EXHIBIT A

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

In Re Flint Water Cases,	No. 5:16-cv-10444-JEL-MKM (consolidated) Hon. Judith E. Levy Mag. Mona K. Majzoub

AFFIDAVIT OF DR. AARON SPECHT, PHD.

I, Dr. Aaron Specht, PhD., under penalty of perjury, hereby affirms that the foregoing is true and correct:

1. I am Research Associate at the Harvard T.H. Chan School of Public Health in Boston, Massachusetts.

2. Attached to this Affidavit as Exhibit A is a true and correct copy of my *curriculum vitae*.

3. I received a B.S. in Physics and a Ph.D. in Medical Physics from Purdue University West Lafayette, Indiana.

4. I performed my postdoctoral training in Environmental Health, Exposure Assessment, and Epidemiology at Harvard University.

5. In 2019, I joined Harvard University where I currently do research in Environmental and Occupational Health, Medical Physics, Health Physics, and Epidemiology.

6. I have dedicated my career to researching the development, validation, and application of a non-invasive X-ray Fluorescence (XRF) technology to quantify metals and trace elements in bone and toenail in vivo. As such, I am fully familiar with the issues raised by Dr. Lawrence Reynolds (Dkt. No. 1436).

7. To be clear the issues outlined by Dr. Reynolds attacking the use of the XRF for the purposes of establishing bone lead exposure is absolutely false. My research and that of others proves this point. Examples of my work are outlined in my C.V.

8. The portable XRF device, in its current state, is validated for use in studies to determine the level of lead exposure. It is solely being utilized as a method to quantify individual exposure levels. I worked directly with the device inventor in order to customize the device calibrations specifically for these measurements as part of our validation work. The commercial device, by itself, should not be used for these measurements, but with proper supervision and calibration, the device can be used for bone lead measurements in humans and has been approved for such use by several IRBs.

9. The procedure and device being used in Flint is the same as that of the validation studies and research health studies performed using the device[1], which have approvals within internal review and radiation safety at Purdue University, Harvard University, Boston University, Beth Israel Deaconess Medical Center, Edith Nourse Rogers Memorial Veterans Hospital, among other institutions.

[1] Zhang, X., Specht, A.J., Wells, E., Weisskopf, M.G., Weuve, J., and Nie, L.H., *Evaluation of a portable XRF device for in vivo quantification of lead in bone among a US population*, Sci Total Environ. 753, Jan. 20, 2021; Specht, A. J., Y. Lin, J. Xu, M. Weisskopf and L. H. Nie (2018); Specht, A. J., M. Weisskopf and L. H. Nie (2018), *Childhood lead biokinetics and associations with age among a group of lead-poisoned children in China*." Journal of Exposure Science & Environmental Epidemiology; Specht AJ, Lin Y, Weisskopf M, Xu J, Nie LH, *Bone lead levels in an environmentally exposed elderly population in shanghai, China*, The Science of the Total Environment. 2018; 626:96-98; Specht, A. J., M. Weisskopf and L. H. Nie (2014), *Portable XRF Technology to Quantify Pb in Bone In Vivo*, J Biomark 2014: 398032; Specht, A. J., Y. Lin, M. Weisskopf, C. Yan, H. Hu, J. Xu and L. H. Nie (2016). *XRF-measured bone lead (Pb) as a biomarker for Pb exposure and toxicity among children diagnosed with Pb poisoning*, Biomarkers 21(4): 347-352; McNeill, F. E., M. Fisher, D. R. Chettle, M. Inskip, N. Healey, R. Bray, C. E. Webber, W. I. Manton, L. Marro and T. E. Arbuckle (2017), *The decrease in population bone lead levels in Canada between 1993 and 2010 as assessed by in vivo XRF*, Physiol Meas 39(1): 015005; McNeill, F. E., L. Stokes, J. A. Brito, D. R. Chettle and W. E. Kaye (2000), *109Cd K x ray fluorescence measurements of tibial lead content in young adults exposed to lead in early childhood*, Occup Environ Med 57(7): 465-471; DM Ceballos, AS Young, JG Allen, AJ Specht, VT Nguyen, J Craig, M Miller, T Webster. Nail salon technician exposure to metal impurities from nail products. International Journal of Hygiene and Health. In Press. 2021; Johnson KM, Specht AJ, Hart J, Salahuddin S, Erlinger AP, Hacker MR, Woolf A, Hauptman M, Karumanchi A, Wylie B, O'Brien K. Lead exposure and association with angiogenic factors and hypertensive disorders of pregnancy. Pregnancy Hypertension. 2020. 22:93-98; Johnson KM, Specht AJ, Hart J, Salahuddin S, Erlinger AP, Hacker MR, Woolf A, Hauptman M, Karumanchi A, Wylie B, O'Brien K. Risk-factor based lead screening and correlation with blood and bone lead levels in pregnancy. Obstetrics and Gynecology. 2020; 135:120s-121s; Li X, Specht AJ, Wang Z, Tan S. A case control study of cumulative lead exposure and infertility in Shenzhen, China. Human Reproduction. Submitted.AJ Specht, X Zhang, A Young, VT Nguyen, DC Christiani, DM Ceballos, JG Allen, J Weueve, LH Nie, MG Weisskopf. Validation of in vivo toenail measurements of manganese and mercury using a portable x-ray fluorescence device. Journal of Exposure Science and Environmental Epidemiology. Submitted.

10. I understand there is an assertion being made that the current bone lead testing program that had already commenced should be considered a "research project." I disagree. The work in Flint does not currently meet the criteria for a research project. There is no generalizable knowledge being sought out and the measurements are currently only being used as a method in determining level of lead exposure for litigation purposes and in accordance with an agreed settlement program. In order to be considered a research project, the project must have a definable research question. Currently, there is no question being answered by collecting measurements on the individuals for distribution of damages in this lawsuit.

11. The radiation dose is equivalent to that of 9 hours of natural background radiation sources, which are unavoidable exposures to everyone. The radiation dose of the bone lead measurement is less than 1/30th of a typical chest x-ray, which is the most common x-ray procedure. The radiation dose has also been established clearly in a publication where the dose was quantified using thermoluminescent dosimeters, optically stimulated luminescent dosimeters, and simulations using the exact parameters and procedures of the device used in Flint and in all studies using

the portable XRF.[2] The publication also expands the potential risks of the procedure in comparison to known deterministic and stochastic radiation effects.

12. Here, approval under the Clinical Laboratory Improvement Amendments of 1988 (CLIA) is not necessary because the test is not used as a "diagnosis, prevention, or treatment of any disease." The sole purpose of the test is to quantify lead exposure. Similarly, approval is not required under the Food, Drug, and Cosmetic Act ("FDCA") because the XRF scans in Flint are *not* "intended for use in the diagnosis of disease or other conditions. . ." The test is not being used to inform any medical or diagnostic criteria beyond the test results itself for purposes of litigation.

13. In conclusion, there is significant misinformation concerning the use of the XRF device on humans. A reasonable physician performing a cursory review of the medical literature would confirm this to be the case. However, it appears that has not happened here. The scans being performed in Flint are not for research purposes and is exclusively being used to determine individual measurements in this litigation.

Dated: 5/27/2021

Signature: _____

[2] Specht AJ, Zhang X, Goodman B, Maher E, Nie LH, Weisskopf MG. Radiation dose assessments for in vivo measurements using a portable x-ray fluorescence device. Health Physics. 2019; 116(5):590-598.

CURRICULUM VITAE

Aaron J Specht, PhD
Research Associate
Department of Environmental Health
Harvard T.H. Chan School of Public Health
655 Huntington Ave Building 1 Room 1402
Boston, MA 02115
Telephone: (317)358-5258
Email: aspecht@hsph.harvard.edu
Website: https://www.hsph.harvard.edu/aaron-specht/

Date Prepared: August 26, 2020

EDUCATION

2016-2019	Environmental Health		Harvard University
2012-2016	Medical Physics	Ph.D.	Purdue University
2008-2012	Physics	B.S.	Purdue University

RESEARCH EXPERIENCE

- Studies of occupational and environmental heavy metal exposures in community and large-scale cohort studies. 2019-Present
  Research Associate, Environmental Health
  Harvard T.H. Chan School of Public Health, Boston, MA
- Novel applications of nuclear instrumentation as exposure assessment in health studies 2016-Present
  Postdoctoral Research Fellow, Environmental Health,
  Harvard T.H. Chan School of Public Health, Boston, MA
- X-ray Fluorescence for quantification of lead and strontium in bone *in vivo* 2012-2016
  Medical Physics, Purdue University, West Lafayette, IN
- Monte Carlo Simulations of radiation dose of CT scan 2011-2012
  Medical Physics, Purdue University, West Lafayette, IN
- Semiconductor detector stability for measurement of nuclear decay rates 2009-2011
  Physics, Purdue University, West Lafayette, IN

MAJOR RESEARCH INTERESTS:

- Development of novel nuclear technologies for occupational and environmental exposure assessment. Development of x-ray fluorescence technology for *in vivo* and *in situ* measurements of biomarkers of metal exposure. Novel calibration methods that allow for non-destructive methods for exposure assessment. Method development for on-site/in-field measurements of metal exposure.

- Toxicokinetics of metal exposures and impact on biomarkers in human and animals. Identification of the biokinetics surrounding typical biomarkers of exposure to better indicate the implications of health associations.
- Application of x-ray fluorescence technology in novel animal and environmental health studies. Many animal species suffer from the human environment interaction and metal exposure assessment allows us to identify both environmental and human health concerns from human intervention in the environment.
- Teeth as biomarkers of metal exposures using synchrotron micro-XRF technology. Identifying technical approaches to maximize the temporal resolution of metal exposure assessment by exploiting standard growth patterns in the human tooth.
- Health associated with environmental and occupational elemental exposures. Applying exposure assessment technology in large scale epidemiologic studies of health indicative of environmental and occupational exposures, nutrition, and geology.

ACADEMIC APPOINTMENTS

2019-Present	Research Associate, Harvard T.H. Chan School of Public Health
2019-Present	Council Member, International Society of Trace Elements in Humans
2018-Present	Research Collaborator- Beth Israel Deaconess Medical Center
2018-Present	Research Scientist- Edith Nourse Rogers Memorial Veterans Hospital
2018-Present	Director, XRF Trace Metals Laboratory, Harvard T.H. Chan School of Public Health NIEHS Center for Environmental Health
2018	Chairman, Harvard T.H. Chan School of Public Health NIEHS Center for Environmental Health Metals Core Symposium 2018
2016-2019	Postdoctoral Fellow, Harvard T.H. Chan School of Public Health
2012-2016	Graduate Research Assistant- Medical Physics Purdue University
2010-2012	Research Assistant- Medical Physics Purdue University
2009-2011	Research Assistant- High Energy Physics Purdue University

HONORS AND AWARDS

2015	Society of Toxicology (SOT) Graduate Student Travel Award
2014	Purdue Research Foundation (PRF) research grant
2014	International Society of Exposure Sciences (ISES) Poster Award
2013	Purdue Doctoral Fellowship
2012	Ross Fellowship
2011	Spira Undergraduate Research Award
2008	Gianni Ascarelli Student Award Physics Research Fellowship

PROFESSIONAL AND SCHOLARLY ASSOCIATIONS

2019-Present	International Society of Trace Element Research in Humans
2018-Present	International Society of Environmental Epidemiology (ISEE)
2014-Present	International Society of Exposure Sciences (ISES)
2013-Present	Society of Toxicology (SOT)
2013-Present	Health Physics Society (HPS)

2009-2012 American Physical Society (APS)

PEER REVIEW

Science of the Total Environment, Journal of Physics D, Physiological Measurement, Physics in Medicine and Biology, Journal of Exposure Science and Environmental Epidemiology, Environment International, Northeastern Naturalist, Applied Radiation and Isotopes, X-ray Spectrometry.

OTHER TRAINING AND CERTIFICATIONS

2018 HSPH, EPI 204 Analysis in Case Control Cohort Epi Data (audit)
2018 HSPH, EPI 203 Study Design in Epidemiologic Research (audit)
2017 HSPH, EH 262 Introduction to the Work Environment (audit)
2017 HSPH, BST 201 Introduction to Statistical Methods (audit)
2017 HSPH, BST 210 Applied Regression Analysis (audit)
2017 HSPH, ID 215 Environmental and Occupational Epidemiology (audit)
2016 HSPH, EPI 202 Elements of Epidemiological Research (audit)
2016 HSPH, EPI 201 Introduction to Epidemiology (audit)
2013 American Board of Radiology, Certification in Therapeutic Medical Physics

PEER REVIEWED PUBLICATIONS

1. Johnson KM, **Specht AJ,** Hart J, Salahuddin S, Erlinger AP, Hacker MR, Woolf A, Hauptman M, Karumanchi A, Wylie B, O'Brien K. Lead exposure and association with angiogenic factors and hypertensive disorders of pregnancy. Pregnancy Hypertension. 2020; In Press.
2. JC Nwanaji-Enwerem, E Colicino, **AJ Specht**, X Gao, C Wang, P Vokonas, MG Weisskopf, EW Boyer, AA Baccarelli, J Schwartz. Individual species and cumulative mixture relationships of 24-hour urine T metal concentrations with DNA methylation age variables in older men. Environmental Research. 2020; 186:109573.
3. Johnson KM, **Specht AJ,** Hart J, Salahuddin S, Erlinger AP, Hacker MR, Woolf A, Hauptman M, Karumanchi A, Wylie B, O'Brien K. Risk-factor based lead screening and correlation with blood and bone lead levels in pregnancy. Obstetrics and Gynecology. 2020; 135:120s-121s.
4. **Specht AJ**, Dickerson AS, Kponee K, Kpobari N, Weisskopf MG. Toenail metal exposures in fishermen from Bodo City, Nigeria. Bulletin of Environmental Contamination and Toxicology. 2020; 104:90-95.
5. **Specht AJ,** Zhang X, Goodman B, Maher E, Nie LH, Weisskopf MG. Radiation dose assessments for *in vivo* measurements using a portable x-ray fluorescence device. Health Physics. 2019; 116(5):590-598.
6. **Specht AJ**, Dickerson AS, Weisskopf MG. Comparison of bone lead measured via portable x-ray fluorescence across and within bones. Environmental Research. 2019; 172:273-278.
7. Dickerson AS, Hansen J, **Specht AJ**, Gredal O, Weisskopf MG. Population-based study of amyotrophic lateral sclerosis and occupational lead exposure in Denmark. Occupational and Environmental Medicine. 2019; 76:208-214.

8. Lin Y, **Specht AJ**, Xu J, Yan C, Geng H, Shen X, Nie LH, Hu H. Blood lead, bone lead and child attention-deficit-hyperactivity-disorder-like behavior. Science of the Total Environment. 2019; 659:161-167.
9. **Specht AJ**, Kirchner KE, Weisskopf MG, Pokras MA. Lead exposure biomarkers in the Common Loon. Science of the Total Environment. 2019; 647:639-644.
10. **Specht AJ,** Kponee K, Kpobari N, Balcom PH, Weuve J, Nie LH, Weisskopf MG. Validation of x-ray fluorescence measurements of metals in toenail clippings against inductively coupled plasma mass spectrometry in a Nigerian population. Physiological Measurement. 2018; 39(8).
11. Dickerson AS, Hansen J, Kioumourtzoglou MA, **Specht AJ,** Gredal O, Weisskopf MG. Study of occupation and amyotrophic lateral sclerosis in a Danish cohort. Occupational and Environmental Medicine. 2018; 75(9):630-638.
12. **Specht AJ**, Weisskopf M, Nie LH. Childhood lead biokinetics and associations with age among a group of lead poisoned children in China. Journal of Exposure Science and Environmental Epidemiology. 2018; 1559-064X.
13. **Specht AJ**, Parish CN, Wallens EK, Watson RT, Nie LH, Weisskopf MG. Feasibility of a portable x-ray fluorescence device for bone lead measurements of condor bones. The Science of the Total Environment. 2018; 615:398-403.
14. **Specht AJ**, Lin Y, Weisskopf M, Xu J, Nie LH. Bone lead levels in an environmentally exposed elderly population in shanghai, China. The Science of the Total Environment. 2018; 626:96-98.
15. Dickerson AS, Rotem R, Christian MA, Nguyen VT, **Specht AJ**. Potential sex differences relative to autism spectrum disorder and metals. Current environmental health reports. 2017; 4(4):405-414.
16. Zhang X, **Specht AJ**, Nie LH. Feasibility of quantifying manganese and mercury in toenail *in vivo* with portable x-ray fluorescence technology. Biomarkers: biochemical indicators of exposure, response, and susceptibility to chemicals. 2017; 23(2):154-160.
17. **Specht AJ**, Mostafaei F, Lin Y, Xu J, Nie LH. Measurements of Strontium Levels in Human Bone *In Vivo* Using Portable X-ray Fluorescence (XRF). Applied spectroscopy. 2017; 71(8):1962-1968.
18. **Specht AJ**, Weisskopf MG, Nie LH. Theoretical modeling of a portable x-ray tube based KXRF system to measure lead in bone. Physiological measurement. 2017; 38(3):575-585.
19. Wang Y, **Specht A**, Liu Y, Finney L, Maxey E, Zheng W, Weisskopf M, Nie L. Microdistribution of lead in human teeth using microbeam synchrotron radiation X-ray fluorescence (μ-SRXRF). X-ray spectrometry: XRS. 2017; 46(1):19-26.
20. **Specht AJ**, Lin Y, Weisskopf M, Yan C, Hu H, Xu J, Nie LH. XRF-measured bone lead (Pb) as a biomarker for Pb exposure and toxicity among children diagnosed with Pb poisoning. Biomarkers: biochemical indicators of exposure, response, and susceptibility to chemicals. 2016; 21(4):347-52.
21. **Specht AJ**, Weisskopf M, Nie LH. Portable XRF Technology to Quantify Pb in Bone *In Vivo*. Journal of biomarkers. 2014; 2014:398032.

Submitted

1. Zhang X, **Specht AJ**, Nie LH. Validation of a portable XRF for bone lead measurement against Cd-109 KXRF in a population from Indiana. Journal of Exposure Science and Environmental Epidemiology. Submitted.
2. Li X, **Specht AJ**, Wang Z, Tan S. A case control study of cumulative lead exposure and infertility in Shenzhen, China. Human Reproduction. Submitted.
3. **AJ Specht,** X Zhang, A Young, VT Nguyen, DC Christiani, DM Ceballos, JG Allen, J Weueve, LH Nie, MG Weisskopf. Validation of in vivo toenail measurements of manganese and mercury using a portable x-ray fluorescence device. Journal of Exposure Science and Environmental Epidemiology. Submitted.
4. DM Ceballos, AS Young, JG Allen, **AJ Specht,** VT Nguyen, J Craig, M Miller, T Webster. Nail salon technician exposure to metal impurities from nail products. Environmental Science and Technology. Submitted.
5. AT Wolf, **AJ Specht**, MS Lee, M Mazumdar, JF Obrycki. Analysis of heavy metals in tea leaves from Bangladesh using x-ray fluorescence. Public Health. Submitted.
6. AS Young, R Hauser, TJ Todd, BA Coull, H Zhu, K Kannan, **AJ Specht**, MS Bliss, JG Allen. Impact of "healthier" materials interventions on dust concentrations of per- and polyfluoroalkyl substances, polybrominated diphenyl ethers, and organophosphate esters. Environment International. Submitted.

PUBLISHED ABSTRACTS, CONFERENCES, AND PRESENTATIONS

1. **Specht AJ**, et al. Mixed metal exposures measured from toenail in relation to mini-mental state examination scores in the Normative Aging Study. International Society of Environmental Epidemiology. Aug. 26, 2020. Baltimore, MD (virtual).
2. **Specht AJ,** Nie LH. Bone Pb, Blood Pb, Biokinetics, and Chelation Therapy Efficacy in a Group of Lead Poisoned Children in China. Montefiore Lead Poisoning Prevention and Treatment Program. November 1, 2019. Bronx, New York.
3. **Specht AJ.** Novel x-ray fluorescence approaches to ease trace metal biomarker measurements in field and low- and middle-income countries. ISTERH. September 23, 2019. Bali, Indonesia.
4. **Specht AJ.** Mixed Metal Exposures and Cognition in the Normative Aging Study. Seminar in Occupational and Environmental Health Research. September 6, 2019. Boston, MA.
5. **Specht AJ,** Weisskopf MG. Feasibility of lead exposure assessment in blood spots using x-ray fluorescence. August 26, 2019. Utrecht, The Netherlands.
6. **Specht AJ**, Lin Y, Nie LH, Xu J, Weisskopf MG. Children's lead biokinetics and chelation efficacy. Harvard Seminar in Occupational and Environmental Health Research. October 12, 2018. Boston, MA.
7. **Specht AJ**, et al. Calibration and validation of x-ray fluorescence measurements for non-destructive metal exposure assessment of toenail clippings from Nigeria. International Society of Environmental Epidemiology. Aug. 26-30, 2018. Ottawa, Ontario, Canada.
8. **Specht AJ**. X-ray Fluorescence Applications in Biological Metal Exposure Assessment. Harvard School of Public Health NIEHS Center for Environmental Health Metals Core Symposium. June 14-15, 2018. Boston, MA.

9. Zhang X, **Specht AJ,** Weisskopf MG, Weuve J, Nie LH. Quantification of bone lead and toenail manganese and mercury *in vivo* with x-ray fluorescence technology. Harvard School of Public Health NIEHS Center for Environmental Health Metals Core Symposium. June 14-15, 2018. Boston, MA.
10. **Specht AJ**, Weisskopf MG. Desktop X-ray Fluorescence for Metal Exposure Assessment. Harvard John A. Paulson School of Engineering and Applied Sciences Seminar. Feb. 1, 2017. Cambridge, MA.
11. Zhang X, **Specht AJ,** Weisskopf MG, Weuve J, Nie LH. Quantification of manganese and mercury in toenail *in vivo* using portable x-ray fluorescence. American Association of Physicists in Medicine Annual Meeting. July 29-August 2, 2017 Indianapolis, IN.
12. **Specht AJ**, Zhang X, Weuve J, Nie LH, and Weisskopf MG. *In vivo* x-ray fluorescence measured toenail manganese as a biomarker of exposure among welders, abstract accepted at the 2017 Annual International Society of Exposure Science meeting Oct. 15-19, 2017. Durham, North Carolina.
13. Zhang X, **Specht AJ,** Weuve J, Weisskopf MG, and Nie LH. Feasibility of quantifying manganese and mercury in toenail *in vivo* with portable x-ray fluorescence technology, abstract presented at the 2017 Annual Health Physics Society meeting July 9-13, 2017. Raleigh, North Carolina.
14. **Specht AJ**, Lin Y, Weisskopf M, Yan CH, Hu H, Xu J, Nie LH. KXRF-measured Bone Lead (Pb) As A Biomarker for Pb Exposure and Toxicity Among Children Diagnosed with Pb Poisoning, abstract accepted for presentation at the 2016 Annual SOT meeting Mar. 13-17, 2016. New Orleans, LA.
15. **Specht AJ**. XRF technology to quantify lead in bone *in vivo*, Purdue University Seminar School of Health Sciences, Nov. 3, 2015. West Lafayette, Indiana.
16. **Specht AJ**, Weisskopf MG, and Nie LH. Calibration and improvements of a portable XRF technology to quantify lead in bone *in vivo*, College of Health and Human Sciences Research Day, 2015. West Lafayette, Indiana.
17. **Specht AJ**. Portable XRF technology to quantify lead in bone in vivo. Hoosier Health Physics Society Spring Meeting. 2014. Lafayette, IN.
18. **Specht AJ.** Calibration and improvements of a portable XRF technology to quantify lead in bone *in vivo*, Purdue University Seminar in School of Health Sciences, Jan. 28, 2014. West Lafayette, Indiana.
19. **Specht AJ**, Weisskopf MG, and Nie LH. Calibration and improvements of a portable XRF technology to quantify lead in bone *in vivo*, abstract published and project presented at the 2014 Annual International Society of Exposure Science meeting Oct. 12-16, 2014. Cincinnati, Ohio.
20. **Specht AJ**, Weisskopf MG, and Nie LH. Calibration and improvements of a portable XRF technology to quantify lead in bone *in vivo*, College of Health and Human Sciences Research Day, 2014. West Lafayette, Indiana.
21. **Specht AJ**, Weisskopf MG, and Nie LH. Calibration and improvements of a portable XRF technology to quantify lead in bone *in vivo*, abstract Published in “The Toxicologist” (2014) and project presented at the the 2014 Annual Society of Toxicology meeting Mar. 23-27, 2014. Phoenix, Arizona

22. **Specht AJ**, Weisskopf MG, and Nie LH. Improvements in portable XRF technology to quantify lead in bone *in vivo*, abstract published and podium presentation for the 2014 Lead Collaborative Consortium June 5-7, 2014. Hamilton, ON, Canada
23. **Specht AJ**, Weisskopf MG, and Nie LH. Portable XRF Technology to Quantify Lead and Strontium in Bone *in vivo* – Calibration and Validation, abstract Published in "The Toxicologist" (2013) and project presented at the 2013 Annual Society of Toxicology meeting Mar. 10-14, 2013. San Antonio, Texas

GRANTS

Current Grants

1K01OH011648-01 (PI) $311,234 09/2019-08/2022
A novel portable KXRF measurement system for in vivo metal measurements
To test the viability of an x-ray tube based portable KXRF device and relation of cumulative lead exposure and motor function.

DoD CRMP 12971061 (Site-PI) $982,325 (HSPH $184,908) 09/2020-08/2022
Combat-Ready Exposure Device (CRED): Validation of a Portable Exposure Biomarker Device for Lead and Other Heavy Metal Exposures
Develop a novel XRF device and biomarkers for exposure assessment of metals typical in military settings.

NIEHS P30ES000002 Center Pilot Funding (Co-PI) $25,000 8/2020-8/2021
Validation of desktop X-ray fluorescence in exposure assessment of nasal fluid
To determine ability of desktop XRF in quantification of metals in nasal fluid in comparison to ICP-MS approaches.

Pending Grants

NIH STTR (Site PI) ($67,000) 01/2021-01/2022
Point of Care Zinc Nutritional Status Meter.
Develop a point of care XRF device for screening of zinc nutritional status using nail, which can simultaneously measure a suite of elements while giving accurate measures of zinc nutrition.

DoD, No Award Number (Sub-contract) 09/2021-08/2024
Association of Metal Exposures with Health Risk Markers, Mood and Cognitive Functioning in Military Veterans
The goal of this study is to determine exposures to metals in military veterans using well-validated traditional and cutting-edge newly developed techniques to evaluate how exposure to one metal as well as combinations of metals relate to brain functioning.

NIEHS R01 (Co-I) $1,250,000 ($293,06) 07/2021-06/2025
Building capacity for childhood lead poisoning and prevention in Bangladesh.
Develop an XRF device for cost-effective nationwide lead screening to determine sources of lead, identify appropriate interventions, and use GIS mapping to identify potentially vulnerable communities.

Health Resources in Action (Subcontract) $165,000 07/2021-06/2024
Building capacity for childhood lead poisoning and prevention in Bangladesh.
Develop an XRF device for cost-effective nationwide lead screening to determine sources of lead, identify appropriate interventions, and use GIS mapping to identify potentially vulnerable communities.

Completed Grants

NIEHS P30ES000002 Center Pilot Funding (Co-PI) $25,000 11/2018-6/2020
Impact of healthy material interventions in offices on reductions in fluorinated chemicals and endocrine-disrupting potency of indoor dust
To determine the contamination of fluorinated chemicals of indoor dust in renovated office spaces and identify novel XRF approaches to measurements of fluorine.

CDC/NIOSH T42/OH008416 ERC Pilot Grant (Co-PI) $5,550 11/2018-6/2019
Examine the exposure window of the bone lead biomarker measured by a portable x-ray fluorescence device
We aim to identify the half-life of bone lead and strontium assessed by portable x-ray fluorescence and blood strontium to better identify exposure windows in studies.

GUP-51952 Argonne National Lab Beamline Access Request 05/2017-09/2017
Early childhood exposure assessment in deciduous teeth using microfluorescence
Determine the epidemiological application of synchrotron micro-XRF for exposure assessment using teeth as a biomarker

NIEHS P30ES000002 Facility Access Funds (Co-PI) $2200 07/2017-10/2017
Feasibility of micro x-ray fluorescence for measurement of pre- and post-natal metal exposures in teeth
To determine the feasibility of micro fluorescence for assessment of critical time windows of exposure in comparison to LA-ICP-MS measurements on teeth

NIEHS P30ES000002 Facility Access Funds (Co-PI) $2600 09/2016-01/2017
Portable x-ray fluorescence (XRF) for in vivo exposure assessment
To obtain a portable XRF device for *in vivo* metal exposure assessment in a group of welders and nail salon workers and future work of the NIEHS center

CDC/NIOSH T42/OH008416 ERC Pilot Grant (Co-PI) $25,000 09/2016-05/2017
Cardiopulmonary responses to occupational particulate exposures
To test feasibility of portable XRF for manganese quantification in toenail and assess neurologic outcomes in relation to manganese exposure in a group of welders.

NIEHS P30ES000002 (Co-PI) Pilot Grant $25,000 09/2016-05/2017
Identifying Sources of Exposure in Nail Salon Workers to Inform Targeted Interventions
To test viability of using portable XRF to quantify metal exposures in toenails comparatively measured with ICP-MS

TEACHING EXPERIENCE

2019 Teaching Assistant/Lecturer, ID 263 Practice of Occupational Health, Harvard University
2018 Guest Lecturer, ES 6 Intro. Env. Science and Engineering, Harvard University
2014 Teaching Assistant, HSCI 514 Radiation Instrumentation Lab, Purdue University
2014 Guest Lecturer, Phys 235 Careers in Physics, Purdue University
2013 Teaching Assistant, HSCI 574 Medical Health Physics, Purdue University

MENTORING EXPERIENCE

Supervising Graduate Research

Supervised Christian S. Hoover, Masters Students, Harvard T.H. Chan School of Public Health
Project title: Feasibility of micro x-ray fluorescence for measurement of pre- and post-natal metal exposures in teeth

Supervised Vy T. Nguyen, PhD candidate, Harvard T.H. Chan School of Public Health
Project title: Novel uses of XRF for lead exposure assessment in epidemiologic studies.

Supervised Anna Young, PhD candidate, Harvard T.H. Chan School of Public Health
Project title: Identifying Sources of Exposure in Nail Salon Workers to Inform Targeted Interventions

Supervised Xinxin Zhang, PhD candidate, Purdue University
Project title: Development and Validation of Portable XRF Technology to Measure Manganese in Toenail *In Vivo*

Supervised Yufei Wang, MSc candidate, Purdue University
Project title: Microdistribution of lead in human teeth using microbeam synchrotron radiation x-ray fluorescence

Supervising Undergraduate Research

Supervised Kimberley Kirchner, Senior at Worcester Polytechnic Institute, Harvard T.H. Chan School of Public Health
Project title: Biomarkers of metal exposure in the common loon.

Supervised Maggie Mittleman, Senior at Wellesley University, Harvard T.H. Chan School of Public Health
Project title: Development of a standard device for measurement of impaired topographical learning

Supervised Scott Blake, senior in Physics Department, Purdue University
Project title: Design and Build a Customized Moderator/Reflector/Shielding Assembly for *In Vivo* Measurement of Manganese in Bone Using NAA Technology

Supervised Austin Trout, senior in Physics Department, Purdue University
Project title: Dosimetry Study of *In Vivo* Neutron Activation Analysis of Metals in Bone

Supervised Jacob Wilson, senior in Physics Department, Purdue University
Project title: *In Vivo* Measurement of Fluorine in Bone using IVNAA Technology: Monte Carlo Simulations

Supervised Nikola Plavsa, senior in Physics Department, Purdue University
Project title: Monte Carlo (MC) Simulation of *In Vivo* Measurement of Metals in Bone using a Portable XRF Device

Supervised Zheng Gu, senior in Health Sciences, Purdue University
Project title: Development of Metal Doped Phantoms for *In Vivo* Metal Measurements of Metals in Toenails

Supervised Emma Wallens, sophomore in Health Sciences, Purdue University
Project title: Feasibility Study of Measurement of Lead in Condor Bones *In Vivo* Using Portable XRF Technology