2013 Research Annual Report

Plastic Surgery

Division Details

Division Data Summary

RESEARCH AND TRAINING DETAILS	
Number of Faculty	4
Number of Joint Appointment Faculty	2
Number of Research Fellows	1
Number of Research Students	1
Number of Support Personnel	1
Direct Annual Grant Support	$150,189
Direct Annual Industry Support	$329,541
Peer Reviewed Publications	21

CLINICAL ACTIVITIES AND TRAINING	
Number of Clinical Staff	6
Number of Clinical Fellows	1
Number of Other Students	4
Inpatient Encounters	1800
Outpatient Encounters	5263

Division Photo

Row 1: R Jiang, Y Lan, D Jones, M Visscher
Row 2: C Gordon, B Pan, A Schw entker, D Billmire

Significant Accomplishments

Exploring the Genetic Roots of Craniofacial Development

Samantha Brugmann, PhD, studies the function of primary cilia in craniofacial development; the role of the Hedgehog (Hh) pathway during the development of the craniofacial complex; and the role of Kif3a in the mandibular prominence and how loss of this protein affects GliA::GliR ratios.

Brugmann in collaboration with Rolf Stottmann, PhD, Human Genetics, is using next generation sequencing technology to identify genetic variants in three families currently being cared for here at Cincinnati Children's. This research has significant potential to influence the families' care and could include crucial discoveries in basic developmental biology.

Christopher Gordon, MD, visiting research scientist Armando Uribe-Rivera, DDS, and Bruce Aronow, PhD, are investigating the role of microRNAs as master controllers of craniofacial development. Armando Uribe-Rivera and Gordon recently won the first prize investigator award at the American Cleft Palate Craniofacial Association.

Donna Jones, PhD, investigates the determinants of bone development, function and shape. In particular, she focuses on the influences of ontogeny, function and evolution on craniofacial morphology. The goal of her research is to assist clinicians treating children with craniofacial abnormalities, either congenital or acquired, through translational and laboratory-based research endeavors.

Jones also collaborates with James Wells, PhD, Developmental Biology, on a project entitled, “Generating human intestinal organoids with an ENS.” The goal of this project is to engineer human intestinal organoids that are innervated with a neural crest-derived enteric nervous system.

Translational and Bench Research to Improve Reconstruction

Gordon collaborates with Alessandro DeAlarcon, MD, and Michael Rutter, MD, on a tissue-engineered neotrachea using decellularized cadaveric scaffolding. The grafts appear to be fully mucosalized with ciliated respiratory epithelium, a key milestone to translating this technology to a human model. Gordon also is pursuing tissue-engineered mandible reconstruction as an alternative to traditional microsurgical reconstruction.

Using shape analysis, our research team is characterizing quantifiable growth curves of craniofacial shape in children from three dimensional photographs. Results from this project are intended for use by clinicians during repair or reconstruction of facial features.

Working with *in vitro* cells and *in vivo* mouse models, our lab is examining how muscle forces influence the developing shape of bone, particularly in the mandible. Using a variety of cell markers, tension sensors, and morphological investigations, this research aims to improve our understanding of the cause of developmental abnormalities of the lower jaw. Findings from this work eventually could help reduce the need for surgeries and long hospital stays in children affected with these disorders.

Yu Lan, PhD, has established a new mutant mouse model for cleft palate research by using ENU mutagenesis and exome sequencing approaches. The mouse model is providing new insight into the cellular mechanisms of palate development.

Lan, in collaboration with Rulang Jiang, PhD, Developmental Biology, has contributed to exciting new discoveries regarding molecular mechanisms involving the odd-skipped family transcription factors in patterning the mammalian dentition and tongue. They also have collaborated with Jing Hu, DDS, PhD, at Sichuan University in China in discovering a critical role of Smad7, an endogenous modulator of the TGF-beta signaling pathway, in the regulation of cranial suture development.

Ann Schwentker, MD, Brian Pan, MD, and Scott Rapp, MD, in collaboration with Bruce Aronow, PhD, are investigating the impact of autologous and cultured adipocyte injections in a porcine model of hypertrophic burn scarring.

Protecting Skin Integrity

Our Skin Sciences Program, led by Marty Visscher, MD, studies premature infants who lack vernix caseosa, have an incompetent skin barrier and are predisposed to infection. She also studies the ontogeny of stratum corneum barrier development in premature infants, using quantitative measures of barrier integrity, hydration, pH, and collection of skin surface samples to determine lipid composition, structural proteins and specific cytokines.

Visscher collaborates with researchers from Johns Hopkins University to study the effect of topical massage oils on neonatal skin integrity. She also uses multiple imaging modalities to characterize the disease and healing processes of skin conditions including hemangiomas, pressure ulcers, irritant contact dermatitis and burn scars. Affected sites are evaluated with high-resolution color imaging, thermal imaging and three-dimensional surface scans.

Division Publications

1. Bailey JK, Burkes SA, Visscher MO, Whitestone J, Kagan RJ, Yakuboff KP, Warner P, Randall Wickett R. **Multimodal quantitative analysis of early pulsed-dye laser treatment of scars at a pediatric burn hospital**. *Dermatol Surg*. 2012; 38:1490-6.
2. Chang CF, Serra R. **Ift88 regulates Hedgehog signaling, Sfrp5 expression, and beta-catenin activity in post-natal growth plate**. *J Orthop Res*. 2013; 31:350-6.
3. Hunt CG, Houtman CJ, Jones DC, Kitin P, Korripally P, Hammel KE. **Spatial mapping of extracellular oxidant production by a white rot basidiomycete on wood reveals details of ligninolytic mechanism**. *Environ Microbiol*. 2013; 15:956-66.
4. McNairn AJ, Doucet Y, Demaude J, Brusadelli M, Gordon CB, Uribe-Rivera A, Lambert PF, Bouez C, Breton L, Guasch G. **TGFβ signaling regulates lipogenesis in human sebaceous glands cells**. *BMC Dermatol*. 2013; 13:2.
5. Northrup AB, Katcher MH, Altman MD, Chenard M, Daniels MH, Deshmukh SV, Falcone D, Guerin DJ, Hatch H, Li C, Lu W, Lutterbach B, Allison TJ, Patel SB, Reilly JF, Reutershan M, Rickert KW, Rosenstein C, Soisson SM, Szewczak AA, Walker D, Wilson K, Young JR, Pan BS, Dinsmore CJ. **Discovery of 1-[3-(1-methyl-1H-pyrazol-4-yl)-5-oxo-5H-benzo[4,5]cyclohepta[1,2-b]pyridin-7-yl] -N-(pyridin-2-ylmethyl)methanesulfonamide (MK-8033): A Specific c-Met/Ron dual kinase inhibitor with preferential affinity for the activated state of c-Met**. *J Med Chem*. 2013; 56:2294-310.
6. Patel PA, Bailey JK, Yakuboff KP. **Treatment outcomes for keloid scar management in the pediatric burn population**. *Burns*. 2012; 38:767-71.
7. Patel PA, Chen W, Wilkening MW, Uribe-Rivera A, Racadio JM, Gordon CB. **Extended composite temporoparietal fascial flap: clinical implications for tissue engineering in mandibular reconstruction**. *J Craniofac Surg*. 2013; 24:273-7.
8. Paterson AH, Wendel JF, Gundlach H, Guo H, Jenkins J, Jin D, Llewellyn D, Showmaker KC, Shu S, Udall J, Yoo MJ, Byers R, Chen W, Doron-Faigenboim A, Duke MV, Gong L, Grimwood J, Grover C, Grupp K, Hu G, Lee TH, Li J, Lin L, Liu T, Marler BS, Page JT, Roberts AW, Romanel E, Sanders WS, Szadkowski E, Tan X, Tang H, Xu C, Wang J, Wang Z, Zhang D, Zhang L, Ashrafi H, Bedon F, Bowers JE, Brubaker CL, Chee PW, Das S, Gingle AR, Haigler CH, Harker D, Hoffmann LV, Hovav R, Jones DC, Lemke C, Mansoor S, ur Rahman M, Rainville LN, Rambani A, Reddy UK, Rong JK, Saranga Y, Scheffler BE, Scheffler JA, Stelly DM, Triplett BA, Van Deynze A, Vaslin MF, Waghmare VN, Walford SA, Wright RJ, Zaki EA, Zhang T, Dennis ES, Mayer KF, Peterson DG, Rokhsar DS, Wang X, Schmutz J. **Repeated polyploidization of Gossypium genomes and the evolution of spinnable cotton fibres**. *Nature*. 2012; 492:423-7.
9. Poore SO, Mahajan AY, Israel JS, Sitzman TJ, Siebert JW. **Facial flap contouring using a sinus microdebrider**. *Plast Reconstr Surg*. 2013; 131:653e-5e.
10. Rada-Iglesias A, Bajpai R, Prescott S, Brugmann SA, Swigut T, Wysocka J. **Epigenomic annotation of enhancers predicts transcriptional regulators of human neural crest**. *Cell Stem Cell*. 2012; 11:633-48.
11. Rapp SJ, Jones DC, Billmire DA, Taylor JA. **Dissection in the subgaleal and subperiosteal plane: implications on scalp wound healing**. *J Plast Surg Hand Surg*. 2013; 47:163-8.
12. Rapp SJ, Jones DC, Gerety P, Taylor JA. **Repairing critical-sized rat calvarial defects with progenitor cell-seeded acellular periosteum: a novel biomimetic scaffold**. *Surgery*. 2012; 152:595-604, 605 e1; discussion 604-5.
13. Sitzman TJ, Fisher DM. **Presurgical unilateral cleft lip anthropometrics: incidence of vermilion height asymmetry**. *Plast Reconstr Surg*. 2013; 131:935e-937e.

14. Visscher M, King A, Nie AM, Schaffer P, Taylor T, Pruitt D, Giaccone MJ, Ashby M, Keswani S. **A Quality-Improvement Collaborative Project to Reduce Pressure Ulcers in PICUs**. *Pediatrics*. 2013; 131:e1950-60.
15. Visscher MO, Pan BS. **Update on techniques for the quantitation of facial skin characteristics**. *Facial Plast Surg Clin North Am*. 2013; 21:7-19.
16. Visscher MO, Pan BS, Kitzmiller WJ. **Photodamage: treatments and topicals for facial skin**. *Facial Plast Surg Clin North Am*. 2013; 21:61-75.
17. Visscher MO, Randall Wickett R. **Hand hygiene compliance and irritant dermatitis: a juxtaposition of healthcare issues**. *Int J Cosmet Sci*. 2012; 34:402-15.
18. Visscher MO, Taylor T, Narendran V. **Neonatal intensive care practices and the influence on skin condition**. *J Eur Acad Dermatol Venereol*. 2013; 27:486-93.
19. Wilkening MW, Patel PA, Gordon CB. **External fixation in a low-velocity gunshot wound to the mandible**. *J Craniofac Surg*. 2012; 23:e418-9.
20. Yokose U, Hachiya A, Sriwiriyanont P, Fujimura T, Visscher MO, Kitzmiller WJ, Bello A, Tsuboi R, Kitahara T, Kobinger GP, Takema Y. **The endogenous protease inhibitor TIMP-1 mediates protection and recovery from cutaneous photodamage**. *J Invest Dermatol*. 2012; 132:2800-9.
21. Zhao B, Pan BS, Shen SW, Sun X, Hou ZZ, Yan R, Sun FY. **Diabetes-induced Central Neuritic Dystrophy and Cognitive Deficits Are Associated with the Formation of Oligomeric Reticulon-3 via Oxidative Stress**. *J Biol Chem*. 2013; 288:15590-9.

Faculty, Staff, and Trainees

Faculty Members

David Billmire, MD, Professor
Leadership Director, Pediatric Plastic Surgery

Samantha Brugmann, PhD, Assistant Professor
Research Interests Craniofacial Development

Christopher Gordon, MD, Associate Professor

Donna Jones, PhD, Assistant Professor

Yu Lan, PhD, Associate Professor

Brian Pan, MD, Assistant Professor

Ann Schwentker, MD, Associate Professor

Marty Visscher, PhD, Associate Professor
Leadership Director, Skin Sciences Program

Research Interests Skin Science

Kevin Yakuboff, MD, Professor
Leadership Co-Director, Hand and Upper Extremity Center

Thomas Sitzman, MD, Assistant Professor

Joint Appointment Faculty Members

Rulang Jiang, PhD, Professor (Developmental Biology)

Clinical Staff Members

Dawn Rothchild, RN, PNP
Stacey Ruth, RN, MSN, CFNP

Trainees

William Abouhassan, MD, Resident, 2004, Cleveland Clinic, PGY9
Haithem Elhadi, MD, Resident, 2000, Kasturba Medical College, PGY6
Darlene Guse, MD, Resident, 2010, Mayo Clinic, PGY2
Jason Hedrick, MD, Resident, 2006, Loma Linda University, PGY5
Audrey Kesselring, MD, Resident, 2007, University of Cincinnati, PGY5
Scott Rapp, MD, Resident, 2008, Medical College of Ohio, PGY4
Chris Runyan, MD, Resident, 2009, University of Cincinnati, PGY3

Grants, Contracts, and Industry Agreements

Grant and Contract Awards		Annual Direct
BRUGMANN, S		
The Role of Primary Cilia in Craniofacial Development		
National Institutes of Health		
R00 DE 019853	02/01/11-01/31/14	$150,189
	Current Year Direct	**$150,189**

Industry Contracts	
VISSCHER	
The Procter and Gamble Company	$295,800
KAO Corporation	$33,741
Current Year Direct Receipts	**$329,541**
Total	**$479,730**