

CURRICULUM VITAE

Larry E. Bowen

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QUALIFICATIONS

Program Management, Laboratory Management
ABSL-2, ABSL-3, ABSL-3+ laboratory experience
Principal Investigator and Study Director experience
Supervisory and Cross-Functional Teams experience
GXP, Regulatory Compliance, and Quality Control experience
Institutional Animal Care and Use Committee (IACUC) experience
DoD Immunization Program
Biosurety and Reliability Program

EDUCATION

B.S. Biology, University of New Mexico - Albuquerque, New Mexico 1993

APPOINTMENTS/AWARDS

- Adjunct faculty member of the University of Alabama Birmingham School of Medicine Pulmonary Injury and Repair Center (PIRC), 2011
- Outstanding Achievement Award – Clinical Research Management, United States Army Medical Research Institute of Infectious Diseases, 2015
- Association of Inhalation Toxicologists Committee Member, 2021

CONTINUING EDUCATION

Aerobiology in Biodefense
Aerosol and Particle Measurement Course (University of Minnesota)
American Biological Safety Association
American Association of Aerosol Researchers
American Society for Microbiology - Biodefense
Inhalation Toxicology Research Institute (ITRI) Aerosol Course
American Industrial Hygiene Association
Laboratory Animal Care Course (Ralston Purina)
American Association for Laboratory Animal Science
International Society of Toxicology
Society of Toxicology

PATENTS

Oro-Nasal Inhalation Plethysmography Mask Exposure System

RIID 15-08

U.S. Utility Applications No. 17/318,905; U.S. National Stage Application No. 16/076,094; PCT Application No. PCT/US2017/016845; U.S. Provisional Application No. 62/292,345

Head-Only and/or Whole-Body Inhalation Exposure Chamber

Head-Only Inhalation Exposure Chamber Modification

RIID 15-12

U.S. National Stage Application No. 16/076,040; PCT Application No. PCT/US2017/016811; U.S. Provisional Application No. 62/292,355

Aerosol Aging and Concentrating Drum for Simulating Operational Conditions

RIID 16-14

U.S. Utility Application No. 15/723,448; U.S. Provisional Application No. 62/403,524; U.S. Provisional Application No. 62/428,883

EXPERIENCE

In-Tox Products, LLC

Albuquerque, New Mexico

Senior Managing Partner/Owner (2015 to Present)

Duties:

Client consultation and training

Designs aerosol, bioaerosol, nanoparticulate, and environmental instrumentation

Designs aerosol, bioaerosol gas, and vapor *in vitro* and *in vivo* inhalation exposure systems

Allergy Therapeutics PLC

Clinton, Mississippi

Clinical Research Scientist-Aerobiology (2019 to 2020)

Duties:

Lead, Pre-Clinical Toxicology Department

Developed the United States Aeroallergen Network (USAN) using Burkard Spore Traps

Installed Burkard Spore Traps and provided operational training and sample handling techniques

Intellectual Property Committee member

Experience with International Council of Technical Requirements for Pharmaceuticals for Human Use (ICH), Paul Ehrlich Institute (PEI), and Food and Drug Administration (FDA) regulations for pharmaceutical guidelines

Scitovation, LLC

Research Triangle Park, North Carolina

In Vitro Inhalation Scientist/Chemical Hygiene Officer (2018-2019)

Duties:

Configured, operated, maintained air-liquid interface (ALI) cellular exposure systems for aerosol, vapor, and gas toxicity testing
Designed aerosol, vapor, and gas *in vitro* ALI cellular inhalation exposure systems
Developed ALI inhalation exposure protocols
Authored Contributing Scientist Reports
Managed ChemInventory program and software database
Provided chemical safety and handling training for employees

United States Army Medical Research Institute for Infectious Diseases

Ft. Detrick, MD

Contractor – Alaka'ina Foundation

Bioaerosol Scientist V (2013 – 2017)

Duties:

Performed duties as a Principal Investigator and Bioaerosol Scientist
Implemented GLP methods for aerobiological studies
Facilitated QA/QC procedures
Validated and calibrated bioaerosol inhalation instrumentation and systems
Designed and tested prototype automated bioaerosol inhalation exposure systems for rodents, rabbits and nonhuman primates
Mentored Science and Engineering Apprentice Program (SEAP) and College Qualified Leaders Program (CQL) students for the US Army Educational Outreach Program
Enrolled in Army Biological Personnel Reliability Program (BPRP)
Enrolled in DoD Vaccination Program
Developed a murine nose-only inhalation model of Ebola Virus infection

Alion Science and Technology Corporation

Durham, North Carolina

Assistant Vice President/ Division Manager/ Program Manager (2012 – 2013)

Duties:

Assistant Vice President/Division Manager/Program Manager:

Provided inhalation toxicology support services and oversight of a National Institute of Environmental Health Sciences (NIEHS) contract

Managed 21 full-time staff including two technical subcontractors

Responsible for the financial, technical and personnel provisions of the contract

Managed Environmental Health and Safety Department

Inhalation Engineering:

Responsible for the design, development, characterization and operation of systems used at the NIEHS Inhalation Toxicology Facility

Supervised four direct reports including a lead chemist, a senior system engineer, a project manager and senior administrative assistant

Southern Research Institute (SR)

Birmingham, Alabama

Associate Project Leader (2005 – 2012)

Duties:

Principal Investigator, Co-Principal Investigator, and Study Director

Project/Contract administrative and budget management

Infectious Diseases Research Aerobiology Group Supervisor

IACUC Chairman January 2006 - January 2012

IACUC member January 2012 – March 2012

Crisis Team member

First Responders Team member

HAZWOPER Certification - 40 Hour

Significant Accomplishments:

- Designed and characterized a murine nose-only inhalation cigarette smoke exposure system at the University of Alabama Birmingham Cystic Fibrosis Research Center
- Designed, developed, and characterized a novel dual nonhuman primate head-out plethysmography oro-nasal inhalation challenge system
- Designed, developed, and characterized a novel dual rabbit head-out plethysmography nose-only inhalation challenge system
- Aerosolized *Bacillus anthracis* Ames, *Yersinia pestis* CO92, Influenza A (H1N1), *Mycobacterium tuberculosis* H37Rv

Lovelace Respiratory Research Institute (LRRI)

Albuquerque, New Mexico

Research Associate (1999 – 2005)

Duties:

Aerosol Respiratory and Dosimetry Program Staff Scientist

Study Director and Supervisory experience

IACUC member

Infectious Diseases Committee member

Biological Safety Level-3 Committee member

Visiting scientist at the Research Center for Toxicology and Hygienic Regulation of Biopreparations (RCT&HRB), Serpukhov, Russia

Significant Accomplishments:

- Designed, developed and characterized a Canine Oro-Nasal Inhalation Exposure System
- Designed, developed and characterized a Dry Powder Aerosol Generator
- Designed, developed and characterized an All-Glass Nebulizer
- Designed, developed, and characterized a Quad-Track Diffusion Dryer
- Designed, developed, and characterized a nonhuman primate oro-nasal inhalation exposure face mask

- Presented Joint University Program (JUP) International Scientific Transfer Committee (ISTC) Recommended Strategy Program to the Research Center for Toxicology and Hygienic Regulation of Biopreparations (RCT&HRB), Serpukhov, Russia, 2005
- Presented JUP ISTC Recommended Strategy Program to the ISTC, Washington, DC, 2005
- Aerosol Scientist for pharmaceutical (fentanyl) and chemical (sarin) vapor studies, combustion gas (NO_x, SO_x, HCN), vapor inhalation exposures, nanoparticle (carbon, vanadium pentoxide) inhalation exposures
- Experience with nonhuman primate pulmonary imaging (scintigraphy using ^{99m}Tc-labeled aerosol)

Battelle Memorial Institute

Columbus, Ohio

Research Scientist (1998 to 1999)

Duties:

Test Director, Aerosol Simulant Exposure Chamber at Dugway Proving Ground, Utah

Biological Safety Level-3 Inhalation Challenge Team member

Significant Accomplishments:

- Developed theoretical models and prototypes for 2.5 µm and 5.0 µm aerosol concentrators

Researcher (1997 to 1998)

Duties:

National Security Division Aerosol Science and Technology Assessment Division Aerosol Scientist

Conducted aerosol science projects focused on the development of filters for respiratory protection of military personnel

Project Supervisor (1996 to 1997)

Duties:

Inhalation toxicology laboratory supervisor

Conducted inhalation toxicology studies of pharmaceutical test materials in rodents, canines, and nonhuman primates

Conducted inhalation toxicology studies using metered dose inhalers and dry powder inhalers

Naval Medical Research Institute Detachment Toxicology (NMRI/TD)

WPAFB, OH

Contractor – GEO-Centers, Inc.

Group Supervisor I / Scientist II (1993 to 1996)

Duties:

Inhalation Laboratory Manager and Group Supervisor

Experience with generation and inhalation exposures with combustion gases CO and CO₂
Experience with generation and inhalation exposures with chlorofluorocarbons (CFC),
hydrofluorocarbons (HFC), and halocarbons
Generation and inhalation exposure with acrolein vapor

Oral Presentations

Development of a Dual Rabbit Head-Out Plethysmography Nose-Only Inhalation System; L.E. Bowen, Aerobiology in Biodefense IV Conference, Glen Allen, VA, June 2011

Development of a Low-Flow Liquid Impinger; L.E. Bowen, Aerosol Monitoring Users Group Annual Meeting, Las Vegas, NV, May 2011

Inhalation Dosimetry in Murine Bioaerosol Challenge Models, L.E. Bowen, Aerobiology in Biodefense III Conference, Cumberland, MD, July 2009

Bioaerosol Inhalation Exposure, L.E. Bowen, Mid-South AALAS Spring Meeting, Birmingham, AL, May 2008

Nose-Only Inhalation Exposure, L.E. Bowen, Air Monitoring Users Group Annual Meeting, Las Vegas, NV, April 2008

Evaluation of a Low-Flow Stainless Steel Impinger, L.E. Bowen, Aerobiology in Biodefense II Conference, Cumberland, MD, July 2007

Nanoparticle Generation, Characterization and Inhalation Exposure, L.E. Bowen, National Institute for Standards and Technology (NIST) meeting, University of Alabama at Birmingham, March 2007

ABL-3 Inhalation Exposure System Overview, L.E. Bowen, Southeastern Biosafety Association (SEBSA) meeting, Birmingham, AL, June 2006

What Are Bioaerosols and Why Do We Work With Them, L.E. Bowen, BioTeach Community Outreach Program of the University of Alabama Birmingham, Birmingham, AL, July 2005

Recommended Strategy Program, Research Center for Toxicology and Hygienic Regulation of Biopreparations (RCT&HRB), Serpukhov, Russia, 2005

Recommended Strategy Program, Joint University Program (JUP) International Scientific Transfer Committee (ISTC), Washington, DC, 2005

Inhalation Exposure and Aerosol Characterization, L.E. Bowen, Annual New Mexico Branch AALAS Meeting, Albuquerque, NM, July 30, 2004

Aerosol Characterization of a Buxco Inhalation Exposure System, L. E. Bowen, E. G. Barrett, E. B. Barr, J. D. McDonald and J.L. Mauderly, poster platform session, at the 40th Annual SOT, San Francisco, CA, 2001

Small Animal Exposure Chambers: Concepts and Characterization, L.E. Bowen, The Rohm and Haas Company, Springhouse, PA, February 1993

Journal Publications

Slattery, SD, Bowen, LE, Mistry, A, Dzierlenga, M, Hartman, JK. Development of an *in vitro* approach to point-of-contact inhalation toxicity testing of volatile compounds, using organotypic culture and air-liquid interface exposure. *Toxicology In Vitro*, in submission. 2020

Ruiz, SI, **Bowen, LE**, Bailey, MM, and Berkland, C. Pulmonary delivery of Ceftazidime for the treatment of melioidosis in a murine model. *Mol Pharm*, 15(3): 1371-1376. 2018

Ruiz, SI, El-Gendy, N, **Bowen, LE**, Berkland, C, Bailey, MM. Formulation and characterization of nanocluster Ceftazidime for the treatment of acute pulmonary melioidosis. *J Pharm Sci*, 105(11): 3399-3408. 2016

Bowen L.E., Bailey M.M., Haupt B.R., Anderson J.B. Development and characterization of an oro-nasal inhalation plethysmography mask exposure system. *Aerosol Science and Technology*, Volume 51, Iss. 4. 2016

Raju SV, Jackson PL, Courville CA, McNicholas CM, Sloane PA, Sabbatini G, Tidwell S, Li PT, Lui B, Fortenberry JA, Jones CW, Boydston JA, Clancy JP, **Bowen LE**, Accurso FJ, Blalock JE, Dransfield MT and Rowe SM. Cigarette smoke induces systemic defect in cystic fibrosis transmembrane conductance regulation function. *Am J Respir Crit Care Med*, Vol 188, Iss. 11, 1321-1330. 2013

Rivers K, **Bowen LE**, Gao J, Yang K, Trombley JE, Bohannon JK, Eichelberger MC. Comparison of the effectiveness of antibody and cell-mediated immunity against inhaled and instilled influenza virus challenge. *Virology*. 10:198. doi: 10.1186/1743-422X-10-198. 2013

Bowen, Larry E., Rivers, Katie, Trombley, John E., Bohannon, J. Kyle, Li, Shixiong X., Boydston, Jeremy A. and Eichelberger, Maryna C. Development of a murine nose-only inhalation model of influenza: comparison of disease caused by instilled and inhaled A/PR/8/34. *Frontiers in Cellular and Infection Microbiology*. Volume 2; Article 74; May 2012.

Bracher, A, Doran, S, Squadrito, G, Postlethwait, E, **Bowen, L**, Matalon, S. Targeted aerosolized delivery of ascorbate in the lungs of chlorine-exposed rats. *Journal of Aerosol Medicine and Pulmonary Drug Delivery*. 03/2012; DOI: 10.1089/jamp.2011.0963.

Zarogiannis, S. G., A. Jurkuvenaite, S. Fernandez, S. F. Doran, A. K. Yadav, G. L. Squadrito, E. M. Postlethwait, **L. Bowen**, and S. Matalon. Ascorbate and Deferoxamine Administration Post

Chlorine Exposure Decrease Mortality and Lung Injury in Mice. *Am J Respir Cell Mol Biol.* 45, 3860. 2011

Fanucchi, Michelle V, Bracher, Andreas, Doran, Stephen F, Squadrito, Giuseppe L, Fernandez, Solana, Postlethwait, Edward M, **Bowen, Larry**, and Matalon, Sadis. Post-Exposure Antioxidant Treatment Decreases Airway Hyperplasia and Hyperreactivity Due to Chlorine Inhalation in Rats. *Am J Respir Cell Mol Biol.* 2011

Cheng, YS, **Bowen, LE**, Rando, RJ, Postlewait, EM, Squadrito, GL, and Matalon, S. Exposing Animals to Oxidant Gases: Nose Only vs. Whole Body. *Proc Am Thora Soc.* Vol 7. pp 264-268. 2010

Bowen, LE. Does that face mask really protect you? *Applied Biosafety: Journal of the American Biological Safety Association.* Volume 15 No. 2. 2010

Edgerton, DS, Cherrington, AD, Williams, P, Neal, DS, Scott, M, **Bowen, L**, Wilson, W, Hobbs, CH, Leach, C, Kuo, MC. Inhalation of human insulin (Exubera) augments the efficiency of muscle glucose uptake in vivo. *Diabetes.* 55(12): 3604-3610. 2006

Edgerton, DS, Stettler, KM, Neal, DW, Scott, M, **Bowen, L**, Wilson, W, Hobbs, CH, Leach, C, Strack, TR, Cherrington, AD. Inhalation of human insulin is associated with improved insulin action compared with subcutaneous injection secretion in dogs. *J Pharmacol Exp Ther.* 19(3): 1258-1264. 2006

March, T. H., **Bowen, L. E.**, Finch, G. L., Nikula, K. J., Wayne, B. J. and Hobbs, C. H. Effects of Strain and Treatment with Inhaled All-Trans-Retinoic Acid on Cigarette Smoke-Induced Pulmonary Emphysema in Mice. *COPD: Journal of Chronic Obstructive Pulmonary Disease,* 3:289-302. 2005

Edgerton, DS, Neal, DW, Scott, M, **Bowen L**, Wilson, W, Hobbs, CH, Leach, C, Strack, TR, Cherrington, AD. Inhalation of insulin (Exubera) is associated with augmented disposal of portally infused glucose in dogs. *Diabetes.* 54(4):1164-1170. 2005

March, TH, Cossey, PY, Esparza, DC, Dix, KJ, McDonald, **Bowen, LE.** Inhalation administration of alltrans retinoic acid for treatment of elastase-induced pulmonary emphysema in rats. *Exp Lung Res.* 30(5):383-404. 2004

Cherrington, AD, Neal, DW, Edgerton, DS, Glass, **Bowen, LE**, Hobbs, CH, Leach, C, Strack, TR. Inhalation of insulin in dogs. Assessment of insulin levels and comparison to subcutaneous injection. *Diabetes.* 53(4):877-881. 2004

March, T. H., Cossey, P. Y., Wayne, B. J., Esparza, D. C., and **Bowen, L. E.** All trans-retinoic acid (ATRA) administered by inhalation or injection does not ameliorate pulmonary emphysema in two animal models. *Am. J. Respir. Crit. Care Med.* 167(7):A317. 2003

Barret, EG, Rudolph, K, **Bowen, LE**, Bice, DE. Parental allergic status influences the risk of developing allergic sensitization and an asthmatic-like phenotype. *Immunology*. 110(4):493-500. 2003

Barrett, E. G., K. Rudolph, **L. E. Bowen**, B. A. Muggenburg and D. E. Bice. Effect of Inhaled Ultrafine Carbon Particles on the Allergic Airway Response in Ragweed Sensitized Dogs. *Inhal. Toxicol.* 15:151- 165. 2003

McDonald, J., **L. Bowen**, J. Mauderly and M. Lomask: Observations and Recommendations Regarding the BUXCO Aerosol Delivery/Unrestrained Plethysmograph Systems. *The Toxicologist* 72: 295 (abstract #1435), 2003

Benson, J.M., Hahn, F.F., Tibbetts, B.M., **Bowen, L.E.**, March, T.F., Langley, R.J., Murray, T.F., Bourdelais, A.J., Naar, J., and Baden, D.G. Florida Red Tide: Inhalation Toxicity of *Karenia brevis* Extract in Rats. Steidinger, K.A., Landsberg, J.H., Tomas, C.R., and Vargo, G.A. (Eds.) 2004. Harmful Algae. Florida Fish and Wildlife Conservation Commission, Florida Institute of Oceanography, and Intergovernmental Oceanographic Commission of UNESCO. 502-504. 2002

Redman, T. K., K. Rudolph, E. B. Barr, **L. E. Bowen**, B. A. Muggenburg and D. E. Bice. Pulmonary Immunity to Ragweed in a Beagle Dog Model of Allergic Asthma. *Exp. Lung Res.* 27(5): 433-451. 2001

Ritchie GD, Kimmel EC, **Bowen LE**, Reboulet JE, Rossi III J. Acute neurobehavioral effects in rats from exposure to HFC 134a or CFC 12. *Neurotoxicology*. Apr 22(2):233-48. 2001

Bowen, L. E., E. G. Barrett, E. B. Barr, J. D. McDonald and J. L. Mauderly: Aerosol Characterization of a Buxco Inhalation Exposure System. *The Toxicologist* 60(1): 70, 2001

McDonald, J. D., Q. H. Powell, **L. E. Bowen**, and J. L. Mauderly: Organic Carbon Content of Aerosols Produced from a Palas Carbon Generation System. *The Toxicologist* 60(1): 430, 2001

Smith EA, Kimmel EC, English JH, **Bowen LE**, Reboulet JE, Carpenter RL. Evaluation of the respiratory tract after acute exposure to a pyrotechnically generated aerosol fire suppressant. *J Appl Toxicol.* Mar-Apr;17(2):95-103. 1997

G.D. Ritchie, J. Rossi III, E.A. Smith, E.C. Kimmel, **L.E. Bowen**, J.E. Reboulet and M.S. Buring. Behavioral and performance effects of the ozone depleting substance replacement R-134A. *The Toxicologist*, 1994. 14(1), 1994

J. Rossi III, G.D. Ritchie, E.C. Kimmel, **L.E. Bowen**, J.E. Reboulet, and M.S. Buring. The behavioral and performance effects of R-134A a non-ozone depleting refrigerant is being evaluated for ship and submarine use. *Outlook, Highlights of NMRDC Research*, NMRDC Press, 1994