BIOGRAPHICAL SKETCH

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NAME: Anastasia Kruse Hauser, Ph.D.

eRA COMMONS USER NAME (credential, e.g., agency login): AKHAUSER

POSITION TITLE: Lecturer, Chemical and Materials Engineering, University of Kentucky

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

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Kentucky, Lexington, KY, USA	B.S.	05/2012	Chemical Engineering
University of Kentucky, Lexington, KY, USA	Ph.D.	05/2016	Chemical Engineering

A. Personal Statement

My experiences span academic research, medical device development and early and late stage pharmaceutical development. My chemical engineering education specialized in bio-pharmaceutical engineering, focusing on the application of chemical engineering principles in the pharmaceutical industry. As a graduate student, my research focused on the development of iron oxide nanoparticles for the enhancement of cancer therapy applications. The scientific knowledge and experience gained during graduate school allowed me to transition into the medical device industry where I worked as a Culture Media Scientist at Cook Medical developing culture media for *in vitro* fertilization. From medical devices, I transitioned to pharmaceutical development and led the development of a sterile injectable undergoing a late stage technology transfer and the development of a pediatric formulation. I returned to academia to teach the senior capstone product and process design courses in chemical engineering, but have remained as a chemistry, manufacturing and controls (CMC) consultant on both development programs. In addition to my technical knowledge and skills, I am acutely aware of the importance of team collaboration, effective communication and project management.

B. Positions and Honors

Positions and Employment

2016-2017 Culture Media Scientist, Cook Medical, Bloomington, IN
2017-2018 CMC Development Scientist, US WorldMeds, Louisville, KY
2018-2019 CMC Development Scientist II, US WorldMeds, Louisville, KY
2020-present Lecturer, Chemical and Materials Engineering, University of Kentucky, Lexington, KY

Other Experience and Professional Memberships

2010-2016 Member, American Institute of Chemical Engineers
2012-2016 Member, Society for Biomaterials
2017-2019 Member, American Association of Pharmaceutical Scientists
2020-present Member, American Institute of Chemical Engineers

Selected Honors

2012-2013 NSF IGERT Graduate Fellowship
2012-2015 Daniel R. Reedy Quality Achievement Fellowship
2012-2015 Dr. Jennifer S. and Mr. Jeffery N. Quinn Graduate Fellowship
2013-2016 NIH Cancer and Nanotechnology Training Center Fellowship
2013-2016 NSF Graduate Research Fellowship Program

2014-2015 Philanthropic Educational Organization (P.E.O.) Scholar Award
2016 Dean's Outstanding PhD Candidate in Research
2018 Above and Beyond Award, US WorldMeds, LLC

C. Contributions to Science

Iron oxide nanoparticles present a unique opportunity for localized treatment of cancer. In the presence of an alternating magnetic field (AMF), iron oxide nanoparticles generate heat due to Neél relaxation and Brownian rotational forces. Heat generated from the particles can induce hyperthermia (42-45°C) conditions which can be combined with specific chemotherapeutics to result in synergistic effects of the combined treatment. My initial research focused on optimizing the physical and chemical characteristics of the iron oxide nanoparticles by altering parameters of the synthesis methods. The nanoparticles were then functionalized with peptides to target the extracellular matrix of cancer tissues to provide localized heating for combinational treatment with cisplatin, a common chemotherapeutic. When localized heat was administered with cisplatin, a synergistic effect of the combined treatment resulted indicating that reduced levels of the chemotherapeutic could be administered in combination with heat to elicit the same effects.

1. Wydra, R.J., **Kruse, A.K.**, Bae, Y., Anderson, K.W., & Hilt, J.Z. (2013). Synthesis and Characterization of PEG-Iron Oxide Core-shell Composite Nanoparticles for Thermal Therapy Applications. Materials Science and Engineering C: Materials for Biological Applications 33, 4660-4666.
2. **Kruse, A.M.**, Meenach, S.A., Anderson, K.W., Hilt, J.Z. (2014) Synthesis and Characterization of CREKA-conjugated Iron Oxide Nanoparticles for the Treatment of Cancer via Hyperthermia. Acta Biomaterialia,10, 2622-2629.
3. **Hauser, A.K.**, Mathias, R., Anderson, K.W., Hilt, J.Z. (2015) Effects of nanoparticle synthesis on the physical and chemical properties of dextran coated iron oxide nanoparticles. Materials Chemistry and Physics, 160, 177–186.
4. **Hauser, A.K.**, Wydra, R.J., Stocke, N.A., Anderson, K.W., Hilt, J.Z. (2015) Magnetic Nanoparticles and Nanocomposites for Remote Controlled Therapies. America's Special Issue of the Journal of Controlled Release, 219, 76-94.

Bulk heating of tumor tissues is difficult to achieve due to the high localized concentration of iron oxide nanoparticles required at the tumor site. However, iron oxide nanoparticles can also provoke intracellular toxicity when activated by an alternating magnetic field as a result of the localized energy delivery through friction from Brownian rotation and heating of the nanoparticle surface catalyzing the formation of reactive oxygen species (ROS). Therefore, iron oxide nanoparticles were functionalized with a cell penetrating peptide to facilitate internalization of the nanoparticles by cancer cells. When the cells were sequentially exposed to an alternating magnetic field, intracellular ROS generation increased, and mitochondrial function of the cells subsequently decreased, resulting in cell death. This developing treatment, formally known as magnetically mediated energy delivery, has several applications as a targeted, combinational treatment with radiation and chemotherapy.

1. **Hauser, A.K.**, Wydra, R.J., Bhandari, R., Rychahou, P.G., Evers, B.M., Anderson, K.W., Dziubla, T.D., Hilt, J.Z. (2015) Corrigendum to The Role of ROS Generation from Magnetic Nanoparticles in an Alternating Magnetic Field on Cytotoxicity. Acta Biomaterialia 25, 284-290.
2. **Hauser, A.K.**, Anderson, K.W., Hilt, J.Z. (2016). Peptide conjugated magnetic nanoparticles for magnetically mediated energy delivery to lung cancer cells. Nanomedicine, 11, 1769-1785.
3. **Hauser, A.K.**, Mitov, M.I., Daley, E.F., McGarry, R., Anderson, K.W., Hilt, J.Z. (2016). *Targeted iron oxide nanoparticles for the enhancement of radiation therapy*. Biomaterials, 105, 127-135.

D. Additional Information: Research Support and/or Scholastic Performance

During my tenure as an academic researcher, my research focused on novel applications of iron oxide nanoparticles in cancer therapy. In collaboration with the University of Kentucky College of Engineering, College of Pharmacy, and Markey Cancer Center, we developed targeted iron oxide nanoparticles for applications in magnetically mediated hyperthermia and magnetically mediated energy delivery. The multidisciplinary team which supported this project provided guidance on the ability for this technology to be implemented in a clinical setting, while the scientists provided unique ideas and problem-solving strategies on the technical and research aspects of the project. While at Cook Medical, I worked to develop new and innovative culture medias to support the various stages of *in vitro* fertilization (IVF). Cook Medical is a leader in the field of medical devices for reproductive health and developing new culture media allows them to support the increasing interest in IVF and expand their offering of reproductive health medical devices from pre-conception to post-partum. My previous work at US WorldMeds focused on a late stage technology transfer of an infusion drug product for advanced stage Parkinson's patients and the development of a pediatric formulation for the treatment of opioid withdrawal. Both cross-functional project teams consist of scientists, engineers, quality, and regulatory personnel. Since returning to academia in January 2020, I have served as a consultant on both programs. As a lecturer, I am focused on the capstone product and process design courses in the senior year of the chemical engineering curriculum which is well integrated with my previous experiences in the pharmaceutical industry.