel J. Tollin PhD, James R. Easter, Stephen P. Cass MD MPH

11. **Test-Retest Reliability of the Binaural Interaction Component of the Auditory Brainstem Response in Guinea Pigs (Cavia porcellus)**
    Alexander Ferber, Victor Benichoux PhD, Daniel J. Tollin PhD
12. The Release and Re-uptake of Glutamate in Taste Buds
   Aurelie Vandenbeuch PhD, Marco Tizzano PhD, Angelo d’Alessandro PhD, Catherine Anderson, Dwight Bergles PhD, Sue C. Kinnamon PhD

13. Shedding Light on Type III Taste Cell Function
   Courtney E Wilson, Wallace S Chick PhD, Sue C. Kinnamon PhD

14. Type III, Sour-responsive Taste Cells are Preferentially Innervated by Nerve Fibers Expressing the Serotonin Receptor, 5-HT\textsubscript{3A}
   Eric Larson PhD, Jennifer Stratford PhD, Ruibiao Yang PhD, Ernesto Salcedo PhD, Sue C. Kinnamon PhD, Thomas E. Finger PhD