BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.

Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: **Empey, Philip Earle**

eRA COMMONS USER NAME (agency login): pempey

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of Rhode Island, Kingston, RI	PharmD	04/1998	Pharmacy
University of Kentucky, Lexington, KY	Resident	06/1999	Pharmacy Practice
University of Kentucky, Lexington, KY	Resident	06/2000	Critical Care Pharmacy Practice
University of Kentucky, Lexington, KY	PhD	12/2007	Clinical Pharmaceutical Sciences
University of Pittsburgh, Pittsburgh, PA	Postdoctoral Fellow	06/2009	Pharmaceutical Sciences

A. PERSONAL STATEMENT

I am a PharmD/PhD (Clinical Pharmaceutical Sciences) with over 10 years of research and training experience in clinical pharmacology. I am also the Associate Director for Pharmacogenomics for the Institute of Personalized Medicine and lead the Pitt/UPMC Pharmacogenomics implementation initiative (PreCISE-Rx) that is designed to advance precision medicine through clinical care, research, and education. My research program is focused on understanding the mechanisms that drive variations in medication-related patient outcomes in critically-ill populations, specifically drug transporters and pharmacogenomics. I have been PI on a 5-year NIH Career Development Award (KL2 TR000146), foundation grants, and internal projects as well as a Co-I on several NIH-funded collaborative studies involving drug transporters, pharmacokinetics, and critical illness. Specifically, we have active and completed projects involving elucidating the role of drug transporters following traumatic brain injury in close collaboration with clinician-scientists in the Safar Center for Resuscitation Research (see Contributions to Science – Section C). I have received national research and teaching awards including the Young Investigator Award from the Society of Critical Care Medicine for an innovative pharmacokinetic analysis in critically ill children (2013, an honor awarded to one individually annually) and the Innovations in Education Award from the American Association of Colleges of Pharmacy in 2015. I actively teach and mentor post-graduate, graduate, and professional trainees.

1. Cousar JL, Conley YP, Willyerd FA, Sarnaik AA, Puccio AM, **Empey PE**, Kochanek PM, Bell MJ, Okonkwo DO, Clark RS. Influence of ATP-binding cassette polymorphisms on neurological outcome after traumatic brain injury. Neurocrit Care. 2013 Oct;19(2):192-8. PubMed PMID: 23896815; PubMed Central PMCID: PMC4332629.
2. Willyerd FA, **Empey PE**, Philbrick A, Ikonomovic M, Puccio AM, Kochanek PM, Okonkwo DO, Clark RS. Expression of ATP-Binding Cassette Transporters B1 and C1 after Severe Traumatic Brain Injury in Humans. J Neurotrauma. 2015 Apr 19; PubMed PMID: 25891836.
3. Hagos FT, Daood MJ, Ocque AJ, Nolin TD, Bayir H, Poloyac SM, Kochanek PM, Clark RSB, **Empey PE**. Probenecid increases plasma and brain exposure of N-acetylcysteine through a mechanism involving inhibition of OAT1 and OAT3 transporters. *Xenobiotica*, 2016 Jun 9:1-8. PMID: 2727858.

B. POSITIONS AND HONORS

Positions and Employment

1998 - 1999	Pharmacy Practice Resident, University of Kentucky Hospital, Lexington, KY
1998 - 2007	Clinical Pharmacist, University of Kentucky Hospital, Lexington, KY
1999 - 2000	Critical Care Resident, University of Kentucky Hospital, Lexington, KY
2000 - 2007	Teaching Assistant/Graduate Student, University of Kentucky, Lexington, KY
2001 - 2003	Clinical Research Associate, Neurosurgery, University of Kentucky Hospital, Lexington, KY
2007 - 2009	Postdoctoral Associate, University of Pittsburgh, School of Pharmacy, Pittsburgh, PA
2009 -	Assistant Professor, Department of Pharmacy and Therapeutics, University of Pittsburgh, School of Pharmacy, Pittsburgh, PA
2011 -	Assistant Professor, Clinical and Translational Science (Secondary Appointment), University of Pittsburgh, School of Pharmacy, Pittsburgh, PA
2013 -	Scientist, Safar Center for Resuscitation Research (Secondary Appointment), University of Pittsburgh, School of Pharmacy, Pittsburgh, PA

Other Experience and Professional Memberships

1996 -	Member, American Society of Health-System Pharmacists
1998 -	Member, Society of Critical Care Medicine
1998 -	Member, American College of Clinical Pharmacy
1999 -	Member, Scholarship of Teaching and Learning Program
2002 -	Member, American Associate of Pharmaceutical Scientists
2008 - 2008	Participant, Scientific Management and Leadership Course, University of Pittsburgh
2008 - 2009	Chair, Pharmacokinetics/Pharmacokinetics Practice/Research Network, American College of Clinical Pharmacy
2013 -	Member, National Neurotrama Society
2014 -	Member, Neurocritical Care Society

Honors

1997	Delegate, Future Pharmacy Leaders - Building a New Foundation
1998	Highest Distinction Honor - PharmD Graduate, University of Rhode Island
1998	Research Program Award, Merck/American Association of Colleges of Pharmacy
1999	Extra Mile Award, University of Kentucky Pharmacy Residency Programs (1999-2000)
2000	K30 Clinical Research and Leadership Development Program, National Institute of Health (2000-2006)
2000	Fellow, American Foundation for Pharmaceutical Education (2000-2006)
2000	Fellow, Research Challenge Trust Foundation (2000-2006)
2002	Predoctoral Fellow, Reproductive Sciences Training Grant (2002-2004)
2004	PPDM Graduate Student Travel Award, American Association of Pharmaceutical Scientists
2006	Travel Award, Peter J. Glavinos, PhD, Graduate Student Endowment
2007	Pharmaceutical Sciences Graduate Student Recognition Award, AFPE
2013	Travel Award, Burroughs Wellcome Fund, Translational Science Meeting 2013
2013	Young Investigator Award, Society of Critical Care Medicine
2015	Outstanding Scholarly Contribution Award, Rho Chi Society
2015	Innovations in Teaching Competition Award, American Association of Colleges of Pharmacy

C. Contribution to Science

1. Developing new therapies for traumatic brain injury: My work in pharmacokinetics has provided solution to a well-known problem in drug development for traumatic brain injury (TBI). There are no FDA-approved treatments for TBI and it is widely-acknowledged that a lack of understanding of drug disposition and specifically, brain penetration of potential therapies is one of the causes of high-profile clinical trial failures. My laboratory takes the novel approach of integrating pharmacokinetic assessments throughout the entire drug development process. I modeled cyclosporine disposition following human traumatic brain injury (TBI) in a Phase I trial to guide final dose selection moving into Phase II trials and showed the approach predicted resultant drug concentrations despite the altered cyclosporine clearance (1a-1b). Through the Operation Brain Trauma Therapy consortium (PI=Kochanek) we test novel TBI therapies in multi-center preclinical trials and, with Dr. Clark, are actively testing a combination therapy that creatively uses a drug transporter interaction to increase delivery of an antioxidant therapy to the injured brain. This combination therapy (probenecid/n-acetylcysteine) is currently being evaluated as a potential treatment for pediatric TBI (NIH R01 NS069247) through pharmacokinetics-focused investigations (1c-d).

   1a. **Empey PE**, McNamara PJ, Young B, Rosbolt MB, Hatton J. Cyclosporin A disposition following acute traumatic brain injury. J Neurotrauma. 2006 Jan;23(1):109-16. PubMed PMID: 16430377.

   1b. Hatton J, Rosbolt B, **Empey P**, Kryscio R, Young B. Dosing and safety of cyclosporine in patients with severe brain injury. J Neurosurg. 2008 Oct;109(4):699-707. PubMed PMID: 18826358; PubMed Central PMCID: PMC2770729.

   1c. Kochanek PM, Jackson TC, Ferguson NM, Carlson SW, Simon DW, Brockman EC, Ji J, Bayır H, Poloyac SM, Wagner AK, Kline AE, **Empey PE**, Clark RS, Jackson EK, Dixon CE. Emerging therapies in traumatic brain injury. Semin Neurol. 2015 Feb;35(1):83-100. PubMed PMID: 25714870; PubMed Central PMCID: PMC4356170.

   1d. Margulies SS, Anderson G, Atif F, Badaut J, Clark RSB, **Empey PE**, Guseva M, Hoane M, Pauly J, Ragupathi R, Scheff S, Stein DG, Tang H, Hicks R. Combination Therapies for Traumatic Brain Injury: Retrospective Considerations. J Neurotrauma. 2016 Jan 1;33(1):101-12. PMID: 25970337.

2. Pharmacokinetics during critical illness: There is an unacceptable variability in medication response in critically ill patients that adversely impacts patient outcomes. Complicating the clinical situation is the interaction with concomitant non-drug therapies such as therapeutic hypothermia which is increasing being employed in ICU. My early work was one of the first to demonstrate that hypothermia alters pharmacokinetics; that systemic cooling to 33°C increases drug concentrations and decreases cytochrome p450-mediated metabolism of commonly-administered medications such as fentanyl and midazolam (2a-2b). This work led to a greater appreciation of the need to consider drug therapy modifications in patients receiving targeted temperature management (2c) and led to a published, highly-cited pharmacometric analysis that quantified the specific impact of hypothermia on phenytoin pharmacokinetics in children receiving this therapy following traumatic brain injury in the multicenter NIH-funded Cool Kids Trial (NIH 1R01-NS052478) (2d). These work was nationally recognized by a research award from the multidisciplinary Society of Critical Care Medicine (described in Section A).

   2a. Zhou J, **Empey PE**, Bies RR, Kochanek PM, Poloyac SM. Cardiac arrest and therapeutic hypothermia decrease isoform-specific cytochrome P450 drug metabolism. Drug Metab Dispos. 2011 Dec;39(12):2209-18. PubMed PMID: 21868471; PubMed Central PMCID: PMC3226379.

   2b. **Empey PE**, Miller TM, Philbrick AH, Melick JA, Kochanek PM, Poloyac SM. Mild hypothermia decreases fentanyl and midazolam steady-state clearance in a rat model of cardiac arrest. Crit Care Med. 2012 Apr;40(4):1221-8. PubMed PMID: 22067624; PubMed Central PMCID: PMC3307845.

   2c. Poloyac SM, **Empey PE**. Drug dosing during hypothermia: to adjust, or not to adjust, that is the question. Pediatr Crit Care Med. 2013 Feb;14(2):228-9. PubMed PMID: 23388572; PubMed Central PMCID: PMC3728377.

   2d. **Empey PE**, de Mendizabal NV, Bell MJ, Bies RR, Anderson KB, Kochanek PM, Adelson PD, Poloyac SM. Therapeutic hypothermia decreases phenytoin elimination in children with traumatic brain injury. Crit Care Med. 2013 Oct;41(10):2379-87. PubMed PMID: 23896831; PubMed Central PMCID: PMC3783553.

3. Pharmacogenomics Research: Recognizing that some clinical variability in drug response (efficacy or adverse drug events) could be explained by genetics, I most recently focused my work in pharmacogenomics (3a-3b). I am PI on the Pharmacogenomics-guided Care to Improve the Safety and Effectiveness of Medications (PreCISE-Rx) study that is integrating panel-based pharmacogenomic testing, genotype-guided medication selection and dosing protocols, and translational research to achieve precision medicine. Early contributions to science from this work include a scalable model for structuring pharmacogenomics information in FDA-approved product labels as well as an open knowledgebase to drive clinical and translational decision support (3c). I also lead the team who created the nationally-awarded Test2Learn™ program which teaches pharmacogenomics concepts through an innovative participatory model involving learner personal genomic testing (3d). The ethical framework we created is a path forward for bridging knowledge gaps that currently hinder the broad dissemination of precision medicine programs.

   3a. **Empey PE**. Genetic predisposition to adverse drug reactions in the intensive care unit. Crit Care Med. 2010 Jun;38(6 Suppl):S106-16. PubMed PMID: 20502164.

   3b. Smithburger PL, Smith RB, Kane-Gill SL, **Empey PE**. Patient predictors of dexmedetomidine effectiveness for sedation in intensive care units. Am J Crit Care. 2014 Mar;23(2):160-5. PubMed PMID: 24585165; PubMed Central PMCID: PMC4132632.

   3c. Boyce RD, Freimuth RR, Romagnoli KM, Pummer T, Hochheiser H, **Empey PE**. Toward semantic modeling of pharmacogenomic knowledge for clinical and translational decision support. AMIA Jt Summits Transl Sci Proc. 2013;2013:28-32. PubMed PMID: 24303292; PubMed Central PMCID: PMC3814496.

   3d. Adams SM, Anderson K, Coons J, Smith RB, Meyer SM, Parker LS, **Empey PE**. Advancing Pharmacogenomics Education in the Core PharmD Curriculum through Student Personal Genomic Testing. Am J Pharm Educ. 2016 Feb 25;80(1):3. doi: 10.5688/ajpe8013. PMID: 26941429. PubMed Central PMCID: PMC4776296

Complete List of Published Work in MyBibliography:

http://www.ncbi.nlm.nih.gov/sites/myncbi/philipe..empey.1/bibliography/10196145/public/?sort=date&direction=descending

D. RESEARCH SUPPORT

Ongoing Research Support

National Association of Chain Drug Stores — Empey (PI) — 3/1/16-8/31/16
Test2Learn: Community Pharmacists Pharmacogenetics Education Certificate Program
The purpose of this project is to teach Pharmacogenetics on-line and in-person through a continuing education program targeting community pharmacists.
Role: PI

Jewish Healthcare Foundation — Jacobson (PI) — 9/1/15-8/31/16
An Inter-Professional Training Program in Big Data, Healthcare Analytics, and Personalized Medicine
This study will develop an inter-professional training program focused on the preparation of health professionals for an era of big data, health analytics, and personalized medicine.
Role: Co-I

2013039201 — Berg (PI) — 2/1/15-6/30/17
McCune Foundation
Development of Pharmacogenomics
This project builds necessary infrastructure to support pharmacogenomics clinical and research programs within the Institute of Personalized Medicine.
Role: Co-I

R01-LM011838 Boyce (PI) 2/15/14-2/14/18
NIH
Addressing gaps in clinically useful evidence on drug-drug interactions
This project proposes to reduce preventable medication errors by more effectively synthesizing existing PDDI knowledge and more rapidly producing evidence to fill in knowledge gaps through linked data and semantic annotation with both user-centered and data-driven knowledge curation to provide more complete, accurate, and current PDDI decision support than is currently possible.
Role: Co-I

Completed Research Support

Central Research Development Fund Grants Program Empey (PI) 7/1/13-6/30/15
University of Pittsburgh
Evaluating the role of the transporter ABCG2 following traumatic brain injury
The central hypothesis of this project is that loss of ABCG2 transporter activity leads to worse outcomes following TBI by increasing protoporphyrin IX-related oxidative stress.
Role: PI

KL2-TR000146 Empey (PI) 7/1/10-6/30/15
NIH
Implications of hypothermia on drug transport
The central hypothesis of this project is that is that mild therapeutic hypothermia will produce time- and pathway-dependent alterations in drug transport.
Role: PI

2014 Research Award Bell (PI) 7/1/14-6/30/15
Mitochondrial Disease Foundation
Improving CNS delivery of brain antioxidants after acute metabolic decompensation in mitochondrial disease
This project will investigate a combination of two FDA-approved drugs for their effectiveness in treating children and young adults with Leigh's Syndrome. This work has the potential to improve brain function in patients with a mitochondrial disease for which there are currently no proven treatments.
Role: Co-I

PPMI Demonstration Grant Empey/Coons (PI) 7/1/13-3/30/16
American Society of Health Systems Pharmacists
Pharmacist-Delivered Pharmacogenomic Care
The central hypothesis of this project is that pharmacist-provided, targeted care which integrates patient genotyping improves outcomes for high-risk patients following percutaneous coronary intervention.
Role: CPI