

Lorin M. Bachmann, PhD, DABCC



Professor, Department of Pathology
Co-Director, Clinical Chemistry
Virginia Commonwealth University
October 2007 - Present
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Licenses & Certifications

Diplomate of the American Board of Clinical Chemistry (DABCC), 2009
American Society of Clinical Pathologists (ASCP), MT, 1996

Education

Postgraduate Training

Fellowship in Clinical Chemistry and Laboratory Medicine
University of Virginia, Charlottesville, VA 2004-2007
Commission on Accreditation in Clinical Chemistry program

Graduate Education

PhD, Molecular Medicine/Microbiology University of Virginia
Charlottesville, VA 2005

Undergraduate Education

BS, Biology with option in Medical Technology
Virginia Tech, Blacksburg, VA 1997

ASCP certified program in Medical Technology Roanoke
Memorial School of Medical Technology Roanoke, VA 1996

Awards

2019	Plenary Lecture Award, CPSA
2017	Excellence in Education, AACC
2017	Outstanding Speaker Award, AACC
2016	Service Award, Clinical Laboratory and Standards Institute (CLSI)
2016	Keynote Lecture Award, CPSA
2016	Outstanding Speaker Award, AACC
2015	Leadership and Service Award, Clinical and Laboratory Standards Institute (CLSI)
2015	Saul Kay Award for Resident Education, VCU
2014	Outstanding Speaker Award, AACC
2013	Outstanding Speaker Award, AACC
2013	Joseph H. Roe Award, AACC Capital Section
2013	VCU Pathology Service Award, VCU
2012	Clinical Chemist Recognition Award, AACC
2012	SYCL Outstanding Roundtable Speaker Award, AACC
2012	Presidential Citation Award, AACC
2011	Outstanding Brown Bag Speaker Award, AACC
2011	Past President's Award, AACC, Capital Section
2008	National Academy of Clinical Biochemistry Distinguished Abstract Award, AACC, Washington DC
2006	Dept. of Pathology Research Award, University of Virginia, Charlottesville, VA
2005	Paul E. Strandjord Clinical Investigator Award, ACLPS, Pittsburgh PA
2003	Visiting Research Scientist Award, BD Diagnostics, Sparks MD
2002	Biotechnology Training Program Fellowship Award, Charlottesville, VA

Virginia Commonwealth University and Medical Center Appointments

Professor, Department of Pathology

Co-Director, Clinical Chemistry

Co-Director, Point of Care Testing

Director, New Kent Emergency Department Laboratory

VCU Service

Faculty Advisor, Pathology Safety Committee
Co-Chair, Clinical Pathology Research Committee
Member, Critical Care Committee
Member, Laboratory Utilization Committee
Member, Chest Pain Accreditation Committee

Professional Organizations

American Association for Clinical Chemistry (AACC)
College of American Pathology (CAP)
Clinical and Laboratory Standards Institute (CLSI)

Professional Service

Member, American Association For Clinical Chemistry (AACC) Finance Committee
Member, American Association For Clinical Chemistry (AACC) Nominating Committee
Chair, Clinical and Laboratory Standards Institute (CLSI) Expert Panel on Clinical Chemistry and Toxicology
Co-Chair, Clinical and Laboratory Standards Institute (CLSI), revision of CLSI EP26, User Evaluation of Between-Reagent Lot Variation, 2nd ed.
Member, Clinical and Laboratory Standards Institute (CLSI) Education Committee
Member, College of American Pathologists (CAP) Accuracy Based Programs Committee
Member, NKDEP-IFCC LWG for Standardization of Urine Albumin (CAP)
Member, Clinical and Laboratory Standards Institute (CLSI), revision of CLSI EP-25, Evaluation of Stability of In Vitro Diagnostic Reagents
Member, Document Development Committee, Clinical and Laboratory Standards Institute (CLSI), CLSI C64 (Draft Document), Quantitative Measurement of Proteins and Peptides by Mass Spectrometry
Expert Panel Member, FDA Workshop (CDRH): Regulatory Considerations

Surrounding Validation of Liquid Chromatography-Mass Spectrometry Based Devices

Expert Panel Member, American Association of Pharmaceutical Scientists (AAPS)/FDA Crystal City VI: Bioanalytical Method Validation (BMV) on Biomarkers

Co-Chair, Document Development Committee, CLSI guideline C57: Mass Spectrometry for Androgen and Estrogen Measurement in Serum

Member, Document Development Committee, CLSI guideline C62: Development and Validation of Liquid Chromatograph-Tandem Mass Spectrometry (LC- MS/MS) Methods for the Clinical Laboratory

Member, Framingham Laboratory Review Committee, National Heart Lung and Blood Institute

Recent Grants

Industry Sponsored: Three assay validations new liquid chromatography tandem mass spectrometry analyzer (PI), 2015-2022

Industry Sponsored: Evaluation of a transplant biomarker (PI), 2019-2020

Industry Sponsored: Evaluation of a cardiac biomarker (PI), 2018-2020

National Institutes of Standards and Technology (NIST): Procurement of materials for development of a Serum Reference Material (PI), 2018

Industry Sponsored: Evaluation of a new diagnostic device (PI), 2017

Industry Sponsored: Evaluation of a new preanalytical module for LC-MS/MS analysis (PI), 2017

National Kidney Disease Education Program (NKDEP)/NIDDK: "Effects of Freeze-Thaw on Urine Albumin Measurement" (PI), 2016

Recent Invited Presentations

Best Practices to Recover from an Out-of-Control Event, Bio-Rad Quality Control Conference, National Webinar. June 30th, 2021.

LC-MSMS 101: Getting Started with Quantitative LC-MS/MS in the Diagnostic Laboratory (4-day workshop). Virtual Meeting, August 14-17th, 2021.

Proficiency Testing: Quandaries and Case Studies. AACC Annual Meeting, December 13th-17th 2020, Virtual Meeting

Plenary Session: The Impact of Bioanalytical Decision Making on Patient Care. Clinical and Pharmaceutical Solutions through Analysis (CPSA) annual meeting, October 28-31, 2019, Langhorne, PA.

Session Moderator and Invited Speaker, Beyond QC – Ongoing Performance Monitoring. AACC Annual Meeting August 5-8, 2019, Anaheim CA.

State of Harmonization in the Clinical Laboratory: Benchmarks and Where We Need to Be. Clinical and Pharmaceutical Solutions Through Analysis (CPSA) Annual Meeting, March 11-13, 2019, Atlanta, GA.

Addressing Sources of Error and Interference in Laboratory Measurements." Virginia Commonwealth University Department of Internal Medicine - Division of Endocrinology, Diabetes and Metabolism Grand Rounds Presentation. February 27, 2019.

Development of Reference Systems to Improve Patient Care. Clinical and Pharmaceutical Solutions through Analysis (CPSA) annual meeting, October 15- 18, 2018, Langhorne, PA.

How to Develop a Reference System: The Example of Urine Albumin. American Association for Clinical Chemistry (AACC) annual meeting, June 30-August 2, 2018, Chicago, IL.

Measurement of 25-OH Vitamin D using a fully integrated, automated sample preparation system for LC-MS/MS in the routine clinical laboratory. 6th Shimadzu International Collaborative Laboratory Forum, March 7-10 2018, Fukuoka Japan. Meet at Shimadzu Headquarters in Kyoto March 5-6, 2018.

LCMS 101: Getting Started with Quantitative LC-MS/MS in the Diagnostic Laboratory – 3 day workshop, Mass Spectrometry Applications to the Clinical Laboratory (MSACL) annual meeting, January 20-25, 2018, Palm Springs, CA.

Implementation of a fully integrated automated sample preparation system for routine clinical LC-MS/MS analysis. Mass Spectrometry Applications to the Clinical Laboratory (MSACL) annual meeting, January 20-25, 2018, Palm Springs, CA.

Quality Assurance - The Path to Peace of Mind: Design a Customized and Effective Quality Assurance Program for Your Laboratory : Part 2 and Potential New Approaches for Quality Assurance Monitoring : Part 3 Mass Spectrometry Applications to the Clinical Laboratory (MSACL) annual meeting, January 20-25, 2018, Palm Springs, CA.

Recent Publications

Peer Reviewed Publications

Bachmann LM. Unexpected persistently elevated intraoperative parathyroid hormone levels in a patient with primary hyperparathyroidism [Commentary]. *Clinical Chemistry*, 2021, 67(9):1182-1186.

Bystrom C, Grant RP, **Bachmann LM**, DeMarco M, Holmes DT, Hoofnagle AN, Intelmann D, Jeffery D, Kushnir MM, Ladwig P, Lowenthal MS, Master SR, Shuford CM, Thomas S, Whiteaker J. Clinical and Laboratory Standards Institute (CLSI). Quantitative Measurement of Proteins and Peptides by Mass Spectrometry. 1st ed. CLSI guideline C64. Clinical and Laboratory Standards Institute; 2021

Godbey EA, Anderson MR, **Bachmann L**, Sanford KW, Wieditz K, Roseff SD. How Do We Monitor Hemoglobin S in Patients who Undergo Red Blood Cell Exchange and Take Voxelotor? *Transfusion Medicine*. 2021; 61(6):1680-1683.

Wiencek JR, **Bachmann LM**, Dinwiddie K, Miller WG, Bazydlo LA. Cross-Institutional Evaluation of the Abbott Architect SARS-CoV-2 IgG Immunoassay. *Laboratory Medicine*. 2021; 52(5):e137-e146.

Godbout EJ, Pryor R, Harmon M, Montpetit A, Greer J, **Bachmann LM**, Doll M, Stevens MP, Bearman G. COVID-19 seroprevalence among healthcare workers in a low prevalence region. *Infection Control and Hospital Epidemiology (ICHE)*. Published online Dec 14th, 2020, 1-3. doi:10.1017/ice.2020.1374.

Jayaraman S, DeAntonio JH, Leichtle SW, Han J, Liebrecht L, Contaifer D, Young C, Chou C, Staschen J, Doan D, Kumar NG, Wolfe L, Nguyen T, Chenault G, Anand RJ, Bennett JD, Ferrada P, Goldberg S, Procter LD, Rodas EB, Rossi AP, Whelan JF, Feeser VR, Vitto MJ, Broering B, Hobgood S, Mangino M, Aboutanos M, **Bachmann L**, Wijesinghe DS. Detecting Direct Oral Anticoagulants in Trauma Patients using Liquid Chromatography-Mass Spectrometry: a Novel Approach to Medication Reconciliation. *J Trauma Acute Care Surg*. 2020;88(4):508-514.

Miller WG, **Bachmann LM**, Delanghe JR, Inker LA, Jones GRD, Vassalotti JA. Optimal Use of Biomarkers for Chronic Kidney Disease. *Clin Chem*. 2019;65(8):949-955

Miller WG, **Bachmann LM**, Fleming JK, Delanghe JR, Parsa A, Narva AS; Laboratory Working Group of the National Kidney Disease Education Program and the IFCC Working Group for Standardization of Albumin in Urine. Recommendations for reporting low and high values for urine albumin and total protein. *Clin Chem*. 2019 Feb;65(2):349-350. PMID:30459169.

Jayaraman S, DeAntonio JH, Leichtle SW, Han J, Liebrecht L, Contaifer D, Young C, Chou C, Staschen J, Doan D, Kumar NG, Wolfe L, Nguyen T, Chenault G, Anand RJ, Bennett JD, Ferrada P, Goldberg S, Procter LD, Rodas EB, Rossi AP, Whelan JF, Feeser VR, Vitto MJ, Broering B, Hobgood S, Mangino M, Aboutanos M, **Bachmann L**, Wijesinghe DS. Detecting Direct Oral Anticoagulants in Trauma Patients using Liquid Chromatography-Mass Spectrometry: a Novel Approach to Medication Reconciliation. *J Trauma Acute Care Surg*. 2019 Oct 29. doi: 10.1097/TA.0000000000002527. [Epub ahead of print]. PMID: 31688825.

Miller WG, **Bachmann LM**, Fleming JK, Delanghe JR, Parsa F, Narva AS. Recommendations for reporting low and high values for urine albumin and total protein. *Clin Chem* 2018, 65:349-350.

Jayaraman S, Anand RJ, Mangino M, Aboutanos M, Kasirajan V, Ivatury R, Valadka AB, Hayes RL, **Bachmann LM**, Brophy GM, Contaifer D, Warncke UO, Brophy DF and Wijesinghe DS. Metabolomics and Precision Medicine in Trauma: The State of the Field. *Shock* 2018; 50:5-13.

Miller GM, Seegmiller JC, Lieske JC, Narva AS, **Bachmann LM**. Standardization of Urine Albumin Measurements: Status and Performance Goals. *JALM* 2017; 2:423- 429.

Metzler G, Crathern S, **Bachmann L**, Fernandez-Metzler, King R. Method for Continuous Monitoring of Electrospray Ion Formation. *JASMS* 2017; 28(10): 2117–2123.

Wise SA, Phinney KW, Tai SS, Camara JE, Myers GL, Durazo-Arvizu R, Tian L, Hoofnagle AN, **Bachmann LM**, Young IS, Pettit J, Caldwell G, Liu A, Brooks SPJ, Sarafin K, Thamm M, Mensink GBM, Busch M, Rabenberg M, Cashman KD, Kiely M, Kinsella M, Galvin K, Zhang JY, Oh K, Lee SW, Jung CL, Cox L, Goldberg G, Guberg K, Prentice A, Carter GD, Jones J, Brannon PM, Lucas RM, Crump PM, Cavalier E, Merkel J, Betz JM, Sempos CT. Baseline Assessment of 25- Hydroxyvitamin D Assay Performance: A Vitamin D Standardization Program (VDSP) Interlaboratory Comparison Study. *J AOAC Int* 2017; 100(5):1244-1252.

Phinney KW, Sempos CT, Tai SS, Camara JE, Wise SA, Eckfeldt JH, Hoofnagle AN, Carter GD, Jones J, Myers GL, Durazo-Arvizu R, Miller WG, **Bachmann LM**, Young IS, Pettit J, Caldwell G, Liu A, Brooks SPJ, Sarafin K, Thamm M, Mensink GBM, Busch M, Rabenberg M, Cashman KD, Kiely M, Galvin K, Zhang JY, Kinsella M, Oh K, Lee SW, Jung CL, Cox L, Goldberg G, Guberg K, Meadows S, Prentice A, Tian L, Brannon PM, Lucas RM, Crump PM, Cavalier E, Merkel J, Betz JM. Baseline Assessment of 25-Hydroxyvitamin D Reference Material and Proficiency Testing/External Quality Assurance Material Commutability: A Vitamin D Standardization Program Study. *J AOAC Int*. 2017; 100(5):1288-1293.

Bachmann LM, Yu M, Boyd JC, Bruns DE, Miller WG. State of Harmonization of 24 Serum Albumin Measurement Procedures and Implications for Medical Decisions. *Clinical Chemistry*, 2017; 63(3): 770-779.

King R, Fernandez-Metzler C, **Bachmann LM**. Biomarkers and the Sample Matrix: Challenges and Opportunities [Editorial]. *Bioanalysis* 2016; 8(22): 2291-2293.

Annesley T, Diamandis E, **Bachmann LM**, Hanash S, Hart B, Javahery R, Singh R, Smith R. A Spectrum of Views on Clinical Mass Spectrometry [Editorial]. *Clin Chem* 2016; 62(1): 30-36.

Botelho JC, **Bachmann LM**, Zhimin C, Chandler DW, Clarke N, Demers LM, Fitzgerald R, George MP, Sapp LM, Sluss PM, Testino SA, Wang C, Weintraub RA, Ziegler RG, Vesper HW. Clinical Laboratory and Standards Institute. Mass Spectrometry for Androgen and Estrogen Measurements in Serum; Approved Guideline. CLSI document C57-A. Wayne, PA: Clinical and Laboratory Standards Institute; 2015.

A difference in bias approach for commutability assessment: application to frozen pools of human serum measured by 8 direct methods for HDL Cholesterol and LDL Cholesterol. Korzun WJ, Nilsson G, **Bachmann LM**, Myers GL, Sakurabayashi I, Nakajima K, Nakamura M, Shamburek RD, Remaley AT, Miller WG. Clinical Chemistry 2015, Clin Chem. 2015; 61(8):1107-13.

Jelinek AJ, **Bachmann LM**. Laboratory Test Interferences in a Patient with Multiple Myeloma. Clin Chem 2014; 60:1375-1378.

Wendroth SM, Heady TN, Haverstick DM, **Bachmann LM**, Scott MG, Boyd JC, Bruns DE. Falsely increased chloride and missed anion gap elevation during treatment with sodium thiosulfate. Clin Chim Acta. 2014 Apr 20;431:77-9.

Bachmann LM, Nilsson G, Bruns DE, McQueen MJ, Lieske JC, Zakowski JJ, Miller WG. State of the Art for Measurement of Urine Albumin: Comparison of Routine Measurement Procedures to Isotope Dilution Tandem Mass Spectrometry. Clin Chem 2014; 60:471-480.

Clarke WC, Molinaro RJ, **Bachmann LM**, Cook J, Cao Z, French D, Garg S, Gawoski JM, Grant RP, Hoofnagle AN, Bagyalakshmi I, Kulasingam V, Mason DS, Rappold B, Tacker D, Truscott SM, Chunli Yu, Zhu Y. Clinical Laboratory and Standards Institute. Development and Validation of Liquid-Chromatography-Tandem Mass Spectrometry (LC-MS/MS) Methods for the Clinical Laboratory; Approved Guideline. CLSI document C62-A. Wayne, PA: Clinical and Laboratory Standards Institute; 2014.

Helou M, Ning Y, Yang S, Irvine P, **Bachmann LM**, Godder K, Massey G. Vitamin D Deficiency in Children with Cancer. J Pediatr Hematol Oncol. 2014; 36(3):212-7.

Oliveira MJ, van Deventer HE, **Bachmann LM**, Warnick GR, Nakajima K, Nakamura M, Sakurabayashi I, Kimberly MM, Shamburek RD, Korzun WJ, Myers GL, Miller WG, Remaley AT. Evaluation of four different equations for calculating LDL-C with eight different direct HDL-C assays. Clin Chim Acta. 2013; 423:135-40.

Lieske JC, Bondar O, Miller WG, **Bachmann LM**, Narva AS, Itoh Y, Zegers I, Schimmel H, Phinney K, Bunk DM. A Reference System for Urinary Albumin: Current Status. Clin Chem Lab Med. 2013; 51:981-989.

Nestler JE, Reilly ER, Cheang KI, **Bachmann LM**, Downs RW. A Pilot Study: Effects of Decreasing Serum Insulin with Diazoxide on Vitamin D Levels in Obese Women with Polycystic Ovarian Syndrome. ACCA. 2012; 123: 209-220.

Greenburg N, Roberts WL, **Bachmann LM**, Wright EC, Dalton RN, Zakowski JJ and Miller WG. Specificity Characteristics of 7 Commercial Creatinine Measurement Procedures By Enzymatic and Jaffe Method Principles. Clin Chem. 2012; 58:391- 401.

Book Chapters

Bachmann LM, Miller GW. Principles of spectrophotometry and related photometric measurements. In: Clarke W, Dufour RD, eds. Contemporary Practice in Clinical Chemistry. Fourth edition. Washington D.C.: AACCC Press. 2020:119-133.

Cook JC, **Bachmann LM**, French D. Steroid Hormones. In: Nair H, Clarke W, eds. Mass Spectrometry for the Clinical Laboratory. First edition. Cambridge: Elsevier Inc, 2017:205-226.

Bachmann LM, Miller GW. Principles of Spectrophotometry and Related Photometric Measurements. In: Clarke W, Dufour RD, eds. Contemporary Practice in Clinical Chemistry. Third edition. Washington D.C.: AACCC Press. 2016:81-94.

Bachmann LM, Miller GW. Principles of Spectrophotometry and Related Photometric Measurements. In: Clarke W, Dufour RD, eds. Contemporary Practice in Clinical Chemistry. Second edition. Washington D.C.: AACCC Press. 2011:87-100.