

Division Details

Division Data Summary

Research and Training Details

Number of Faculty	19
Number of Joint Appointment Faculty	4
Number of Research Fellows	4
Number of Research Students	4
Number of Support Personnel	102
Direct Annual Grant Support	\$6,034,086
Direct Annual Industry Support	\$3,191,758
Peer Reviewed Publications	93

Clinical Activities and Training

Number of Clinical Staff	7
Number of Clinical Fellows	4
Number of Other Students	18
Inpatient Encounters	2,684
Outpatient Encounters	1,073

Division Photo



Row 1: L Danziger-Isakov, M Dickey, M Hostetter, N Sawtell, M Staat, R Cardin
 Row 2: E Schlaudecker, N Hutchinson, M Tan, S Way, J Jiang
 Row 3: M Steinhoff, T Farkas, B Connelly, J Qualls, S Shah

Significant Accomplishments

New Faculty

Three new faculty members will join the division in the FY13 academic year: Joe Qualls, PhD, from St. Jude as assistant professor; Sing Sing Way, MD, PhD, from the University of Minnesota as associate professor; and Lara Danziger-Isakov, MD, MPH, as associate professor. Each brings a new area of expertise to the division's research efforts; Qualls in macrophage biology, Way in the immunology of pregnancy, and Danziger-Isakov in transplant infectious diseases.

Expanded Clinical Activities

The division's clinical revenues topped \$700,000 in billings for the first time. This amount doubles the billing total in 2008. We also opened a new general infectious diseases clinic at the Liberty campus and a travel medicine clinic at the Burnet campus.

Research

Our research grants and industry sponsored projects also hit a new high -- \$11.8 million in the past year. Grant funding is expected to increase even more in the coming year, with several faculty having obtained new funding that will begin in FY13. The Division of Infectious Diseases ranks second in overall funding among the divisions in the Cincinnati Children's Research Foundation.

Division Highlights

Margaret K. Hostetter, MD

Research in the Hostetter laboratory has expanded into three main areas. (1) Heparin binding motifs in *Candida albicans* and their role in biofilm. After identifying 55 *C. albicans* proteins that contain putative heparin binding motifs, Kris Orsborn and Julianne Green showed that alanine mutation of a particular motif decreased heparin binding. An antibody made to a peptide encompassing the most potent heparin binding motif inhibited binding to heparin *in vitro*. *In vivo* studies in a biofilm model are underway. (2) Role of candidal vaginal colonization in preterm birth. Aashvini Belosay, PhD, is currently characterizing the cytokine profile released by *C. albicans* incubated with vaginal epithelium. (3) Genetics of disseminated staphylococcal osteomyelitis. Exome sequencing of parent/child trios identified de novo mutations implicating a novel pathway for susceptibility to disseminated staphylococcal disease. *In vitro* experiments to identify the functional correlates of these mutations are underway.

David I. Bernstein, MD, MA

The pivotal trial for a genital herpes vaccine composed of herpes simplex type 2 glycoprotein D (cd) and adjuvanted with MPL and Alum was published in the *NEJM*. Although two large trials showed efficacy in women this trial showed no efficacy for prevention of genital herpes caused by HSV type 2 (HSV-2) but surprisingly demonstrated efficacy against HSV-1 genital herpes. Therefore we have begun evaluations using a different vaccine strategy, live attenuated HSV vaccines. To date the live vaccine has proven to be more effective than the gD vaccine in our animal model of genital herpes. We have also completed enrollment in the largest study of congenital CMV, enrolling 100,000 newborns at 6 centers around the USA. Results will more accurately determine the burden of disease in diverse populations.

Turning to GI viruses we completed the first human trial of a vaccine for norovirus and found it to be moderately protective as noted in the recent *NEJM* publication. We are currently directing a study of a new bivalent vaccine which will evaluate safety and efficacy. The rotavirus vaccine we developed continued to prevent hospitalizations and deaths around the world.

Rebecca Brady, MD

For this period, approximately 60% of Dr. Brady's effort was devoted to clinical patient care. She was the CCHMC lead investigator for an NIH, DMID-sponsored clinical trial of influenza vaccines in post-partum breastfeeding women and their infants. Dr. Brady also served as a co-investigator for many clinical trials performed at the Gamble Program for Clinical Studies, CCHMC Infectious Diseases Division.

Rhonda Cardin, PhD

The Cardin lab previously showed that the viral chemokine receptor M33 encoded by murine cytomegalovirus (CMV) is required for long term latent infection of the bone marrow. In 2011, we pursued the identification of cell types in the bone marrow and spleen of mice which are latently infected with cytomegalovirus using a combination of immunomagnetic bead enrichment and cell sorting. We have identified several myeloid lineage cells which could harbor latent virus and are in the process of demonstrating that virus can be recovered from these populations. In collaboration with Dr. Helen Farrell in Australia, we continue to characterize the role of the cytomegalovirus-encoded chemokine receptors during infection. Also, in collaboration with Dr. David Bernstein, we have characterized several new guinea pig cytomegalovirus isolates which will be a useful tool for understanding multi-strain congenital CMV infection in newborn infants as well as for evaluation of vaccine

strategies in our guinea pig cytomegalovirus model. In our studies, we find that the newly isolated guinea pig cytomegalovirus crosses the placenta and infects the developing fetus. Human CMV is the leading infectious cause of congenital hearing loss, with approximately 0.5-2.0% of newborn infants experiencing hearing loss within the first 2-4 years of life. Our next studies will determine whether co-infection of pregnant guinea pigs with multiple strains of guinea pig cytomegalovirus leads to increased hearing loss in the newborn guinea pigs. Lastly, we have characterized a live-attenuated HSV-2 vaccine in our guinea pig model of genital herpes, and although promising, further studies are needed to show that the vaccine controls recurrent vaginal shedding, and thus, would be a useful vaccine which limits HSV-2 transmission.

Beverly Connelly, MD

Dr. Connelly's focus is on hospital quality improvement, specifically in reducing healthcare associated infections. She has collaborations hospital-wide, with major efforts on the reduction of surgical site infections and has centered efforts in the area of spinal fusion procedures with spin-offs for all device associated infections.

Tibor Farkas, PhD, DVM

In 2011, we completed a pilot study to establish the pathobiology of reovirus infection by experimental inoculation of rhesus macaques with the prototype Tulane virus (*PLoS One*, 2012). We demonstrated the development of acute gastroenteritis (diarrhea, fever, seroconversion, virus shedding) and the presence of TV in cells in the lamina propria of duodenal biopsies but not in enterocytes. This study along with our previous studies further indicates that reoviruses are a promising surrogate and disease model for human noroviruses. In a separate study that investigated the prevalence of reoviruses, we obtained serological evidence for reovirus infections in several non-human primate species (not only in rhesus macaques) and in both conventional and SPF colonies in several National Primate Research Centers (NPRC). The significance and economic impact of reovirus gastroenteritis in NPRCs were also estimated (*J. Med. Primatology*, 2012).

We continued our work on the molecular characterization of novel avian picornaviruses that were identified in our laboratory last year (*Virus Genes*, 2011). In a new study that targeted the identification of novel enteric RNA viruses in wild and laboratory rodents, we described novel picorna-, noro- and astroviruses in both laboratory and wild mice (*Veterinary Microbiology*, 2012 and *Virus Genes*, in revision). These findings suggest that our understanding of the complexity of the rodent enteric viral flora is still limited. Viruses described in laboratory mice are relevant to biomedical research that heavily relies on the mouse model. Because of the diversity of rodent species and their pivotal role as vectors or reservoirs in the spread of several human infectious diseases, coupled with the unknown diversity and often close relationship of rodent enteric viruses to human pathogens these findings can also have public health relevance.

Robert W. Frenck, MD

Dr. Frenck continues with his interest in clinical vaccine trials with special interest in enteric diseases and vaccines to prevent the infections. The successful completion of the first ever human challenge model with a G2 strain of norovirus led to collaboration with an industrial partner, Ligocyte, to test the efficacy of their candidate G2 norovirus vaccine in preventing norovirus among people administered the G2 challenge strain. Dr. Frenck also is heading a VTEU project to test the safety and immunogenicity of a vaccine against *Shigella sonnei*, the most common cause of *Shigella* in the United States. Finally, Dr. Frenck continues to head efforts at CCHMC testing candidate vaccines against *Staphylococcus aureus* and *Streptococcus pneumoniae*. His work on the *S. pneumoniae* vaccine was integral to the data collected which led to the licensure of the 13-valent conjugate pneumococcal vaccine in children and more recently adults.

Jason Jiang, PhD

Noroviruses (NVs) and rotaviruses (RVs) are two important causes of acute gastroenteritis. In the past year we have made significant progress in understanding the virus/host interaction and receptors for the two virus species. For norovirus, we have completed the first human volunteer challenge study on a GII.4 norovirus and demonstrated a strong association of GII.4 infection with the histo-blood types of the volunteers. Following this study, we initiated two additional studies: 1) further improve the model by determining the minimal doses of the challenge pool, and 2) apply the human challenge model to evaluate a norovirus VLP vaccine (both studies were funded by LigoCyte). In the study of developing norovirus P particle vaccine, we have established a norovirus challenge model using gnotobiotic pigs (collaboration with Virginia Tech). We also performed translation studies on designing antivirals and antibodies (chicken IgYs) against norovirus for potential therapeutic and prophylactic treatment against noroviruses. For rotavirus, we discovered a new receptor binding pattern of rotaviruses recognizing the type A antigens by characterization of three strains in another [P] genogroup from those described in our previous studies. We also performed a comprehensive phylogenetic analysis of rotaviruses based on sequences of the surface spike protein VP8* of rotaviruses, which is important for future study on the genetic relatedness of rotaviruses with HBGAs. Our P particle presented rotavirus chimeric vaccine candidates have been licensed to PATH and LigoCyte for further development. Furthermore, our studies on the evaluation of TV as a surrogate for human noroviruses are ongoing. Finally, we have initiated a new study on characterization of norovirus replication in human intestinal organoids developed from stem cells with some interesting observations. This study will be continued in the near future.

Monica M. McNeal, MS

The Laboratory for Specialized Clinical Studies provides lab support for a large number of clinical studies involving vaccine trials and vaccine development. Influenza virus vaccines and rotavirus vaccines continue to be important for overall health of children in the US and around the world. The lab is committed to help establish clinical labs in India to support rotavirus vaccine trials in that country. In addition, the lab consults with other labs around the world to provide training and support for establishing quality assays to support vaccine trials. Additional projects include using animal models to investigate the effects of malnutrition on oral rotavirus vaccines and the anti-viral effects of hyaluronan regulation of host defenses in the intestinal tract.

We have continued to support rotavirus vaccine trials conducted in numerous countries around the world. We are analyzing clinical samples collected from a trial conducted in a developing country aimed at increasing the effectiveness of rotavirus vaccines and are scheduled to participate in several more trials in the upcoming year. We have continued our support for developing laboratory capabilities in India to support rotavirus vaccine trials in that country. A new project this year is to develop an animal model to look at malnutrition and intestinal enteropathy in relation to rotavirus vaccine take. Another new project involves developing and qualifying new assays to measure antibody responses to new rotavirus vaccines. We have continued our support of influenza vaccine trials by running assays to determine the responses after vaccination. We have developed and qualified a neutralization assay for influenza and are using this assay in a number of clinical trials. We are continuing our lab support for a CMV vaccine trial and are developing a neutralization assay for this study. We are continuing our support for surveillance studies involving rotavirus and respiratory infections and have added a realtime rt-PCR assay to quantify norovirus in stool samples from children less than 5 years of age. Most recently we have been chosen to support a *Shigella* vaccine trial and have transferred assays and technology to the lab for these future studies.

Nancy Sawtell, PhD

Most of the human population world-wide has been infected by herpes simplex viruses. Following the initial lytic

infection, HSVs establish permanent latent infections within neurons in both the peripheral and central nervous systems. Reactivation of latent virus not only results in viral disease (new infections, blindness and encephalitis) but also contributes to HIV infection, diabetes, cardiovascular and neurodegenerative diseases. No effective vaccine is available and no therapy eliminates latency or prevents reactivation. The long-term goal of ongoing research in the Sawtell lab is to find interventions for recurrent HSV episodes by defining mechanisms that control establishment and reactivation of HSV-1 latency. The gene expression cascade during HSV-1 lytic infection begins with activation of immediate-early (IE) gene transcription by the virion protein VP16 with host factors Oct-1 and HCF-1. In contrast, the initial events in the reactivation from latency are still poorly defined. Our central hypothesis is that regulation of both VP16 expression and activity underlie the establishment of latency and reactivation from latency. These two levels of control involve multiple positive and negative inputs to allow or inhibit viral replication in the neuron *in vivo*. An additional focus of the lab is to determine the influence of host genetics on the HSV disease outcome. Utilizing advanced recombinant inbred mice together with a group of low passage clinical isolates is allowing us to map the intersection between host and viral genetics.

Elizabeth Schlaudecker, MD, MPH

Dr. Schlaudecker has studied the immunologic response to influenza immunization in pregnant women with the support of a Procter Scholars award. The hemagglutination inhibition titers were significantly decreased in pregnant women compared to non-pregnant women after immunization, suggesting that pregnant women may demonstrate a less robust response to immunization.

Mary Staat, MD, MPH

Through Dr. Staat's large epidemiology and surveillance program developed in 1997, she has been able to develop optimal methods of detecting the changes and manifestations of infectious diseases of children within CCHMC and for the population of Hamilton County, and to compare these findings to national trends. Recognizing that CCHMC captures essentially all Hamilton County children requiring hospitalization or care in the emergency department has allowed Dr. Staat to conduct studies to determine the population-based rates of Hamilton County hospitalizations and emergency department visits for many pediatric infectious diseases using unique methods such as capture-recapture methods to determine disease burden and case-cohort and case-control designs to determine the post-licensure effectiveness of rotavirus and influenza vaccines. Studies published last year included the effectiveness of rotavirus vaccine post-licensure, the direct and indirect effects of the rotavirus immunization program, parent and physician perspectives on porcine circovirus and rotavirus vaccine and the post-licensure effectiveness of influenza vaccine in children.

Dr. Staat has also utilized data from her large international adoption center to publish studies to assist in the development of evidence-based guidelines for internationally adopted children. This past year, her manuscript on the country-specific prevalence of intestinal parasites and the optimal protocol for screening stool specimens was published.

Ming Tan, PhD

Dr. Tan's research focused on two directions: 1) development of norovirus (NoV) P protein-based complexes into useful vaccines and vaccine platforms and 2) elucidation of NoV-host interaction. For the first direction, we have provided solid evidence to show the NoV P particle as a capable platform for antigen presentation. A chimeric P particle containing the spike protein VP8* of rotavirus (RV) has been shown to be a good dual vaccine candidate against both NoVs and RVs. The technology of P particle-VP8* chimeric vaccine has been licensed to LigoCyte and PATH Vaccine Solution, a pharmaceutical and a vaccine company, respectively, for further development under support from Bill and Melinda Gate Foundation. In addition, we have developed a

new protein complex system to turn dimeric/oligomeric antigens into large, polyvalent complexes for increased immunogenicity. This protein complex system can be used as multivalent vaccines and vaccine platforms. For the second direction, we elucidated the structures of histo-blood group antigen (HBGA) binding sites of two more NoVs, a GII.9 and a GI.8 strains, which shed light into the complex interactions between the diverse NoV and polymorphic HBGAs. These similar interactions have been recently extended to RVs. A number of papers have been published and a new patent has been applied. Our research outcomes provide valuable data and strategies for future development of vaccine and antivirals against NoVs and other infectious diseases.

Significant Publications

Ambroggio L, Tabb LP, O'Meara T, Sheffler-Collins S, McGowan KL, **Shah SS**. **Influence of antibiotic susceptibility patterns on empiric antibiotic prescribing for children hospitalized with community-acquired pneumonia.** *Pediatr Infect Dis J*. 31(4):331-336. Apr 2012.

This paper examined antibiotic prescriptions for 4888 children hospitalized in 33 children's hospitals with community-acquired pneumonia. The percent of penicillin-non-susceptible isolates (9-70%) and the percent of penicillin-resistant isolates (0-60%) did not influence antibiotic prescribing patterns, in that broad spectrum antibiotics were prescribed to 93% of patients. These data demonstrate the substantial variability in antibiotic prescribing for community-acquired pneumonia among 33 children's hospitals in the United States.

Eaves-Pyles T, Bu HF, Tan XD, Cong Y, Patel J, Davey RA, **Strasser JE**. **Luminal-applied flagellin is internalized by polarized intestinal epithelial cells and elicits immune responses via the TLR5 dependent mechanism.** *PloS One*. 6(9):e24869. 2011.

This paper demonstrates that apical exposure of intestinal epithelial cells to flagellin from both virulent bacteria such as *Salmonella* and *E. coli*, O83:H1 and avirulent *E. coli* led to internalization by a TLR5-dependent mechanism and to subsequent IL-8 secretion. Once internalized, flagellin co-localized to endosomal and lysosomal compartments. Blockade of TLR5 inhibited internalization and IL-8 secretion.

Hostetter MK. **What we don't see.** *N Engl J Med*. 366(14):1328-1334. Apr 5 2012.

In celebration of the 200th anniversary of the *New England Journal of Medicine*, representatives from internal medicine, surgery, obstetrics/gynecology, pediatrics, and other medical disciplines were invited to write historical reviews for the *New England Journal*. This paper reviewed seminal pediatric publications over the past two centuries, with a particular emphasis on vaccine development and efficacy. Several Cincinnati Children's Hospital Medical Center innovations were featured.

Sestak K, Feely S, Fey B, Dufour J, Hargitt E, Alvarez X, Pahar B, Gregoricus N, Vinje J, **Farkas T**. **Experimental inoculation of juvenile rhesus macaques with primate enteric caliciviruses.** *PloS One*. 7(5):e37973. 2012.

Two of three macaques inoculated with tissue culture-adapted Tulane virus developed diarrhea, fever, virus shedding in stools, lymphocytic inflammation of the lamina propria and villous blunting in the duodenum, and a 16-fold increase of neutralizing serum antibodies, while macaques inoculated with a mixture of GII.2 and GII.4 human norovirus remained asymptomatic. In most of the TV antigen-positive cells in the lamina propria, TV co-localized perinuclearly with calnexin. These results show that macaque challenge with ReCVs represent a viable animal model to study enteric calicivirus replication, pathogenesis, and immunity.

Xia M, **Tan M**, Wei C, Zhong W, Wang L, **McNeal M**, **Jiang X**. **A candidate dual vaccine against influenza and**

noroviruses. *Vaccine*. 29(44):7670-7677. Oct 13 2011.

A chimeric vaccine made from matrix protein 2 (M2e) of influenza virus, a highly conserved antigen, was presented on the norovirus P particle. Mice immunized with the P particle-M2e chimera displayed significantly increased antibody responses to M2e and 100% survival, compared to 12.5% survival in those immunized with free M2e peptides. After immunization with the P particle-M2e vaccine, mouse sera were able to block the binding of norovirus-like particle and P particle to histo-blood group antigen receptors.

Division Publications

1. Agarwal N, Ollington K, Kaneshiro M, Frenck R, Melmed GY. **Are immunosuppressive medications associated with decreased responses to routine immunizations? A systematic review.** *Vaccine*. 2012; 30:1413-24.
2. Allred NJ, Poehling KA, Szilagyi PG, Zhang F, Edwards KM, Staat MA, Donauer S, Prill MM, Fairbrother G. **The impact of missed opportunities on seasonal influenza vaccination coverage for healthy young children.** *J Public Health Manag Pract*. 2011; 17:560-4.
3. Ambroggio L, Tabb LP, O'Meara T, Sheffler-Collins S, McGowan KL, Shah SS. **Influence of antibiotic susceptibility patterns on empiric antibiotic prescribing for children hospitalized with community-acquired pneumonia.** *Pediatr Infect Dis J*. 2012; 31:331-6.
4. Aronson PL, Yan AC, Mittal MK, Mohamad Z, Shah SS. **Delayed acyclovir and outcomes of children hospitalized with eczema herpeticum.** *Pediatrics*. 2011; 128:1161-7.
5. Atmar RL, Bernstein DI, Harro CD, Al-Ibrahim MS, Chen WH, Ferreira J, Estes MK, Graham DY, Opekun AR, Richardson C, Mendelman PM. **Norovirus vaccine against experimental human Norwalk Virus illness.** *N Engl J Med*. 2011; 365:2178-87.
6. Banerjee R, Hersh AL, Newland J, Beekmann SE, Polgreen PM, Bender J, Shaw J, Copelovitch L, Kaplan BS, Shah SS. **Streptococcus pneumoniae-associated hemolytic uremic syndrome among children in North America.** *Pediatr Infect Dis J*. 2011; 30:736-9.
7. Belshe RB, Leone PA, Bernstein DI, Wald A, Levin MJ, Stapleton JT, Gorfinkel I, Morrow RL, Ewell MG, Stokes-Riner A, Dubin G, Heineman TC, Schulte JM, Deal CD. **Efficacy results of a trial of a herpes simplex vaccine.** *N Engl J Med*. 2012; 366:34-43.
8. Bereszczak JZ, Barbu IM, Tan M, Xia M, Jiang X, van Duijn E, Heck AJ. **Structure, stability and dynamics of norovirus P domain derived protein complexes studied by native mass spectrometry.** *J Struct Biol*. 2012; 177:273-82.
9. Bernstein DI. **Vaccines for cytomegalovirus.** *Infect Disord Drug Targets*. 2011; 11:514-25.
10. Bernstein DI, Bravo FJ, Clark JR, Earwood JD, Rahman A, Glazer R, Cardin RD. **N-Methanocarbathymidine is more effective than acyclovir for treating neonatal herpes simplex virus infection in guinea pigs.** *Antiviral Res*. 2011; 92:386-8.
11. Bernstein DI, El Sahly HM, Keitel WA, Wolff M, Simone G, Segawa C, Wong S, Shelly D, Young NS, Dempsey W. **Safety and immunogenicity of a candidate parvovirus B19 vaccine.** *Vaccine*. 2011; 29:7357-63.
12. Bernstein DI, Falloon J, Yi T. **A randomized, double-blind, placebo-controlled, phase 1/2a study of the safety and immunogenicity of a live, attenuated human parainfluenza virus type 3 vaccine in healthy infants.** *Vaccine*. 2011; 29:7042-8.
13. Bernstein DI, Malkin E, Abughali N, Falloon J, Yi T, Dubovsky F. **Phase 1 study of the safety and immunogenicity of a live, attenuated respiratory syncytial virus and parainfluenza virus type 3 vaccine in seronegative children.** *Pediatr Infect Dis J*. 2012; 31:109-14.

14. Black S, Nicolay U, Vesikari T, Knuf M, Del Giudice G, Della Cioppa G, Tsai T, Clemens R, Rappuoli R. **Hemagglutination inhibition antibody titers as a correlate of protection for inactivated influenza vaccines in children.** *Pediatr Infect Dis J.* 2011; 30:1081-5.
15. Black S, Pizza M, Nisum M, Rappuoli R. **Toward a meningitis-free world.** *Sci Transl Med.* 2012; 4:123ps5.
16. Bradley JS, Byington CL, Shah SS. **Reply to Tamma and Cosgrove and Esposito.** *Clin Infect Dis.* 2012; 54:885.
17. Bradley JS, Byington CL, Shah SS, Alverson B, Carter ER, Harrison C, Kaplan SL, Mace SE, McCracken GH, Jr., Moore MR, St Peter SD, Stockwell JA, Swanson JT, Pediatric Infectious Diseases S, the Infectious Diseases Society of A. **Executive summary: the management of community-acquired pneumonia in infants and children older than 3 months of age: clinical practice guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America.** *Clin Infect Dis.* 2011; 53:617-30.
18. Brizzi K, Hines EM, McGowan KL, Shah SS. **Diagnostic accuracy of cerebrospinal fluid gram stain in children with suspected bacterial meningitis.** *Pediatr Infect Dis J.* 2012; 31:195-7.
19. Brooks W, A., Steinhoff MC. **Epidemiology of Influenza in Tropical and Subtropical Low-Income Regions.** *Influenza Vaccines for the Future.* Siena, Italy: Springer Basel; 2011:55-76.
20. Brown C, Clayton-Boswell H, Chaves SS, Prill MM, Iwane MK, Szilagyi PG, Edwards KM, Staat MA, Weinberg GA, Fairbrother G, Hall CB, Zhu Y, Bridges CB. **Validity of parental report of influenza vaccination in young children seeking medical care.** *Vaccine.* 2011; 29:9488-92.
21. Chen Y, Tan M, Xia M, Hao N, Zhang XC, Huang P, Jiang X, Li X, Rao Z. **Crystallography of a Lewis-binding norovirus, elucidation of strain-specificity to the polymorphic human histo-blood group antigens.** *PLoS Pathog.* 2011; 7:e1002152.
22. Cohn KA, Thompson AD, Shah SS, Hines EM, Lyons TW, Welsh EJ, Nigrovic LE. **Validation of a clinical prediction rule to distinguish Lyme meningitis from aseptic meningitis.** *Pediatrics.* 2012; 129:e46-53.
23. Dai YC, Hu GF, Zhang XF, Song CL, Xiang WL, Wu XB, Wang LY, Jiang X, Nie J. **Molecular epidemiology of norovirus gastroenteritis in children in Jiangmen, China, 2005-2007.** *Arch Virol.* 2011; 156:1641-6.
24. Divanovic S, Sawtell NM, Trompette A, Warning JI, Dias A, Cooper AM, Yap GS, Arditi M, Shimada K, Duhadaway JB, Prendergast GC, Basaraba RJ, Mellor AL, Munn DH, Aliberti J, Karp CL. **Opposing biological functions of tryptophan catabolizing enzymes during intracellular infection.** *J Infect Dis.* 2012; 205:152-61.
25. Eaves-Pyles T, Bu HF, Tan XD, Cong Y, Patel J, Davey RA, Strasser JE. **Luminal-applied flagellin is internalized by polarized intestinal epithelial cells and elicits immune responses via the TLR5 dependent mechanism.** *PLoS One.* 2011; 6:e24869.
26. El Sahly HM, Davis C, Kotloff K, Meier J, Winokur PL, Wald A, Johnston C, George SL, Brady RC, Lehmann C, Stokes-Riner A, Keitel WA. **Higher antigen content improves the immune response to 2009 H1N1 influenza vaccine in HIV-infected adults: a randomized clinical trial.** *J Infect Dis.* 2012; 205:703-12.
27. Farkas T, Fey B, Hargitt E, 3rd, Parcells M, Ladman B, Murgia M, Saif Y. **Molecular detection of novel picornaviruses in chickens and turkeys.** *Virus Genes.* 2012; 44:262-72.
28. Feudtner C, Berry JG, Parry G, Hain P, Morse RB, Slonim AD, Shah SS, Hall M. **Statistical uncertainty of mortality rates and rankings for children's hospitals.** *Pediatrics.* 2011; 128:e966-72.
29. Fieldston ES, Hall M, Shah SS, Hain PD, Sills MR, Slonim AD, Myers AL, Cannon C, Pati S. **Addressing inpatient crowding by smoothing occupancy at children's hospitals.** *J Hosp Med.* 2011; 6:462-8.
30. Frenck R, Jr., Thompson A, Yeh SH, London A, Sidhu MS, Patterson S, Gruber WC, Emini EA, Scott DA, Gurtman A. **Immunogenicity and safety of 13-valent pneumococcal conjugate vaccine in children previously immunized with 7-valent pneumococcal conjugate vaccine.** *Pediatr Infect Dis J.* 2011; 30:1086-91.
31. Frenck RW, Jr., Belshe R, Brady RC, Winokur PL, Campbell JD, Treanor J, Hay CM, Dekker CL, Walter EB,

- Jr., Cate TR, Edwards KM, Hill H, Wolff M, Leduc T, Tornieporth N. **Comparison of the immunogenicity and safety of a split-virion, inactivated, trivalent influenza vaccine (Fluzone(R)) administered by intradermal and intramuscular route in healthy adults.** *Vaccine*. 2011; 29:5666-74.
32. Frenck RW, Jr., Yeh S. **The development of 13-valent pneumococcal conjugate vaccine and its possible use in adults.** *Expert Opin Biol Ther*. 2012; 12:63-77.
 33. Giaquinto C, Dominiak-Felden G, Van Damme P, Myint TT, Maldonado YA, Spoulou V, Mast TC, Staat MA. **Summary of effectiveness and impact of rotavirus vaccination with the oral pentavalent rotavirus vaccine: a systematic review of the experience in industrialized countries.** *Hum Vaccin*. 2011; 7:734-48.
 34. Gollomp K, Rankin SC, White CM, Mattei P, Harris MC, Kilpatrick LE, Sheffler-Collins S, McGowan KL, Shah SS. **Broad-range polymerase chain reaction in the microbiologic diagnosis of complicated pneumonia.** *J Hosp Med*. 2012; 7:8-13.
 35. Goodman DM, Hall M, Levin A, Watson RS, Williams RG, Shah SS, Slonim AD. **Adults with chronic health conditions originating in childhood: inpatient experience in children's hospitals.** *Pediatrics*. 2011; 128:5-13.
 36. Hersh AL, Shapiro DJ, Pavia AT, Shah SS. **Antibiotic prescribing in ambulatory pediatrics in the United States.** *Pediatrics*. 2011; 128:1053-61.
 37. Hines EM, Nigrovic LE, Neuman MI, Shah SS. **Adjustment of cerebrospinal fluid protein for red blood cells in neonates and young infants.** *J Hosp Med*. 2012; 7:325-8.
 38. Hoft DF, Babusis E, Worku S, Spencer CT, Lottenbach K, Truscott SM, Abate G, Sakala IG, Edwards KM, Creech CB, Gerber MA, Bernstein DI, Newman F, Graham I, Anderson EL, Belshe RB. **Live and inactivated influenza vaccines induce similar humoral responses, but only live vaccines induce diverse T-cell responses in young children.** *J Infect Dis*. 2011; 204:845-53.
 39. Hostetter MK. **What we don't see.** *N Engl J Med*. 2012; 366:1328-34.
 40. Hostetter MK. **Fungal Infections in the Neonatal Intensive Care Unit.** *Avery's diseases of the newborn*. Philadelphia: Saunders Elsevier; 2012:565.
 41. Huang P, Xia M, Tan M, Zhong W, Wei C, Wang L, Morrow A, Jiang X. **Spike protein VP8* of human rotavirus recognizes histo-blood group antigens in a type-specific manner.** *J Virol*. 2012; 86:4833-43.
 42. Iwane MK, Prill MM, Lu X, Miller EK, Edwards KM, Hall CB, Griffin MR, Staat MA, Anderson LJ, Williams JV, Weinberg GA, Ali A, Szilagyi PG, Zhu Y, Erdman DD. **Human rhinovirus species associated with hospitalizations for acute respiratory illness in young US children.** *J Infect Dis*. 2011; 204:1702-10.
 43. Jin M, Chen J, Zhang XH, Zhang M, Li HY, Cheng WX, Liu N, Tan M, Jiang T, Duan ZJ. **Genetic diversity of noroviruses in Chinese adults: potential recombination hotspots and GII-4/Den Haag-specific mutations at a putative epitope.** *Infect Genet Evol*. 2011; 11:1716-26.
 44. Kimberlin DW, Whitley RJ, Wan W, Powell DA, Storch G, Ahmed A, Palmer A, Sanchez PJ, Jacobs RF, Bradley JS, Robinson JL, Shelton M, Dennehy PH, Leach C, Rathore M, Abughali N, Wright P, Frenkel LM, Brady RC, Van Dyke R, Weiner LB, Guzman-Cottrill J, McCarthy CA, Griffin J, Jester P, Parker M, Lakeman FD, Kuo H, Lee CH, Cloud GA. **Oral acyclovir suppression and neurodevelopment after neonatal herpes.** *N Engl J Med*. 2011; 365:1284-92.
 45. Linam WM, Margolis PA, Atherton H, Connelly BL. **Quality-improvement initiative sustains improvement in pediatric health care worker hand hygiene.** *Pediatrics*. 2011; 128:e689-98.
 46. Macy ML, Hall M, Shah SS, Hronek C, Del Beccaro MA, Hain PD, Alpern ER. **Differences in designations of observation care in US freestanding children's hospitals: are they virtual or real?** *J Hosp Med*. 2012; 7:287-93.
 47. Mahnke YD, Saqr A, Hazenfeld S, Brady RC, Roederer M, Subbramanian RA. **Age-related changes in durability and function of vaccine-elicited influenza-specific CD4(+) T-cell responses.** *Vaccine*. 2011;

48. Morgan CI, Hobson MJ, Seger B, Rice MA, Staat MA, Wheeler DS. **2009 Pandemic influenza A (H1N1) in critically ill children in Cincinnati, Ohio***. *Pediatr Crit Care Med*. 2012; 13:e140-4.
49. Morse RB, Hall M, Fieldston ES, McGwire G, Anspacher M, Sills MR, Williams K, Oyemwense N, Mann KJ, Simon HK, Shah SS. **Hospital-level compliance with asthma care quality measures at children's hospitals and subsequent asthma-related outcomes**. *JAMA*. 2011; 306:1454-60.
50. Mullins TL, Zimet GD, Rosenthal SL, Morrow C, Ding L, Shew M, Fortenberry JD, Bernstein DI, Kahn JA. **Adolescent perceptions of risk and need for safer sexual behaviors after first human papillomavirus vaccination**. *Arch Pediatr Adolesc Med*. 2012; 166:82-8.
51. Neuman MI, Lee EY, Bixby S, Diperna S, Hellinger J, Markowitz R, Servaes S, Monuteaux MC, Shah SS. **Variability in the interpretation of chest radiographs for the diagnosis of pneumonia in children**. *J Hosp Med*. 2012; 7:294-8.
52. Nigrovic LE, Kimia AA, Shah SS, Neuman MI. **Relationship between cerebrospinal fluid glucose and serum glucose**. *N Engl J Med*. 2012; 366:576-8.
53. Nigrovic LE, Shah SS, Neuman MI. **Correction of cerebrospinal fluid protein for the presence of red blood cells in children with a traumatic lumbar puncture**. *J Pediatr*. 2011; 159:158-9.
54. Ortega-Sanchez IR, Molinari NA, Fairbrother G, Szilagyi PG, Edwards KM, Griffin MR, Cassedy A, Poehling KA, Bridges C, Staat MA. **Indirect, out-of-pocket and medical costs from influenza-related illness in young children**. *Vaccine*. 2012; 30:4175-81.
55. Pasquali SK, Li JS, He X, Jacobs ML, O'Brien SM, Hall M, Jaquiss RD, Welke KF, Peterson ED, Shah SS, Gaynor JW, Jacobs JP. **Perioperative methylprednisolone and outcome in neonates undergoing heart surgery**. *Pediatrics*. 2012; 129:e385-91.
56. Pasquali SK, Li JS, He X, Jacobs ML, O'Brien SM, Hall M, Jaquiss RD, Welke KF, Peterson ED, Shah SS, Jacobs JP. **Comparative analysis of antifibrinolytic medications in pediatric heart surgery**. *J Thorac Cardiovasc Surg*. 2012; 143:550-7.
57. Pati S, Lorch SA, Lee GE, Sheffler-Collins S, Shah SS. **Health insurance and length of stay for children hospitalized with community-acquired pneumonia**. *J Hosp Med*. 2012; 7:304-10.
58. Payne DC, Humiston S, Opel D, Kennedy A, Wikswo M, Downing K, Klein EJ, Kobayashi A, Locke D, Albertin C, Chesley C, Staat MA. **A multi-center, qualitative assessment of pediatrician and maternal perspectives on rotavirus vaccines and the detection of Porcine circovirus**. *BMC Pediatr*. 2011; 11:83.
59. Payne DC, Staat MA, Edwards KM, Szilagyi PG, Weinberg GA, Hall CB, Chappell J, Curns AT, Wikswo M, Tate JE, Lopman BA, Parashar UD. **Direct and indirect effects of rotavirus vaccination upon childhood hospitalizations in 3 US Counties, 2006-2009**. *Clin Infect Dis*. 2011; 53:245-53.
60. Pirko I, Cardin R, Chen Y, Lohrey AK, Lindquist DM, Dunn RS, Zivadinov R, Johnson AJ. **CMV infection attenuates the disease course in a murine model of multiple sclerosis**. *PLoS One*. 2012; 7:e32767.
61. Prill MM, Iwane MK, Edwards KM, Williams JV, Weinberg GA, Staat MA, Willby MJ, Talbot HK, Hall CB, Szilagyi PG, Griffin MR, Curns AT, Erdman DD. **Human coronavirus in young children hospitalized for acute respiratory illness and asymptomatic controls**. *Pediatr Infect Dis J*. 2012; 31:235-40.
62. Rappuoli R, Mandl CW, Black S, De Gregorio E. **Vaccines for the twenty-first century society**. *Nat Rev Immunol*. 2011; 11:865-72.
63. Renuart AJ, Mistry RD, Avery RA, Licht DJ, Seiden JA, Huh JW, Boswinkel JP, Liu GT, Shah SS. **Reference range for cerebrospinal fluid protein concentration in children and adolescents**. *Arch Pediatr Adolesc Med*. 2011; 165:671-3.
64. Ross SA, Novak Z, Pati S, Patro RK, Blumenthal J, Danthuluri VR, Ahmed A, Michaels MG, Sanchez PJ, Bernstein DI, Tolan RW, Palmer AL, Britt WJ, Fowler KB, Boppana SB. **Mixed infection and strain diversity in congenital cytomegalovirus infection**. *J Infect Dis*. 2011; 204:1003-7.

65. Rowhani-Rahbar A, Klein NP, Lewis N, Fireman B, Ray P, Rasgon B, Black S, Klein JO, Baxter R. **Immunization and Bell's Palsy in Children: A Case-Centered Analysis.** *Am J Epidemiol.* 2012; 175:878-85.
66. Sankarapandian V, Friberg IK, John SM, Bhattacharji S, Steinhoff MC. **Reported healthcare utilisation for childhood respiratory illnesses in Vellore, South India.** *International Health* . 2011; 3:199-205.
67. Sawtell NM, Triezenberg SJ, Thompson RL. **VP16 serine 375 is a critical determinant of herpes simplex virus exit from latency in vivo.** *J Neurovirol.* 2011; 17:546-51.
68. Schlaudecker EP, Steinhoff MC, Moore SR. **Interactions of diarrhea, pneumonia, and malnutrition in childhood: recent evidence from developing countries.** *Curr Opin Infect Dis.* 2011; 24:496-502.
69. Sestak K, Feely S, Fey B, Dufour J, Hargitt E, Alvarez X, Pahar B, Gregoricus N, Vinje J, Farkas T. **Experimental inoculation of juvenile rhesus macaques with primate enteric caliciviruses.** *PLoS One.* 2012; 7:e37973.
70. Shah SS, Aronson PL, Mohamad Z, Lorch SA. **Delayed acyclovir therapy and death among neonates with herpes simplex virus infection.** *Pediatrics.* 2011; 128:1153-60.
71. Shah SS, Byington CL, Bradley JS. **Reply to Zimmerman et al.** *Clin Infect Dis.* 2012; 54:1816-7.
72. Shah SS, Hines EM, McGowan KL. **Cerebrospinal fluid enrichment broth cultures rarely contribute to the diagnosis of bacterial meningitis.** *Pediatr Infect Dis J.* 2012; 31:318-20.
73. Shah SS, Test M, Sheffler-Collins S, Weiss AK, Hall M. **Macrolide therapy and outcomes in a multicenter cohort of children hospitalized with *Mycoplasma pneumoniae* pneumonia.** *J Hosp Med.* 2012; 7:311-7.
74. Shang J, Cheng F, Dubey M, Kaplan JM, Rawal M, Jiang X, Newburg DS, Sullivan PA, Andrade RB, Ratner DM. **An organophosphonate strategy for functionalizing silicon photonic biosensors.** *Langmuir.* 2012; 28:3338-44.
75. Sills MR, Hall M, Fieldston ES, Hain PD, Simon HK, Brogan TV, Fagbuyi DB, Mundorff MB, Shah SS. **Inpatient capacity at children's hospitals during pandemic (H1N1) 2009 outbreak, United States.** *Emerg Infect Dis.* 2011; 17:1685-91.
76. Smith CK, McNeal MM, Meyer NR, Haase S, Dekker CL. **Rotavirus shedding in premature infants following first immunization.** *Vaccine.* 2011; 29:8141-6.
77. Staat MA, Griffin MR, Donauer S, Edwards KM, Szilagyi PG, Weinberg GA, Hall CB, Prill MM, Chaves SS, Bridges CB, Poehling KA, Fairbrother G. **Vaccine effectiveness for laboratory-confirmed influenza in children 6-59 months of age, 2005-2007.** *Vaccine.* 2011; 29:9005-11.
78. Staat MA, Payne DC, Donauer S, Weinberg GA, Edwards KM, Szilagyi PG, Griffin MR, Hall CB, Curns AT, Gentsch JR, Salisbury S, Fairbrother G, Parashar UD. **Effectiveness of pentavalent rotavirus vaccine against severe disease.** *Pediatrics.* 2011; 128:e267-75.
79. Staat MA, Rice M, Donauer S, Mukkada S, Holloway M, Cassedy A, Kelley J, Salisbury S. **Intestinal parasite screening in internationally adopted children: importance of multiple stool specimens.** *Pediatrics.* 2011; 128:e613-22.
80. Steinhoff MC, Omer SB, Roy E, El Arifeen S, Raqib R, Dodd C, Breiman RF, Zaman K. **Neonatal outcomes after influenza immunization during pregnancy: a randomized controlled trial.** *CMAJ.* 2012; 184:645-53.
81. Tan M, Jiang X. **Norovirus P particle, a subviral nanoparticle for vaccine development against norovirus, rotavirus and influenza virus..** *Nanomedicine.* 2012; 7:889-97.
82. Tan M, Jiang X. **The formation of P particle increased immunogenicity of norovirus P protein.** *Immunology.* 2012; 136:28-9.
83. Tan M, Jiang X. **Norovirus-host interaction: multi-selections by human histo-blood group antigens.** *Trends Microbiol.* 2011; 19:382-8.
84. Thompson RL, Sawtell NM. **The herpes simplex virus type 1 latency associated transcript locus is required for the maintenance of reactivation competent latent infections.** *J Neurovirol.* 2011; 17:552-8.

85. Tieder JS, Hall M, Auger KA, Hain PD, Jerardi KE, Myers AL, Rahman SS, Williams DJ, Shah SS. **Accuracy of administrative billing codes to detect urinary tract infection hospitalizations.** *Pediatrics*. 2011; 128:323-30.
86. Vidwan NK, Regi A, Steinhoff M, Huppert JS, Staat MA, Dodd C, Nongrum R, Anandan S, Verghese V. **Low Prevalence of Chlamydia trachomatis Infection in Non-Urban Pregnant Women in Vellore, S. India.** *PLoS One*. 2012; 7:e34794.
87. Wang W, Donnelly B, Bondoc A, Mohanty SK, McNeal M, Ward R, Sestak K, Zheng S, Tiao G. **The rhesus rotavirus gene encoding VP4 is a major determinant in the pathogenesis of biliary atresia in newborn mice.** *J Virol*. 2011; 85:9069-77.
88. Wheeler DS, Giaccone M, Hutchinson N, Haygood M, Demmel K, Britto MT, Margolis PA, Provost LP. **An unexpected increase in catheter-associated bloodstream infections at a children's hospital following introduction of the Spiros closed male connector.** *Am J Infect Control*. 2012; 40:48-50.
89. Wheeler DS, Giaccone MJ, Hutchinson N, Haygood M, Bondurant P, Demmel K, Kotagal UR, Connelly B, Corcoran MS, Line K, Rich K, Schoettker PJ, Brill R. **A hospital-wide quality-improvement collaborative to reduce catheter-associated bloodstream infections.** *Pediatrics*. 2011; 128:e995-e1004; quiz e1004-7.
90. White CM, Statile AM, Conway PH, Schoettker PJ, Solan LG, Unaka NI, Vidwan N, Warrick SD, Yau C, Connelly BL. **Utilizing improvement science methods to improve physician compliance with proper hand hygiene.** *Pediatrics*. 2012; 129:e1042-50.
91. Wilson KM, Shah SS, Simon TD, Sruvastava R, Tieder JS. **The challenge of pediatric hospital medicine research..** *Hospital Pediatr*. 2012; 2:8-9.
92. Xia M, Tan M, Wei C, Zhong W, Wang L, McNeal M, Jiang X. **A candidate dual vaccine against influenza and noroviruses.** *Vaccine*. 2011; 29:7670-7.
93. Zhang XF, Dai YC, Zhong W, Tan M, Lv ZP, Zhou YC, Jiang X. **Tannic acid inhibited norovirus binding to HBGA receptors, a study of 50 Chinese medicinal herbs.** *Bioorg Med Chem*. 2012; 20:1616-23.

Faculty, Staff, and Trainees

Faculty Members

Margaret K. Hostetter, MD, Professor

Leadership Director, Division of Infectious Diseases; Albert Sabin Professor of Pediatrics

Research Interests Candida albicans: (a) heparin binding motifs and biofilm and (b) role of vaginal colonization in preterm birth. Genetics of disseminated S. aureus infection

David I. Bernstein, MD, MA, Professor

Leadership Director, Gamble Program for Clinical Studies; Director, VTEU

Research Interests Vaccines, rotavirus, herpes simplex, cytomegalovirus

Steven Black, MD, Adjunct

Research Interests Vaccine safety

Rebecca C. Brady, MD, Associate Professor

Leadership Director of Adult Clinical Studies

Research Interests Adult vaccines, influenza

Rhonda D. Cardin, PhD, Assistant Professor

Research Interests Cytomegalovirus, genital herpes vaccines

Beverly L. Connelly, MD, Professor

Leadership Director, Pediatric Infectious Diseases Fellowship Training Program; Director, Infection Control Program

Research Interests Hospital process improvement; infection prevention and control

Michelle P. Dickey, MS, CRN, Instructor

Leadership Manager, Gamble Program

Tibor Farkas, DVM, PhD, MBA, Assistant Professor

Research Interests Human and animal enteric viral infections

Robert W. Frenck, MD, Professor

Leadership Chairman, Institutional Review Board; Director of Clinical Medicine

Research Interests Vaccines, enteric diseases

Nancy M. Hutchinson, RN, MSN, CIC, Instructor

Leadership Infection Control Program

Xi Jason Jiang, PhD, Professor

Research Interests Caliciviruses, rotavirus, vaccines

Monica M. McNeal, MS, Instructor

Leadership Associate Director, LSCS

Research Interests Rotavirus and influenza vaccine research

Nancy M. Sawtell, PhD, Associate Professor

Research Interests Herpes simplex virus: Virus host interactions

Elizabeth Schlaudecker, MD, MPH, Assistant Professor

Research Interests Immunologic response to influenza immunization in pregnant women

Samir Shah, MD, MSCE, Associate Professor

Leadership Research Director, Hospital Medicine

Mary A. Staat, MD, MPH, Professor

Leadership Director, International Adoption Center

Research Interests Rotavirus, epidemiology, international adoption, vaccine preventable diseases

Mark C. Steinhoff, MD, Professor

Leadership Director, Global Health Center

Research Interests Global vaccines, vaccine in pregnancy

Jane E. Strasser, PhD, Adjunct

Leadership Director, UC Office of Research Compliance and Regulatory Affairs

Research Interests Shiga like toxins, genetics of susceptibility and resistance

Ming Tan, PhD, Assistant Professor

Research Interests Calicivirus

Joint Appointment Faculty Members

Steve Black, MD, Adjunct (Global Health Center)

Research Interests Vaccine Safety

Samir Shah, MD, MSCE, Associate Professor (Hospital Medicine)

Elizabeth Schlaudecker, MD, MPH, Assistant Professor (Global Health Center)

Research Interests Immunologic response to influenza immunization in pregnant women

Mark C. Steinhoff, MD, Professor (Global Health Center)

Research Interests Global vaccines, vaccine in pregnancy

Clinical Staff Members

- **Tracy Byrne, RN**,
OPAT Clinic, International Adoption Center
- **Kelly Hicks, RN, MSN**,
International Adoption Center
- **Jennifer Kelley, APN**,
OPAT Clinic
- **Susan Ruedy, MA**,
International Adoption Clinic
- **Tisha Way, MSSA, LISW-S**,
International Adoption Clinic

Trainees

- **Kevin Downes, MD**, PL-4, University of Pennsylvania
- **Andrea Hahn, MD**, PL-4, Ohio State University
- **Julianne Green, MD, PhD**, PL-6, University of Louisville College of Medicine
- **Andrew Kreppel, MD**, PL-6, St. Louis University School of Medicine
- **Blair Murphy**, , PGY1, University of Cincinnati College of Medicine
- **Stephanie Skelton**, , PGY1, University of Cincinnati, Genetic Counseling Graduate Program
- **Stephanie Donauer, MS**, PGY1, University of Cincinnati-Epidemiology and Biostatistics Program
- **Karen Gallegos**, , PGY1, University of Cincinnati-Molecular Genetics, Biochemistry and Microbiology

Division Collaboration

Division of Immunobiology, Center for Autoimmune Genomics and Etiology (CAGE) ; Cancer and Blood Diseases Institute » John Harley, MD, PhD, Ken Kaufman, PhD, and Susanne Wells, PhD

Dr. Margaret Hostetter has collaborated with John Harley, MD, PhD and Ken Kaufman, PhD of CAGE to perform exome sequencing of parent/child trios for de novo mutations that contribute to disseminated staphylococcal osteomyelitis. De novo mutations identified in the first two trios implicated a new pathway for osteomyelitis susceptibility. *In vitro* studies of the biology of this disease will be conducted in collaboration with Susanne Wells, P..

Division of Biomedical Informatics; UC Environmental Health » Jason Lu, PhD and Alexey Porollo, PhD

Dr. Hostetter has also collaborated with Jason Lu, PhD and Alexey Porollo, PhD to identify heparin binding motifs in several pathologic microorganisms and their structural correlates.

Division of Biomedical Informatics » Jarek Meller, PhD

Dr. Jason Jiang is collaborating with Jarek Meller, PhD on characterization of the receptor binding interfaces and viral protease of human noroviruses and on drug screening using computer based drug design approach (horologe modeling and virtual screening).

Division of Rheumatology » Jennifer Huggins, MD and Rina Mina, MD

Dr. Steven Black and Dr. Rebecca Brady collaborated with Jennifer Huggins, MD and Rina Mina, MD in the Division of Rheumatology to submit an application to the CDC RFP Solicitation#: 2012-N-14296 Clinical Immunization Safety Assessment which is currently being reviewed.

Division of Nephrology » Stuart Goldstein, MD

Dr. Rebecca Brady collaborated with Stuart Goldstein, MD to do a chart review of antimicrobial use and acute kidney injury.

Division of Neurology » Brenda Wong, MD

Dr. Rebecca Brady collaborated with Brenda Wong, MD on a clinical trial comparing the immunogenicity of intramuscular versus subcutaneous administration of trivalent inactivated influenza vaccine in individuals with neuromuscular diseases.

Division of Experimental Hematology » James Mulloy, PhD and Marie-Dominique Filippi, PhD

Dr. Tibor Farkas is investigating murine astrovirus infections in NSG mice with James Mulloy, PhD.

Dr. Rhonda Cardin is collaborating with Marie-Dominique Filippi, PhD in the identification of the latent CMV infected cells in the bone marrow.

Veterinary Services » Gary Keller, DVM

Dr. Tibor Farkas is working with Gary Keller, DVM on the evaluation of laboratory rodents for enteric viral infections.

Division of Neonatology and Pulmonary Biology » Ardythe Morrow, PhD and Beena Kamath-Rayne, MD, MPH

Dr. Tibor Farkas is also collaborating with Ardythe Morrow, PhD under the human milk grant.

Dr. Jason Jiang is collaborating with Ardythe Morrow, PhD on characterization of elements in human milk as potential decoy receptors in protection of infants against viral pathogens relying on human histo-blood group antigens as receptors, mainly on human norovirus and rotavirus. They are also collaborating on characterization of human histo-blood group antigens as potential biomarker in necrotic enter colitis (NEC) and other intestinal inflammable diseases.

Dr. Elizabeth Schlaudecker is also working with Ardythe Morrow, PhD on the immunologic response in breast milk after influenza immunization.

Dr. Elizabeth Schlaudecker is collaborating with Kamath-Rayne, MD, MPH on a neonatal resuscitation program, Helping Babies Breath in Honduras.

Division of Gastroenterology » Sean Moore, MD

Monica McNeal, MS is collaborating with Sean Moore, MD on a project to generate a mouse model of environmental enteropathy to study rotavirus vaccines.

Dr. David Bernstein is working with Sean Moore, MD in the development of a malnourished mouse model and evaluation of rotavirus vaccines.

Division of Human Genetics » Derek Neilson, MD

Monica McNeal, MS is collaborating with Derek Neilson, MD to develop an animal model of influenza induced acute necrotizing encephalopathy.

Division of Pediatric General and Thoracic Surgery » Greg Tiao, MD

Monica McNeal, MS is collaborating with Greg Tiao, MD on a project that involves using the animal model of rotavirus induced biliary atresia to determine the mechanism of the disease.

Division of Pediatric Otolaryngology » Daniel I. Choo, MD

Dr. Rhonda Cardin is collaborating with Daniel Choo, MD in the analysis of hearing loss in the guinea pig CMV models characterized by Drs. Bernstein and Cardin.

Division of Molecular Immunology » Kasper Hoebe, PhD

Dr. Rhonda Cardin is collaborating with Kasper Hoebe, PhD to characterize murine CMV infection in various mutant mice generated in Dr. Hoebe's lab and to determine the role of NK cell and innate immunity on latent CMV infection.

Division of Adolescent Medicine » Jessica Khan, MD and Lea Widdice, MD

Dr. David Bernstein is co-investigator with Jessica Khan, MD on an RO-1 to evaluate the effect of HPV vaccination on circulating strains of HPV; Behavioral and Virologic Impact of HPV Immunization.

Dr. David Bernstein is a mentor and co-investigator with Lea Widdice, MD on a VTEU project to assess the impact of off schedule HPV vaccination.

Division of Immunobiology » Marsha Wills-Karp, PhD

Dr. Elizabeth Schlaudecker has collaborated with Marsha Wills-Karp, PhD on cytokine analysis after influenza immunization in pregnant women.

Division of Physical Medicine and Rehabilitation; Pediatric Neuroimaging Research Consortium » Shari Wade, PhD and Scott Holland, PhD

Dr. Mary Staat is collaborating with Shari Wade, PhD on research to examine transitional issues of families who have internationally adopted and along with Scott Holland, PhD the functional MRI findings of institutionalized children.

Division of Critical Care Medicine » Derek Wheeler, MD

Dr. Mary Staat collaborated with Derek Wheeler, MD on a study to examine the clinical findings of children with H1N1 and non-H1N1 influenza in children requiring intensive care management.

Department of Surgical Services; Division of Orthopaedic Surgery; Hospital Medicine » Frederic Ryckman, MD, Peter Sturm, MD, and Joshua K. Schaffzin, MD, PhD, FAAP

Dr. Beverly Connelly has collaborations hospital-wide, however major efforts have been on the reduction of surgical site infections, centering efforts in the area of spinal fusion procedures with spin-offs for all device associated infections with collaborators, Fred Ryckman, MD, general and transplant surgery; Peter Sturm, MD; orthopaedic surgery; and Joshua Schaffzin, MD, PhD, surgical hospital medicine.

Grants, Contracts, and Industry Agreements

Grant and Contract Awards

Annual Direct

BERNSTEIN, D

Mouse and Guinea Pig Models for Herpesviruses
National Institutes of Health

HHSN272201000008I	09/27/10-09/26/12	\$384,723
The Natural History of CMV-Related Hearing Loss		
National Institutes of Health(University of Alabama-Birmingham)		
HHSN260200500008C	07/01/05-06/30/12	\$96,193
Vaccine and Treatment Evaluation Units (VTEUs)		
National Institutes of Health		
HHSN272200800006C	11/01/07-10/31/14	\$2,069,574

HOSTETTER, M

Pediatric Physician Scientist Program Award		
National Institutes of Health		
K12 HD 000850	09/01/10-06/30/12	\$1,317,364
PSDP March of Dimes Funding Commitment		
March of Dimes National		
	09/01/10-06/30/13	\$102,330

JIANG, J

Role of Human Mik in Infant Nutrition and Health - Project 2		
National Institutes of Health		
P01 HD 013021	08/01/09-07/31/14	\$110,955
Role of Human Mik in Infant Nutrition and Health - Core D		
National Institutes of Health		
P01 HD 013021	08/01/09-07/31/14	\$84,803
Novel Broad Spectrum Therapeutic Glycans Against Category B Pathogens		
National Institutes of Health(Boston College)		
U01 AI 075563	09/01/10-08/31/12	\$59,966.00
An Integrated Approach to Prevent and Minimize Foodborne Diseases		
US Department of Agriculture(Ohio State University)		
2010-51110-21080	05/01/11-05/31/14	\$60,820.00
Immune Responses to Norovirus after Natural Infection in Vietnamese Children and Correlation with Blood Group Antigen Secretor Status		
Fogarty International Center		
R03 TW 009174	04/25/12-01/31/14	\$46,665
Inactivation of Enteric Foodborne Viruses in High Risk Foods by Non-Thermal Processing Technologies		
US Department of Agriculture(University of Delaware)		
2011-68003-30005	02/01/11-01/31/16	\$124,112
Building Capacity to Control Viral Food-borne Disease		
US Department of Agriculture(North Carolina State University)		
2011-68003-30395	06/01/11-05/31/14	\$156,000.00
Novel Vaccine Against Norovirus		
National Institutes of Health		
R01 AI 089634	05/15/10-04/30/15	\$810,507

MCNEAL, M

Hyaluronan Regulation of Microbial Host Defense of the Intestine		
National Institutes of Health(Cleveland Clin Lerner Col of Med of CWRU)		
R01 HD 061918	09/15/09-07/31/11	\$29,518

SAWTELL, N

Ocular HSV Infection-Latency and Pathogenesis		
National Institutes of Health(University of Cincinnati)		
R01 EY 013168	05/01/08-04/30/12	\$96,079

STAAT, M

Enhanced Surveillance for New Vaccine Preventable Diseases		
Centers for Disease Control and Prevention		

TAN, M		
Norovirus P Particle, A Multifunctional Platform For Vaccine Development		
National Institutes of Health		
R21 AI 092434	06/01/12-05/31/13	\$125,000
Current Year Direct		\$6,034,086

Industry Contracts

BERNSTEIN, D		
LigoCyte Pharmaceuticals, Inc		\$1,002,347
MedImmune Inc.		\$34,458
Pfizer, Inc.		\$65,970
Sanofi Pasteur Inc		\$37,615

CARDIN, R		
Lytix Biopharma AS		\$27,667
Novartis Pharmaceuticals		\$52,737

FRENCK, R		
GlaxoSmithKline		\$35,399
Pfizer, Inc		\$123,727
Wyeth Pharmaceuticals		\$36,704

JIANG, J		
LigoCyte Pharmaceuticals, Inc		\$373,277

MCNEAL, M		
Astellas Pharma Inc.		\$20,146
GlaxoSmithKline LLC		\$154,987

STAAT, M		
GlaxoSmithKline		\$940,555

WARD, R		
Merck & Company, Inc.		\$159,032
Sanofi Sythelabo		\$94,710
Wyeth Pharmaceuticals		\$32,427

Current Year Direct Receipts		\$3,191,758
Total		\$9,225,844