

Division Photo



First Row: M. Visscher; Second Row: G. Kasting, V. Narendran, K. Bailey, S. Boyce, K. Li, S. Hoath.

Not Present: R. Boissy, R. Wickett, J. Kitzmiller

Division Data Summary

Research and Training Details

Number of Faculty	13
Number of Research Students	4
Direct Annual Industry Support	\$269,382
Peer Reviewed Publications	28

Clinical Activities and Training

Number of Clinical Students	1
Number of Other Students	6

Significant Publications

Narendran V, Visscher MO, Abril I, Hendrix SW, Hoath SB. Biomarkers of epidermal innate immunity in premature and full-term infants. *Pediatr Res* 2010;67:382-386.

The paper addresses the ontogeny of the skin neuroimmune system and is the first to measure biomarkers of innate immunity and barrier maturation from the stratum corneum of premature and full term neonates.

Visscher M, deCastro MV, Combs L, Perkins L, Winer J, Schwegman N, et al. Effect of chlorhexidine gluconate on the skin integrity at PICC line sites. *J Perinatol* 2009;29:802-807.

Neonatal intensive care patients are at risk for nosocomial infections. Due to the high morbidity and mortality, prevention strategies are being implemented and evaluated for effectiveness as efforts to identify both causative and corrective factors continue. The study is the first to examine the effects of CHG among neonates within the context the combination with the dressing. The results indicate that CHG does not cause and immediate inflammatory response, but they highlight the contribution of adhesive dressings to skin compromise in the clinical setting and the importance of identifying alternatives in order to avoid iatrogenic epidermal injury in this population.

Sriwiriyanont P, Hachiya A, Pickens WL, Moriwaki S, Ohuchi A, Kitahara T, et al. Lentiviral vector-mediated gene transfer to human hair follicles. J Invest Dermatol 2009;129:2296-2299

Transduction efficacy of VSVG-pseudotyped HIV vector was determined for gene transfer to human hair follicles. Ex vivo transduction before grafting was more efficient than injection into grafted follicles. The vector can be used to examine molecular mechanisms involved with epidermal homeostasis and hair follicle morphogenesis. The method can be used for further studies of hereditary or acquired skin conditions.

Kadekaro AL, Leachman S, Kavanagh RJ, Swope V, Cassidy P, Supp D, et al. Melanocortin 1 receptor genotype: an important determinant of the damage response of melanocytes to ultraviolet radiation. FASEB J 2010

Epidermal melanocytes are the precursors of melanoma. The resistance of melanoma to conventional oncological treatments necessitates identification of genetic markers. The melanocortin 1 receptor appears to be a gene marker of melanoma susceptibility. The paper describes the molecular mechanisms by which the melanocortin 1 receptor genotype controls the mutagenic effect of ultraviolet radiation on human melanocytes and discusses implications for melanoma.

Visscher M, Davis J, Wickett R. Effect of topical treatments on irritant hand dermatitis in health care workers. Am J Infect Control 2009;37:842 e841-842 e811.

Irritant contact dermatitis (ICD) from repetitive hand hygiene is significant and the primary reason for compliance failure among health care workers (HCWs). Chronic ICD has implications for infection control because higher bacterial counts are associated with increased skin compromise. The dermatitis is chronic and does not recover during time off. Aggressive application of hand lotions/creams is necessary in order to mitigate the epidermal barrier compromise that occurs with repetitive hand hygiene procedures. The findings have implications for patient safety, worker safety and health care policy.

Division Highlights

Vivek Narendran, MD; Steven Hoath, MD; Marty Visscher, PhD

Epidermal innate immunity is a complex process involving a balance of pro- and anti-inflammatory cytokines, structural proteins, and specific antigen presenting cells occurring against a background of neuroendocrine modulators such as cortisol. Skin surface samples from premature and full term infants, adults and vernix were analyzed for Keratin 1,10,11, Keratin 6, involucrin, albumin, fibronectin and cortisol, and cytokines IL-1, TNF α , IL-6, IL-8, MCP1, IP10, IFN γ and IL-1 receptor antagonist. Keratin 1,10,11 was decreased and involucrin was increased in infants versus adults. All infants had elevated IL1 α and reduced TNF α versus adults. IL-6, IL-8 and MCP1 were significantly increased in premature versus term infants and adults. Skin surface cortisol and albumin were significantly elevated in premature infants. The biomarker profile in premature infants was unique with differences in structural proteins, albumin and cytokines IL-6, IL-1 β , IL-8 and MCP1. The higher infant IL1 α may be associated with skin barrier maturation. The significant elevations in skin surface cortisol for preterm infants may reflect a neuroendocrine response to the stress of premature birth.

Division Collaboration

Collaboration with Patient Services

Collaborating Faculty: Marty Visscher

As part of the patient safety Pressure Ulcer Prevention Collaborative, to understand the factors influencing pressure ulcer formation and to develop a bundle for reducing the incidence

Collaboration with Health Policy and Clinical Effectiveness

Collaborating Faculty: Vivek Narendran, Marty Visscher

To develop a skin care bundle for the Ohio Perinatal Quality Collaborative's work on reducing mortality and morbidity due to nosocomial infections in very premature infants

Collaboration with Hematology/Oncology

Collaborating Faculty: Marty Visscher

To apply multiple quantitative skin imaging methods for the characterization of hemangiomas and vascular malformations

Faculty Members

Steven B. Hoath, MD, Professor ; *Medical Director, The Skin Sciences Institute*

Research Interests: Epidermal barrier development, vernix biology

Marty O. Visscher, PhD, Research Professor ; *Director, The Skin Sciences Institute*

Research Interests: neonatal skin maturation, innate immunity, vernix biology

Vivek Narendran, MD, Associate Professor ; *Director Newborn Nursery Christ Hospital, Director NICU University Hospital, Director Perinatal Outreach Program*

Research Interests: epidermal innate immunity

Raymond E. Boissy, PhD, Professor ; *Director, National Vitiligo Foundation*

Research Interests: melanization, skin pigmentation and pigmentary diseases

W. John Kitzmiller, MD, FACS, Associate Professor ; *Head, Division of Plastic and Reconstructive Surgery; Director of Wound Care Drake Hospital*

Research Interests: mechanisms of dermal and epidermal resurfacing

J. Kevin Bailey, MD, FACS, Assistant Professor ; *Medical Director, University Hospital Burn Wals-In Center*

Research Interests: enhanced methods for burn scar treatment

Steven T. Boyce, PhD, Professor ; *Director, Skin Substitute Laboratories, Shriners Burns Institute*

Research Interests: Development of cultured skin substitutes, burn physiology, skin restoration

R. Randall Wickett, PhD, Professor ; *Director, Skin Pharmaceuticals and Cosmetic Science Graduate Program; President Elect, Society of Cosmetic Chemists*

Research Interests: Quantitation of skin optical and biophysical properties

Gerald B. Kasting, PhD, Associate Professor ; *Director, Graduate Programs; Past Co-chairman, Gordon Research Conference*

Research Interests: computational models for topical delivery and dermal risk assessment

Li Kevin, PhD, Associate Professor

Research Interests: transport barrier properties, drug delivery across skin

Diya F. Mutasim, MD, Professor ; *Chairman, Department of Dermatology*

Research Interests: Bullous diseases, dermatopathology

Zalfa Abdel-Malek, PhD, Research Professor

Research Interests: regulation of human pigmentation, UV effects

Neville G. Pinto, PhD, Professor ; *Vice Provost and Dean, The Graduate School*

Trainees

- **Shona Burkes, PhD**,
- **Jodi Eubanks, PhD**,
- **Marisa Robinson, PhD**,
- **Jennifer Davis, PhD**,
- **Maria Victoria deCastro, MSN**,
- **Claire Burkhart, BSN**,
- **Teresa Taylor, RN, BSN, WCC**,
- **Linda Lacina, RN, Edu I**,
- **Tammy Casper, RN, MSN, Edu II**,
- **Ann Marie Nie, NNP, CWOCN**,
- **Lisa Mack, RN, BSN**,

Significant Accomplishments

Studying the role of vernix caseosa

Despite constant water exposure in utero, full-term neonates have a functional stratum corneum (SC) barrier, a process dependent upon molecular mechanisms of endogenous water binding within the SC. Neonatal skin hydration decreases rapidly after birth, then increases over the first month. Transition from high to low humidity may initiate filaggrin proteolysis to water-binding free amino acids (FAAs). We examined FAAs in vernix and infant stratum corneum. FAAs are low at birth, higher one month later, but lower than adult levels. FAAs are higher at 24 hours in vernix-treated than vernix-removed skin, suggesting that vernix provides FAAs to plasticize the skin before adaptive changes can occur. Coupled with the healing, anti-infective and anti-oxidant properties, the water-binding function of vernix is essential for premature infants who often lack vernix.

Dermatitis among healthcare workers

Chronic irritant contact hand dermatitis (ICD) is common in healthcare workers. A polymorphism at position -308 on the TNF α gene has been associated with skin irritation. We examined the TNF α -308 genotype and atopy among healthcare workers with ICD and their responses to repetitive hand hygiene and lotion treatment. Both TNF α -308 and atopy influence irritation, recovery and effectiveness of common skin care products in chronically damaged and normal skin. The AA/GA genotype experienced more irritation than genotype GG. Targeted genotyping for TNF α -308 and atopy could reduce occupational skin disorders through treatment and prevention.

Controlling human hair shape

Long-term transgene expression via follicular gene therapy may be useful in treating diseases such as X-linked

hypohydrotic ectodermal dysplasia, where mutations in EDAR and receptor EDAR cause abnormal hair shape and lack of eccrine glands. We used a high titer of VSV-G-pseudotyped lentiviral vector encoding insulin-like growth factor binding protein 5 (IGFBP-5) to transfect curly and straight human hair follicles before grafting onto SCID mice. Overexpression of IGFBP-5 in hair xenografts resulted in decreased extracellular matrix proteins and disassembly of adhesional junctions. The resulting hair twisted shafts have an unusual deposition of hair cuticle. Lentiviral transduction is useful for analyzing genes regulating human hair morphogenesis.

Division Publications

1. :

Grants, Contracts, and Industry Agreements

Industry Contracts

Visscher, M

Medline INDs	\$ 13,475
KAO Corporation	\$ 194,307
Procter and Gamble	\$ 61,600

Current Year Direct Receipts \$269,382

Total \$269,382
