ARUP LABORATORIES

ARUP Laboratories is a national clinical and anatomic pathology reference laboratory and a nonprofit enterprise of the University of Utah and its Department of Pathology. Located in Salt Lake City, Utah, ARUP offers in excess of 3,000 tests and test combinations, ranging from routine screening tests to esoteric molecular and genetic assays. Rather than competing with its clients for physician office business, ARUP chooses instead to support clients’ existing test menus by offering complex and unique tests, with accompanying consultative support, to enhance their abilities to provide local and regional laboratory services. ARUP’s clients include many of the nation’s university teaching hospitals and children’s hospitals, as well as multihospital groups, major commercial laboratories, group purchasing organizations, military and other government facilities, and major clinics. In addition, ARUP is a worldwide leader in innovative laboratory research and development, led by the efforts of the ARUP Institute for Clinical and Experimental Pathology®.

Since its formation in 1984 by the Department of Pathology at the University of Utah, ARUP has founded its reputation on reliable and consistent laboratory testing and service. This simple strategy contributes significantly to client satisfaction. When ARUP conducts surveys, clients regularly rate ARUP highly and respond that they would recommend ARUP to others.

As the most responsive source of quality information and knowledge, ARUP strives to be the reference laboratory of choice for community healthcare systems. ARUP helps its clients meet the customized needs of their unique communities. We believe in collaborating, sharing knowledge, and contributing to laboratory science in ways that provide the best value for the patient. Together, ARUP and its clients will improve patient care today and in the future.

patients. answers. results.

A laboratory test is more than a number; it is a person, an answer, a diagnosis.
client commitment.

ARUP supports our clients’ success by providing excellence and consistency in our delivery of services, by sharing knowledge, and by developing progressive laboratory technology.

ARUP does not compete with its clients for physician office business, choosing instead to support clients’ existing test menus by offering highly complex tests and accompanying consultative support.
INTRODUCTION

ARUP LABORATORIES
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ARUP’S WEBSITE www.aruplab.com
ARUP’s website, www.aruplab.com, contains the up-to-date, searchable Laboratory Test Directory, as well as the current company and testing information, a list of tests by specialty, an overview of ARUP’s Suite of Services, education and lab expertise sections, and various other relevant information for ARUP clients.

Available on www.aruplab.com, ARUP Connect is a secure, online resource that assists registered clients with management of their referral testing. Through Connect, clients can order testing, access test results, manage exceptions, view invoices, and manage their bills, securely and at their convenience. ARUP Connect also allows clients to receive reports and notifications, and order supplies. Contact your business development manager or refer to www.aruplab.com/suite/connect.php for additional information.

ARUP CONSULT® www.arupconsult.com
ARUP Consult, The Physician’s Guide to Laboratory Test Selection and Interpretation, is a dynamic, online reference tool provided by ARUP for all physicians and clinicians at no cost or obligation. ARUP Consult’s goal is to assist the clinician with test selection and interpretation, since knowing the right test to order for a specific disease can improve patient care and decrease unnecessary testing and costs.

Co-authored and maintained by ARUP Laboratories’ expert panel of University of Utah faculty, Consult contains nearly 2,000 lab tests categorized into disease-related topics and 50 algorithms that support clinical decision-making. Topics include clinical background information, concise diagnostic advice, screening and monitoring recommendations, pharmacogenetics information, and test-ordering suggestions.

Consult can be accessed at point-of-care with new and updated content released six times per year, and is available on the web at www.arupconsult.com, on your mobile device at m.arupconsult.com, or as a free app in the App Store.

LABORATORY TEST DIRECTORY
ARUP’s Laboratory Test Directory, available on www.aruplab.com, contains complete, up-to-date test information, including methodology and reporting times, collection and transportation specifications, reference intervals, test notes, and CPT codes. Clients can access entries via an A to Z index located in the upper-left section of the site and search by test name, key word, test number, or mnemonic.

EDUCATION
In partnership with the University of Utah Department of Pathology, ARUP’s Institute for Learning offers credits for a broad range of continuing education opportunities. ARUP’s Online Scientific Resource for Research and Education, located at www.arup.utah.edu, offers more than 17 P.A.C.E.® credits to laboratory professionals and more than 20 CME courses for physicians, all at no cost, with new topics added monthly.

STAFF AND CONSULTANTS
ARUP’s medical directors and consultants are nationally and internationally recognized pathologists, subspecialty-qualified clinicians, and board-certified clinical scientists. These professionals make significant contributions in research and development and support the medical community by providing consultation in all aspects of laboratory medicine; each holds a faculty appointment at the University of Utah School of Medicine.

ARUP’s medical and technical staff author textbooks and journal articles, as well as present lectures, workshops, and symposia at regional, national, and international meetings.

ACCREDITATIONS AND LICENSURE
ARUP Laboratories maintains a current CLIA number with the U.S. Department of Health and Human Services Centers for Medicare and Medicaid Services (CMS), is accredited by the College of American Pathologists (CAP), and holds all other necessary state licenses. For additional information or copies of our certificates, please visit www.aruplab.com or call Client Services at (800) 522-2787.
The executive management team’s maturity and devotion to patient care, from both a medical and business perspective, sustain ARUP as a valuable asset to its clients and the lab industry. Each executive management team member possesses leadership and vision in his or her related areas of expertise, resulting in a better, stronger, and smarter laboratory.

**JULIE ALTWIES**
*Vice President, Director of Sales ARUP Laboratories*
Ms. Altwies has been with ARUP since 2010 and is currently the vice president and director of sales in ARUP’s Business Development Division. Prior to joining ARUP, Ms. Altwies spent more than 20 years in the healthcare industry, and has extensive experience in sales management, leadership training, strategic planning, and marketing. Prior to joining ARUP, Ms. Altwies spent several years at Byram Healthcare and two decades at Roche Diagnostics. She received a bachelor of science from the University of Kansas.

**NANCY ANDES, MBA, MT(ASCP)**
*Senior Vice President Marketing*
As senior vice president of Marketing, Ms. Andes is responsible for the Integrated Marketing Communications, Marketing Research/Analytics, Proposal/Contract, and Strategic Pricing teams. She has more than 30 years of laboratory experience in the hospital and reference laboratory setting, with nearly 20 years of sales and marketing experience. Ms. Andes received her MBA from the University of Phoenix and earned a BS in clinical laboratory science from the University of Utah.

**JERRY W. HUSSONG, MD, MS**
*Vice President, Chief Medical Officer/Director of Laboratories\nMedical Director, Immunology and Infectious Disease Laboratories*
Dr. Hussong is a chief medical officer and director of laboratories at ARUP Laboratories and an associate professor of pathology at the University of Utah School of Medicine. He received his MD at Northwestern University Medical School and his DDS from Northwestern University Dental School; he also received an MS degree in cellular and molecular pathology at Northwestern University. Dr. Hussong completed a postdoctoral fellowship in hematopathology at the University of Utah and served an AP/CP pathology residency at Northwestern Memorial Hospital in Chicago. Dr. Hussong serves on the editorial board of *Archives in Pathology* and has been a member of the CAP Cancer Committee and Surgical Pathology (PIP) Committee. His clinical interests include flow cytometry, hematopathology, and immunohistochemistry; he also has a strong additional research interest in the prognostic role of angiogenesis in hematopoietic neoplasms.
EXECUTIVE MANAGEMENT TEAM

DAVID P. JACKSON, MBA
Senior Vice President
Strategic Services

Mr. Jackson is senior vice president of Strategic Services at ARUP. His specific areas of responsibility include strategic planning, project management, human services, and education. Mr. Jackson's former duties at ARUP included facility operations and development, as well as new building construction.

Prior to joining ARUP, Mr. Jackson worked in various marketing, planning, and operations positions at a number of hospitals, health systems, and medical group practices. In addition, he has more than 20 years of experience as a healthcare consultant, focusing on general growth strategies and new program development and implementation. Mr. Jackson received his BA and MBA degrees from the University of Utah.

BRIAN R. JACKSON, MD, MS
Vice President, Chief Medical Informatics Officer

As vice president and chief medical informatics officer, Dr. Jackson directs the Informatics Department at ARUP, including ARUP Consult, decision support, product management, informatics software development, and ATOP® consulting. He is also the medical director for Referal Testing and an associate professor of pathology at the University of Utah. He received his BA in mathematics, his MS in medical informatics, his MD from the University of Utah, and completed a clinical pathology residency at Dartmouth-Hitchcock Medical Center. Prior to his employment at ARUP, Dr. Jackson was a staff clinical pathologist and informaticist at Dartmouth-Hitchcock Medical Center, a product manager for a Belgium-based medical software firm, and a National Library of Medicine informatics fellow at the University of Utah. Dr. Jackson’s research interests include economic analysis of diagnostic testing and physician utilization of laboratory tests. He is certified in clinical pathology by the American Board of Pathology.

PETER E. JENSEN, MD
Chairman
Department of Pathology, University of Utah

Dr. Jensen is professor and chair of the Department of Pathology at the University of Utah. He received his MD from the Vanderbilt University School of Medicine and completed residency training in anatomic pathology at Washington University in St. Louis. Dr. Jensen was previously a professor and director of experimental pathology and director of clinical immunology in the Department of Pathology and Laboratory Medicine at Emory University in Atlanta. His research is focused on various aspects of immunology, including antigen processing and presentation, immune regulation, and autoimmunity.

DEAN Y. LI, MD, PHD
Interim President and CEO, ARUP Laboratories
Chief Scientific Officer for U of U Health Sciences
Associate VP for Research, University of Utah Health Sciences
Interim Co-Chair, Department of Physiology
Director, Molecular Medicine Program
Vice Dean for Research, School of Medicine

Dr. Li is a distinguished scientist and internationally recognized for his groundbreaking research in vascular development and disease. In addition, Dr. Li practices general cardiology and ICU medicine, diagnosing and treating patients at the Veterans Hospital. He is the HA and Edna Benning Endowed Professor of Internal Medicine and Director of the Molecular Medicine Program and School of Medicine MD/PhD Program. He is also an Adjunct Professor of Human Genetics and Adjunct Professor of Oncological Sciences. Dr. Li received his bachelor’s degree from the University of Chicago and his graduate degrees from Washington University in St. Louis.
JOHN R. PENROSE, BS  
Senior Vice President  
Chief Information Officer  
Mr. Penrose has more than 25 years of experience in clinical laboratory information technology and is a member of HIMSS (Healthcare Information and Management Systems Society) and CHIME (College of Healthcare Information Management Executives). He previously worked for Cerner Corporation, where he designed, developed, and implemented laboratory information systems. Mr. Penrose received a BSBA in computer information systems from the University of Central Missouri.

SHERRIE L. PERKINS, MD, PHD  
Senior Vice President, Research and Development  
Co-Executive Director, ARUP Institute for Clinical and Experimental Pathology  
Head, Hematopathology  
Dr. Perkins is a senior vice president of Research and Development, co-executive director of the Institute for Clinical and Experimental Pathology, and head of hematopathology at ARUP, as well as the chief of the Clinical Pathology Division, vice chair of pathology, and tenured professor at the University of Utah School of Medicine. Dr. Perkins has been with ARUP and the University of Utah for more than 20 years and has served in numerous leadership positions, including director of hematopathology, interim department chair, and, for the past three years, a member of the ARUP Laboratories’ executive management team. She is board certified in anatomic pathology, with a special qualification in hematology. Dr. Perkins received her PhD in biochemistry from the University of Miami, and earned her MD and completed her pathology residency at Washington University in St. Louis. She completed her hematopathology fellowship under Dr. Carl Kjeldsberg at the University of Utah and has published more than 170 peer-reviewed articles and 70 book chapters.

ANDREW A. THEURER, CPA, BA  
Senior Vice President  
Chief Financial Officer  
Mr. Theurer is a senior vice president and chief financial officer at ARUP. He is a certified public accountant and has more than 20 years of experience in accounting and more than 18 years of experience in healthcare. He is a member of several societies, including the American Institute of Certified Public Accountants and the Utah Association of Certified Public Accountants.

CONNIE WILKINS, MSHA, MT (ASCP)  
Senior Vice President  
Director of Technical Operations  
Ms. Wilkins is a senior vice president responsible for technical operations at ARUP Laboratories. She has over 20 years of executive and operational experience in the healthcare industry, and has served as a clinical consultant internationally as part of the President’s Emergency Plan for AIDS Relief (PEPFAR). Ms. Wilkins received a BS in medical technology from Missouri Southern State College and an MHA from Central Michigan University.
ARUP’s medical directors and consultants are nationally and internationally recognized pathologists, subspecialty-qualified clinicians, and board-certified clinical scientists. These professionals make significant contributions in research and development, and each holds a faculty appointment at the University of Utah School of Medicine.

**ARCHANA MISHRA AGARWAL, MD**  
Medical Director, Hemoglobin  
Associate Medical Director, Molecular Oncology  
Dr. Agarwal is the medical director of the Hemoglobin Laboratory in the Special Genetics Division and an associate medical director of the Molecular Oncology Laboratory at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. Dr. Agarwal received her MD at Delhi University in India and was a postdoctoral research scholar at the University of Iowa. She served as a pathology resident, a hematopathology fellow, and a molecular genetics pathology fellow at the University of Utah School of Medicine. Dr. Agarwal is board certified in hematopathology, anatomic pathology, and clinical pathology. She is also a member of several professional societies, including the College of American Pathologists and the American Society for Clinical Pathology. Dr. Agarwal’s research interests include red-cell enzymopathies, hemoglobinopathies, and molecular hematopathology.

**ERIKA ANDERSEN, PHD**  
Medical Director, Cytogenetics and Genomic Microarray  
Dr. Andersen is a medical director of the Cytogenetics and Genomic Microarray laboratories at ARUP and an instructor at the University of Utah School of Medicine. She received her PhD in genetics from the University of Wisconsin-Madison and completed a clinical cytogenetics fellowship at the University of Utah.

**MOUIED ALASHARI, MD**  
Pediatric Pathologist  
Dr. Alashari is the director of perinatal pathology at Primary Children’s Hospital and an associate professor of pathology at the University of Utah School of Medicine. He received his MD from Baghdad University College of Medicine, and completed residencies in anatomic pathology and general surgery at New York Medical College, a clinical pathology residency at Yale University, and a pediatric pathology fellowship at the Children’s Hospital of Pittsburgh. He is board certified by the American Board of Pathology in anatomic and clinical pathology and pediatric pathology. Dr. Alashari is a member of several professional societies, including the Society for Pediatric Pathology, the American Society of Clinical Pathologists, and the College of American Pathologists.

**EDWARD R. ASHWOOD, MD**  
Medical Director, Maternal Serum Screening  
Vice President for Government Relations/ARUP  
Dr. Ashwood is a professor of pathology at the University of Utah School of Medicine. He joined ARUP in 1985. He received his MD from the University of Colorado and completed a laboratory medicine residency in clinical pathology at the University of Washington. Dr. Ashwood is board certified in clinical and chemical pathology, and his research interests include the clinical chemistry of pregnancy. He is the co-editor of the Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, Tietz Fundamentals of Clinical Chemistry, and Fundamentals of Molecular Diagnostics. He is a trustee of the College of American Pathologists. He served as ARUP’s CMO from 2002 to 2009 and ARUP’s President and CEO from 2009 to 2015. As the Vice Chair for Health Policy, Department of Pathology, he is leading a nationwide effort to mitigate the FDA’s intent to regulate laboratory developed tests.

**DANIEL ALBERTSON, MD**  
Staff Pathologist, Surgical Pathology and Oncology  
Dr. Albertson is a staff pathologist in the Surgical Pathology and Oncology Division at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. He received his MD from the University of Nebraska and completed his residency in anatomic and clinical pathology at Creighton University, followed by a surgical pathology fellowship at the University of Utah. While at Creighton, Dr. Albertson served as the chief resident for two years and received the Hal Lankford Pathology Resident Award. He is a member of the American Society for Clinical Pathologists (ASCP) and the College of American Pathologists (CAP). Dr. Albertson’s special research interest includes genitourinary pathology.

**DAVID W. BAHLER, MD, PHD**  
Staff Pathologist, Hematopathology  
Dr. Bahler is a staff pathologist in hematopathology at ARUP and an associate professor of pathology at the University of Utah School of Medicine. He is certified by the American Board of Pathology in clinical pathology, with an added qualification in hematology. Dr. Bahler received his PhD in immunology and his MD from the University of Rochester.
ADAM BARKER, PHD
Medical Director, Microbiology
Dr. Barker is a medical director of microbiology at ARUP Laboratories and an assistant professor at the University of Utah School of Medicine. He received his PhD in microbiology and immunology at the University of Colorado Health Sciences Center and completed a postdoctoral fellowship in the Department of Microbiology and Molecular Genetics at Harvard Medical School. Dr. Barker is the recipient of the 2009 Outstanding Postdoctoral Award from the Harvard Medical School and 2002 Excellence in Research Award from the University of Colorado Health Sciences Center. He is a member of the American Society of Microbiology, Biophysical Society, and Protein Society.

PINAR BAYRAK-TOYDEMIR, MD, PHD
Medical Director, Molecular Genetics and Genomics
Dr. Bayrak-Toydemir is the medical director of the Molecular Genetics and Genomics laboratories at ARUP and an associate professor of pathology at the University of Utah, School of Medicine. Dr. Bayrak-Toydemir received her MD from the Ankara University School of Medicine in Ankara, Turkey, where she also received her PhD in human genetics. Subsequently, she completed her fellowship in clinical molecular genetics at the University of Utah. She is board certified in medical genetics, and her research interests include inherited vascular disorders, specifically hereditary hemorrhagic telangiectasia, and implementation of new technologies, such as next-generation sequencing, in clinical settings.

PHILIP S. BERNARD, MD
Medical Director, Molecular Oncology
Dr. Bernard is the medical director of the Molecular Oncology Laboratory at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. As an investigator at the Huntsman Cancer Hospital, Dr. Bernard’s laboratory uses microarrays for a comprehensive genomics approach to developing molecular classifications for cancer. Dr. Bernard received his MD from and completed his postdoctoral training at the University of Utah and is certified in clinical pathology by the American Board of Pathology.

HUNTER BEST, PHD
Medical Director, Molecular Genetics
Dr. Best is a medical director of the Molecular Genetics Department at ARUP and an assistant professor of clinical pathology at the University of Utah School of Medicine. Dr. Best received his PhD in molecular and cellular pathology at the University of North Carolina School of Medicine and completed a fellowship in clinical molecular genetics at the Vanderbilt University Medical Center in Nashville. He is a member of the American Society for Investigative Pathology, Association for Molecular Pathology, and American Association for the Advancement of Science.

ROBERT C. BLAYLOCK, MD
Medical Director: Blood Services and Phlebotomy and Support Services; Immunohematology Reference Lab; University Hospitals and Clinics Clinical Lab; U of U Transfusion Services
Dr. Blaylock is the medical director of the Immunohematology Reference Lab, Blood Services, and Phlebotomy and Support Services at ARUP, and the Clinical Lab and Transfusion Services at the University of Utah Hospitals and Clinics. He is also an associate professor of pathology at the University of Utah School of Medicine. Dr. Blaylock received his MD from the University of Utah School of Medicine and is board certified in clinical pathology by the American Board of Pathology, with special certification in blood banking/transfusion medicine. Dr. Blaylock co-authored Practical Aspects of the Transfusion Service.

MARY BRONNER, MD
Division Chief, Anatomic Pathology and Oncology
Dr. Bronner is the division chief of the Anatomic Pathology and Oncology divisions at ARUP and Carl R. Kjeldsberg presidential endowed professor of pathology at the University of Utah School of Medicine. She received her MD from the University of Pennsylvania and completed her residency training at the Hospital of the University of Pennsylvania. Her honors include her election as president of the GI Pathology Society and the award of the 2005 Arthur Purdy Stout Prize, recognizing her work as a surgical pathologist under the age of 45. Dr. Bronner has served as an investigator on numerous NIH and foundation grants and has published over 100 peer-reviewed articles and numerous book chapters. Her research interests include molecular biomarkers for the early detection and prevention of gastrointestinal cancers.

BART BARBERT, MD
Medical Director, Cytology Laboratory
Dr. Bart Barbert is a medical director of the Cytology Laboratory and a staff pathologist of surgical pathology at the University of Utah School of Medicine. He received his MD from the University of Utah and is certified in clinical pathology, with special certification in surgical pathology. Dr. Barbert’s research interests include the use of molecular markers in cytology and the development of new technologies for the early detection and prevention of gastrointestinal cancers.

BARBARA E. CHADWICK, MD
Medical Director, Anatomic Pathology
Dr. Chadwick is a medical director of the Cytology Laboratory and a staff pathologist of surgical pathology at ARUP, as well as an assistant professor of anatomic pathology at the University of Utah School of Medicine. Dr. Chadwick received her MD at Loma Linda University in California where she also served as a pathology fellow. She completed her residency in anatomic and clinical pathology at the University of Utah School of Medicine and was a cytopathology fellow at the University of Washington in Seattle. She is a member of the United States and Canadian Academy of Pathology, American Society of Cytopathology, and College of American Pathologists. Dr. Chadwick’s research interests include the use of molecular markers in cytology, pancreatic and biliary cancer, and cervical cancer screening.

XINJIAN CHEN, MD, PHD
Medical Director, Anatomic Pathology
Dr. Chen is a medical director of the Anatomic Pathology Laboratory and a staff pathologist of surgical pathology at ARUP, as well as an associate professor of anatomic pathology, cell biology, and immunology at the University of Utah School of Medicine. Dr. Chen received his MD from the Hunan Medical College in Hunan, China and his PhD from the University of Alabama at Birmingham. Following his completion of an internship in internal medicine at the University of Alabama at Birmingham, Dr. Chen served as a research fellow in dermatology at Stanford University and resident fellow in pathology at Emory University Hospital. Dr. Chen’s research is focused on mechanisms regulating immunity and immunological tolerance and mechanisms for immunodeficiency and autoimmune diseases.
FREDERIC CLAYTON, MD  
**Director, Anatomic Pathology Autopsy Services**  
Dr. Clayton is the director of the Anatomic Pathology Autopsy Service at ARUP and an associate professor of pathology and autopsy director at the University of Utah School of Medicine. Dr. Clayton received his MD from Washington University in St. Louis and completed postgraduate training in anatomic pathology at Stanford University Hospital and in clinical pathology at the University of Utah. He also completed a fellowship in surgical pathology at the University of Minnesota Hospital and in anatomic pathology at Anderson Hospital. He is a member of the United States and Canadian Academy of Pathology.

IRENE DE BIASE, MD, PHD  
**Assistant Medical Director, Biochemical Genetics and Newborn Screening**  
Dr. De Biase is the assistant medical director of the Biochemical Genetics and Newborn Screening laboratories at ARUP and an assistant professor of pathology at the University Of Utah School Of Medicine. Dr. De Biase received her MD and PhD in cellular and molecular genetics at the Federico II University in Naples, Italy. She served as a postdoctoral fellow in molecular genetics at the University of Oklahoma Health Sciences Center and as a postdoctoral fellow in clinical biochemical genetics at the Greenwood Genetics Center in South Carolina. She was a recipient of the SERGG student travel award and SIMD student travel award and is a member of the Society for Inherited Metabolic Disorders. Dr. De Biase’s research interests include lysosomal storage disorders and fatty acid oxidation disorders. Dr. De Biase is board certified in clinical biochemical genetics.

MICHAEL COHEN, MD  
**Medical Director, Anatomic Pathology and Oncology Division**  
Dr. Cohen is a medical director in the Anatomic Pathology and Oncology Division at ARUP, and a professor and vice chair for faculty and house staff development at the University of Utah School of Medicine. Dr. Cohen received his MD from Albany Medical College in Albany, NY and completed his anatomic pathology residency at the University of California, San Francisco. Dr. Cohen has been the recipient of multiple honors, including the Regents Award for Faculty Excellence at the University of Iowa and the Leonard Tow Humanism in Medicine Award. Dr. Cohen has been included in Castle Connolly America’s Top Doctors since 2007 and America’s Top Doctors for Cancer since 2005; Consumers’ Research Council of America Guide to America’s Top Pathologists since 2007; and Best Doctors in America list since 2005.

JESSICA COMSTOCK, MD  
**Pediatric Pathologist**  
Dr. Comstock is the director of autopsy at Primary Children’s Hospital and an associate professor of pathology at the University of Utah School of Medicine. She received her MD from the University of Iowa and completed both a pathology residency and a pediatric pathology fellowship at the University of Utah. She is board certified in anatomic and clinical pathology with a sub-certification in pediatric pathology. Dr. Comstock is a member of several professional societies, including the Society of Pediatric Pathology, College of American Pathologists, and the American Society of Clinical Pathologists.

JULIO DELGADO, MD, MS  
**Head, Histocompatibility and Immunogenetics**  
**Group Medical Director, Immunology Division**  
**Co-Executive Director, ARUP Institute for Clinical and Experimental Pathology**  
Dr. Delgado is the head of the Histocompatibility and Immunogenetics Laboratory, group medical director of the Immunology Division, and co-executive director of the Institute for Clinical and Experimental Pathology at ARUP, as well as an associate professor of pathology at the University of Utah School of Medicine. Dr. Delgado received his MD from Universidad Industrial de Santander in Colombia and his MS degree in epidemiology from the Harvard School of Public Health. His research interests include immunity to infectious diseases and transplantation immunology.

ERINN DOWNS-KELLY, DO, MS  
**Medical Director, Anatomic Pathology and Oncology**  
Dr. Downs-Kelly is a medical director of the Anatomic Pathology and Oncology divisions at ARUP and an associate professor of pathology at the University of Utah School of Medicine. She received her DO from Michigan State University and her MS from Northern Michigan University. Following her residency in anatomic and clinical pathology at the Cleveland Clinic, Dr. Downs-Kelly completed a gastrointestinal, hepatic, and pancreaticobiliary pathology fellowship at the Cleveland Clinic and a breast pathology fellowship at the MD Anderson Cancer Center. Dr. Downs-Kelly is a member of various professional organizations, including the College of American Pathologists, American Society for Clinical Pathology, and the International Society of Breast Pathology. Her research interests include non-obligate precursor lesions of the breast, as well as prognostic and predictive marker testing.

IRENE DE BIASE, MD, PHD  
**Medical Director, Gross Dissection**  
**Associate Medical Director, Surgical Pathology**  
Dr. Emerson is the medical director of the Gross Dissection Laboratory and an associate medical director of Surgical Pathology at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. Dr. Emerson received her MD from the University of Texas Health Sciences Center at Houston and served a residency in pathology at the University of New Mexico Health Sciences Center and University of Texas at Houston. She completed her fellowship in general surgical pathology at the University of Utah School of Medicine. She is certified by the American Board of Pathology in anatomic pathology and is a member of the United States and Canadian Academy of Pathology, American Society for Clinical Pathology (fellow), and the Huntsman Institute for Cancer Care Program. Dr. Emerson’s service work is predominantly in general surgical pathology, with a subspecialty interest in gastrointestinal pathology. Her research efforts are currently in the area of pancreatic-cancer research.
MEDICAL DIRECTORS & CONSULTING FACULTY

RACHEL E. FACTOR, MD, MHS
Medical Director, Cytology
Dr. Factor is a staff pathologist and a medical director in the Cytology Laboratory at ARUP and an assistant professor of pathology at the University of Utah Health Sciences Center. Dr. Factor received her master of health science from Johns Hopkins School of Public Health and her MD from the Albert Einstein College of Medicine in Bronx, New York. She completed an internship in internal medicine at NYU Medical Center and a residency in anatomic pathology followed by fellowships in surgical pathology and cytopathology at Brigham and Women’s Hospital in Boston. Dr. Factor is board certified in anatomic pathology and cytopathology, and is a member of the College of American Pathology, United States and Canadian Academy of Pathology, and the American Society for Clinical Pathology. Her research interests include topics in breast pathology and cytopathology.

MARK FISHER, PHD, D(ABMM)
Medical Director, Bacteriology, Antimicrobials, Parasitology, and Infectious Disease Rapid Testing
Dr. Fisher is the medical director of the Bacteriology, Antimicrobials, Parasitology, and Infectious Disease Rapid Testing laboratories at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. Dr. Fisher obtained a PhD in microbiology and molecular genetics from Emory University and a master of science in microbiology from Idaho State University. He subsequently completed fellowships in microbial pathogenesis at the Rocky Mountain Laboratories (NIH) and in medical microbiology at the University of Utah. He is board certified in medical microbiology, and his research interests include microbial pathogenesis and transmission of vector borne pathogens.

ELIZABETH L. FRANK, PHD
Medical Director, Analytic Biochemistry
Medical Director, Calculi and Manual Chemistry
Co-Medical Director, Mass Spectrometry
Dr. Frank is the medical director of the Analytic Biochemistry Laboratory and the Calculi and Manual Chemistry Laboratory and co-medical director of the Mass Spectrometry Laboratory at ARUP, as well as an associate professor of pathology at the University of Utah School of Medicine. Dr. Frank received her PhD from the University of Colorado at Boulder in organic chemistry and completed her clinical internship in pathology from the Penrose Hospital School of Medical Technology. Dr. Frank continued her training with a postdoctoral fellowship in pharmacy at the University of Colorado Health Sciences Center and a postdoctoral fellowship in clinical chemistry at the University of Utah School of Medicine. Dr. Frank is certified in clinical chemistry by the American Board of Clinical Chemistry.

JONATHAN R. GENZEN, MD, PHD
Co-Medical Director, Automated Core Lab
Dr. Genzen is a co-medical director of the Automated Core Laboratory at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. He received his MD and PhD at the University of Chicago and completed his clinical pathology residency at Yale New Haven Hospital/Yale University Department of Medicine, where he also conducted his postdoctoral research fellowship. He is board certified in clinical pathology by the American Board of Pathology and is a fellow of the American Society for Clinical Pathology. Dr. Genzen is a member of the American Association for Clinical Chemistry and the Academy of Clinical Laboratory Physicians and Scientists. His clinical and research focus involves automated chemistry and quality improvement through informatics.

KATHERINE GEIERSBACH, MD, FCAP, FACMG
Medical Director, Solid Tumor Paraffin FISH Staff Pathologist, Molecular Oncology
Dr. Geiersbach is the medical director of solid tumor paraffin FISH and a staff pathologist in molecular oncology at ARUP, as well as an assistant professor of pathology at the University of Utah School of Medicine. Dr. Geiersbach received her MD from the University of Colorado School of Medicine and completed her residency in pathology at the University of Colorado Health Sciences Center. She is certified by the American Board of Pathology in anatomic and clinical pathology, with subspecialty certification in molecular genetic pathology and clinical cytogentic. She is a fellow of the College of American Pathologists and the American College of Medical Genetics. Her research interests include DNA-based genotyping of molar pregnancy, cytogenetic abnormalities in spontaneous pregnancy loss, and genetic abnormalities in cancer.

EVELYN V. GOPEZ, MD
Medical Director, Cytology
Dr. Gopez is a medical director of the Cytology Laboratory at ARUP, and director of the Pathology Residency Training Program, medical director of the School of Cytotechnology, and professor of pathology at the University of Utah School of Medicine. Dr. Gopez received her MD at the University of Santo Tomas in the Philippines and served a residency in anatomic and clinical pathology at the Berkshire Medical Center. She also completed a fellowship in cytopathology and surgical pathology at the University of Pennsylvania. Dr. Gopez staffs radiology-guided FNAs and oversees the cytology practice at ARUP. She also performs fine-needle aspiration biopsies on out-patient and in-house patients and is actively involved in the Cytotechnology and School of Medicine Mentorship programs at the University of Utah.

DAVID G. GRENAQUE, PHD
Medical Director, Special Chemistry
Dr. Grenache is the director of the Special Chemistry Laboratory at ARUP, a certified diplomate by the American Board of Clinical Chemistry, and an associate professor of pathology at the University of Utah School of Medicine. Dr. Grenache earned his PhD from Worcester Polytechnic Institute in Worcester, Massachusetts and completed a clinical chemistry fellowship at Washington University, St. Louis.

ALLIE GROSSMANN, MD, PHD
Staff Pathologist, Surgical Pathology and Oncology
Dr. Grossmann is a staff pathologist in the Surgical Pathology and Oncology Division at ARUP and an instructor of pathology at the University of Utah School of Medicine. Dr. Grossmann received a PhD and MD from the Oregon Health Sciences University, and completed both a residency in anatomic pathology and a research fellowship in molecular medicine at the University of Utah. Her postdoctoral work in the laboratory of Dean Y. Li, MD, PhD, focused on the role of small GTPases in melanoma invasion and metastasis. Her primary subspecialties are sarcoma pathology and molecular oncology, and her research interests include mechanisms of tumorigenesis, metastasis, and the development of targeted therapies for cancer treatment.
H. EVIN GULBAHCE, MD
Staff Pathologist, Surgical Pathology and Oncology
Dr. Gulbahce is a staff pathologist in the Surgical Pathology and Oncology Division at ARUP and a professor of pathology at the University of Utah School of Medicine. Dr. Gulbahce received her MD from Hacettepe University in Ankara, Turkey, and completed a residency in anatomic and clinical pathology and a surgical pathology fellowship at the University of Minnesota, where she remained as a faculty member. She is a member of the American Society of Cytopathology, the College of American Pathology, and the International Society of Breast Pathology, amongst others. Her research interests include breast cancer risk factors, pulmonary complications of solid organs, and hematopoietic stem cell transplantation.

KIMBERLY E. HANSON, MD, MHS
Medical Director, Mycology, Mycobacteriology, and Virology
Dr. Hanson is the medical director of the Mycology, Mycobacteriology, and Virology laboratories at ARUP and an assistant professor of medicine and pathology at the University of Utah School of Medicine. She earned her MD from Northwestern University Medical School and her master of health science at Duke University Medical Center. Dr. Hanson completed her clinical training in medicine at the Dartmouth-Hitchcock Medical Center and her infectious diseases and medical microbiology fellowships at Duke University. Prior to joining ARUP, Dr. Hanson worked as an associate in pathology and medicine at Duke University Medical Center and was an associate director of the Duke Molecular Microbiology Laboratory. Her clinical and research interests focus on the diagnosis and management of infectious complications following transplantation. She is board certified in infectious disease, medical microbiology, and general internal medicine.

CHARLES D. HAWKER, PHD, MBA, FACB
Scientific Director, Automation and Special Projects
Dr. Hawker is the scientific director of Automation and Special Projects for ARUP and an adjunct professor of pathology at the University of Utah School of Medicine. He is a past president of the Association of Clinical Scientists, the National Academy of Clinical Biochemistry (NACB), and the Clinical Ligand Assay Society (CLAS). He received the John V. Bergen Award from the Clinical and Laboratory Standards Institute in 2010, the NACB’s Professor Abtin Dubin Award in 2009, and the Association for Laboratory Automation’s Becton Dickinson Award in 2000. Dr. Hawker is the co-author of chapters on automation in the fifth edition of the Tietz Textbook of Clinical Chemistry and Molecular Diagnostics and the sixth edition of the Tietz Fundamentals of Clinical Chemistry. He received his PhD from the University of Pennsylvania and his MBA from Washington University, St. Louis.

KAREN A. HEICHMAN, PHD
Vice President, Oncology Technology Development and Licensing
Dr. Heichman is the vice president of technology development and in-licensing in the area of oncology at ARUP and an assistant professor at the University of Utah School of Medicine. Dr. Heichman holds a BS in genetics from the University of California at Berkeley and a PhD in biological chemistry from the UCLA School of Medicine, and trained as a postdoctoral fellow in the field of cycle control at the Fred Hutchinson Cancer Research Center in Seattle. Dr. Heichman has 25 years of scientific experience in both corporate and academic institutions. She has been a longstanding member of the National Cancer Institute Cancer Center’s Clinical Cancer Investigations Committee, where she is involved in clinical trial design and evaluation.

JERRY W. HUSSONG, MD, MS
Vice President, Chief Medical Officer and Director of Laboratories
Dr. Hussong is a chief medical officer and director of laboratories at ARUP Laboratories and an associate professor of pathology at the University of Utah School of Medicine. He received his MD at Northwestern University Medical School and his DDS from Northwestern University Dental School; he also received an MS degree in cellular and molecular pathology at Northwestern University. Dr. Hussong completed a postdoctoral fellowship in hematopathology at the University of Utah and served an ACP/PCP pathology residency at Northwestern Memorial Hospital in Chicago. Dr. Hussong serves on the editorial board of Archives in Pathology and has been a member of the CAP Cancer Committee and Surgical Pathology (PIP) Committee. His clinical interests include flow cytometry, hematopathology, and immunohistochemistry; he also has a strong additional research interest in the prognostic role of angiogenesis in hematopoietic neoplasms.

NAAHLE HEIKAL, MD, MS
Assistant Medical Director, Immunology and Hemostasis/Thrombosis
Dr. Heikal is an assistant medical director of Immunology and Hemostasis/Thrombosis at ARUP Laboratories and an assistant professor at the University of Utah School of Medicine. She received her MD from the Ein-Sham University School of Medicine in Cairo, Egypt, and a master’s degree in clinical and chemical pathology from the Cairo University School of Medicine. Dr. Heikal completed a clinical immunology fellowship and a clinical pathology residency at the University of Utah School of Medicine and holds American Board of Pathology board certification in clinical pathology as well as a New York State Department of Health certification in diagnostic immunology. She is a member of the American Association of Immunologists, International Society of Heart and Lung Transplant, College of American Pathologists, and American Society of Clinical Pathology.

HARRY R. HILL, MD
Medical Director, Immunology and Infectious Disease
Dr. Hill is a medical director of the Immunology and Infectious Disease Laboratory at ARUP Laboratories, as well as a professor of pathology, pediatrics, and medicine and head of the Clinical Pathology Division at the University of Utah School of Medicine. Dr. Hill is a diplomate of the American Board of Pediatrics and a member of the American Society of Clinical Pathologists, the Academy of Clinical Laboratory Physicians and Scientists, the American Society of Microbiology, the Infectious Disease Society of America, and the American Association of Immunology. He received his MD from the Baylor University College of Medicine.

D minions ho medical S ector, oo th洗澡 MBA, FACB
Medical Director, Molecular Infectious Diseases
Dr. Hillyard is the medical director of Research and Development for the Infectious Diseases Laboratories at ARUP, as well the medical director of the following laboratories: Core Nucleic Acid Sequencing, Core Molecular Infectious Diseases, Infectious Diseases Sequencing, and Molecular Hepatitis/Retrovirus. He is also a professor of pathology, with an adjunct appointment in biology, at the University of Utah School of Medicine. Dr. Hillyard received his MD from the Columbia University College of Physicians and Surgeons. His training was in anatomic and clinical pathology, with fellowships in medical microbiology and microbial genetics.

IMMUNOLOGY AND INFECTIOUS DISEASES

DAVID R. HILLYARD, MD
Medical Director, Molecular Infectious Diseases
Dr. Hillyard is the medical director of Research and Development for the Infectious Diseases Laboratories at ARUP, as well the medical director of the following laboratories: Core Nucleic Acid Sequencing, Core Molecular Infectious Diseases, Infectious Diseases Sequencing, and Molecular Hepatitis/Retrovirus. He is also a professor of pathology, with an adjunct appointment in biology, at the University of Utah School of Medicine. Dr. Hillyard received his MD from the Columbia University College of Physicians and Surgeons. His training was in anatomic and clinical pathology, with fellowships in medical microbiology and microbial genetics.
BRIAN R. JACKSON, MD, MS  
Vice President, Chief Medical Informatics Officer

As vice president and chief medical informatics officer, Dr. Jackson directs the Informatics Department at ARUP, including ARUP Consult®, decision support, product management, informatics software development, and ATOP® consulting. He is also the medical director for Referral Testing and an associate professor of pathology at the University of Utah. He received his BA in mathematics, his MS in medical informatics, and his MD from the University of Utah, and completed a clinical pathology residency at Dartmouth-Hitchcock Medical Center. Prior to his employment at ARUP, Dr. Jackson was a staff clinical pathologist and informaticist at Dartmouth-Hitchcock Medical Center, a product manager for a Belgium-based medical software firm, and a National Library of Medicine informatics fellow at the University of Utah. Dr. Jackson’s research interests include economic analysis of diagnostic testing and physician utilization of laboratory tests. He is certified in clinical pathology by the American Board of Pathology.

ELKE JARBOE, MD  
Staff Pathologist, Surgical Pathology and Cytopathology

Dr. Jarboe is a staff pathologist in surgical pathology and cytopathology at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. She received her MD from the University of Utah and is board certified in clinical pathology by the American Board of Pathology. Her postdoctoral fellowship in clinical chemistry at the University of Utah, and completed a clinical chemistry residency at Dartmouth-Hitchcock Medical Center. Prior to his employment at ARUP, Dr. Jarboe was a staff clinical pathologist and informaticist at Dartmouth-Hitchcock Medical Center, a product manager for a Belgium-based medical software firm, and a National Library of Medicine informatics fellow at the University of Utah. Dr. Jarboe’s research interests include economic analysis of diagnostic testing and physician utilization of laboratory tests. He is certified in clinical pathology by the American Board of Pathology.

PETER E. JENSEN, MD  
Chair, Department of Pathology and ARUP Board

Dr. Jensen is a professor and chair of the Department of Pathology at the University of Utah and chair of the board at ARUP Laboratories. He received his MD from the Vanderbilt University School of Medicine in 1987 and completed residency training in anatomic pathology at Washington University in St. Louis. Dr. Jensen was previously a professor and director of experimental pathology and director of clinical immunology in the Department of Pathology and Laboratory Medicine at Emory University in Atlanta. His research is focused on various aspects of immunology, including antigen processing and presentation, immune regulation, and autoimmunity.

KAMISHA JOHNSON-DAVIS, PHD, DABCC  
Medical Director, Clinical Toxicology Lab

Dr. Johnson-Davis is the medical director of the Clinical Toxicology Laboratory at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. Dr. Johnson-Davis received her PhD in pharmacology at the University of Utah and is board certified in clinical chemistry by the American Board of Clinical Chemistry. She completed her postdoctoral fellowship in clinical chemistry at the University of Utah, Department of Pathology, and was a postdoctoral research associate at the Center of Human Toxicology at the University of Utah. Dr. Johnson-Davis is a member of various professional societies, including the Academy of Clinical Laboratory Physicians and Scientists and the American Association for Clinical Chemistry.

NORIKO KUSUKAWA, PHD  
Vice President; Director, New Technology Assessment and Licensing

Dr. Kusukawa is a vice president and director of New Technology Assessment and Licensing at ARUP and an adjunct associate professor of pathology at the University of Utah School of Medicine. Her role at ARUP is to locate new cutting-edge technologies and organize collaborations with like-minded organizations with the goal of bringing those technologies into the clinical laboratory setting. In addition to laboratory experience, Dr. Kusukawa has more than 15 years of business-development experience. Prior to her position at ARUP, Dr. Kusukawa was a technical director of FMC Corporation, overseeing the Research and Development and Compliance and Quality Systems departments. Dr. Kusukawa received her PhD from Kyoto University in Japan.

TODD KELLEY, MD  
Medical Director, Molecular Hematopathology

Medical Director, Hematopathology

Dr. Kelley is the medical director of the Molecular Hematopathology and Hematopathology laboratories at ARUP, and an assistant professor in the Department of Pathology at the University of Utah. He received his MS in immunology and microbiology and his MD from Ohio State University, and completed fellowship training in hematology at the Cleveland Clinic. He is board certified in anatomic and clinical pathology by the American Board of Pathology, with subspecialty certification in hematology. His research interests include the identification of novel diagnostic and prognostic biomarkers in leukemia and lymphoma.

ATTILA KUMANOVICS, MD  
Assistant Medical Director, Immunology Coordinator, Immunogenetics

Dr. Kumanovics is an assistant medical director of the Immunology Laboratory and co-director of the Immunogenetics Laboratory at ARUP Laboratories, as well as an assistant professor of pathology at the University of Utah School of Medicine. Dr. Kumanovics received his MD at the University of Pecs Medical and Health Sciences Centre in Hungary. He completed postdoctoral research fellowships at the University of Utah School of Medicine, University of Texas Southwestern Medical Center, and Howard Hughes Medical Institute, and served as a clinical pathology resident, an immunology fellow, and a molecular genetic pathology fellow at the University of Utah School of Medicine. Dr. Kumanovics is board certified in clinical pathology by the American Board of Pathology and molecular genetic pathology by the American Board of Medical Genetics and American Board of Pathology.

ALLEN N. LAMB, PHD, FACMG  
Medical Director, Cytogenetics and Genomic Microarray

Dr. Lamb is a medical director in the Cytogenetics and Genomic Microarray Laboratory at ARUP and an associate professor of clinical pathology in the Department of Pathology at the University of Utah School of Medicine. He received his PhD from Wesleyan University in molecular biology and biochemistry. He completed fellowships in clinical cytogenetics in the Department of Pediatrics at the University of North Carolina and in clinical molecular genetics at Harvard Medical School. Dr. Lamb is a founding fellow of the American College of Medical Genetics and is certified by the American Board of Medical Genetics in clinical cytogenetics and clinical molecular genetics.
Dr. Lehman is the co-medical director of the University Hospitals and Clinics Clinical Laboratory, Phlebotomy and Support Services, and Transfusion Services at ARUP, and an associate professor of pathology at the University of Utah School of Medicine. He received his MD from New York Medical College and completed a residency in anatomic and clinical pathology at the University of California, San Diego, where he served as chief resident and received the David J. Epstein Research Award during his last year. Dr. Lehman is also a fellow in hematopathology at University of Utah, and is board certified by the American Board of Pathology in anatomic and clinical pathology, with subspecialty boards in hematology. He is a member of several professional societies, including the College of American Pathologists, the American Society for Clinical Pathology, and the United States and Canadian Academy of Pathology. Dr. Lehman’s research interests include flow cytometry and immunohistochemistry of B-cell lymphomas.

Dr. Longo received his MD and PhD in molecular biology and pathology from the University of Parma Medical School in Italy and trained in medical and biochemical genetics at Emory University in Atlanta, Georgia. Dr. Longo is board certified in medical genetics and clinical biochemical genetics.

Dr. Longo is the medical director of the Biochemical Genetics Laboratory at ARUP and a professor of pediatrics and an associate professor of pathology at the University of Utah. Dr. Longo received his MD and PhD in molecular biology and pathology from the University of Parma Medical School in Italy and trained in medical and biochemical genetics at Emory University in Atlanta, Georgia. Dr. Longo is board certified in medical genetics and clinical biochemical genetics.

Dr. Ma is the medical director of Molecular Genetics at ARUP, and an assistant professor of pathology and co-director of the Clinical Medical Genetics Fellowship Program at the University of Utah School of Medicine. Dr. Ma received her MD from Capital University of Medicine in Beijing, China and her MS in molecular pathology from Beijing Union Medical College. She is certified by the American Board of Medical Genetics, with a subspecialty in clinical molecular genetics, and by the New York State Department of Health, with a subspecialty in genetic testing.

Dr. Lyon combines clinical laboratory responsibilities with research and development in human genetics, employing methods for mutation detection by targeted mutation analysis, gene sequencing, gene scanning, exonic-level deletion, and duplications and molecular haplotyping.

Dr. Lyon received her PhD in medical genetics from the University of Alabama at Birmingham and continued with fellowship training in clinical molecular genetics at the University of Utah. Dr. Lyon’s research interests include pediatric gastrointestinal pathology and medical education.

Dr. Lowichik is board certified in pediatric pathology, clinical pathology, and anatomic pathology, and is a member of the Society for Pediatric Pathology. Dr. Lowichik’s research interests include pediatric gastrointestinal pathology and medical education.

Dr. McMillin is a medical director of the Toxicology Laboratory and co-medical director of Pharmacogenomics at ARUP, as well as an associate professor of pathology at the University of Utah School of Medicine. She received her PhD in pharmacology and toxicology from the University of Utah and is certified by the American Board of Clinical Chemistry in clinical chemistry and toxicological chemistry.
RODNEY R. MILES, MD, PHD  
**Staff Hematopathologist**  
Dr. Miles is a staff hematopathologist at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. Dr. Miles received his MD and a PhD in cell biology from the University of Nebraska. He is certified by the American Board of Pathology in anatomic and clinical pathology, with subspecialty certification in hematology. His research interests include biological subtypes of adult and pediatric non-Hodgkin lymphomas. Dr. Miles is a fellow of the American Society for Clinical Pathology and a member of the American Society of Hematology, the Society for Hematopathology, and the United States and Canadian Academy of Pathology.

CHERYL ANN PALMER, MD  
**Director, Neuropathology**  
Dr. Palmer is the director of neuropathology at ARUP as well as a professor of pathology at the University Of Utah School of Medicine. Dr. Palmer received her MD at West Virginia University and served as a resident in neurology and postdoctoral fellow in neuropathology at the University of Utah, where she also completed internships in internal medicine and pathology. She is a fellow of the American Academy of Neurology, serves as the chairman of the membership committee of American Association of Neuropathologists, and sits on the editorial board of *Case Reports in Pathology*. Dr. Palmer’s current research interests include neuropathological parameters of epilepsy, relationships between histologic and molecular genetic findings in brain tumors, and pediatric neuropathology, with special emphasis on epileptogenic disorders and brain tumors.

MARZIA PASQUALI, PHD  
**Medical Director, Biochemical Genetics**  
Dr. Pasquali is the medical director of the Biochemical Genetics and Newborn Screening laboratories at ARUP. She is also a professor at the University of Utah School of Medicine and a clinical scientist in the area of newborn screening. Born and educated in Italy, Dr. Pasquali earned her degrees of doctor in pharmaceutical chemistry and technology and pharmacy doctor at the University of Parma School of Pharmacy. Dr. Pasquali trained in biochemical genetics at Emory University and later served as the co-director of the Biochemical Genetics Laboratory. Dr. Pasquali is board certified in Clinical Biochemical Genetics.

SHERRIE L. PERKINS, MD, PHD  
**Senior Vice President, R&D; Co-Executive Director, ARUP Institute for Clinical and Experimental Pathology; Head, Hematopathology**  
Dr. Perkins is a senior vice president of R & D, co-executive director of the Institute for Clinical and Experimental Pathology, and head of hematopathology at ARUP, as well as the chief of the Clinical Pathology Division, vice chair of pathology, and tenured professor at the University of Utah School of Medicine. Dr. Perkins has served in numerous leadership positions at ARUP and the University of Utah, including director of hematopathology, interim department chair, and, for the past three years, a member of the ARUP Laboratories’ executive management team. Dr. Perkins received her PhD in biochemistry from the University of Miami, and earned her MD and completed her pathology residency at Washington University in St. Louis. She has published more than 170 peer-reviewed articles and 70 book chapters.

THEODORE J. PYSHER, MD  
**Chief, Pediatric Pathology and Electron Microscopy**  
Dr. Pysher is the chief of pediatric pathology and electron microscopy at ARUP, and an adjunct professor of pediatrics, professor of clinical pathology, and chief of the Division of Pediatric Pathology at the University of Utah School of Medicine. He is also the head of pathology and director of laboratories at Primary Children’s Medical Center. Dr. Pysher received his MD at the University of Chicago, and trained as a pathology resident at Cleveland Metropolitan General, pediatrics resident at Rainbow Babies Children’s Hospital in Cleveland, and pediatric pathology fellow at Children’s Hospital of Los Angeles. He is a former president of the Society for Pediatric Pathology, and a member of the Pediatric Pathology Test Development and Advisory Committee of the American Board of Pathology and the editorial board for Pediatric and Developmental Pathology. Dr. Pysher’s research interests include hemolytic uremic syndrome and pediatric laboratory medicine.

JOSEF T. PRCHAL, MD  
**Medical Director, Special Genetics**  
Dr. Pchhal is the medical director of the Special Genetics Laboratory at ARUP. His primary appointment is at the University of Utah in the Division of Hematology, Department of Internal Medicine. He received his medical education at Charles University and completed his internal medicine residency and hematology fellowship at the University of Toronto. Dr. Pchhal was then a research fellow at City of Hope National Medical Center. He has had academic appointments at the University of Alabama at Birmingham and Baylor College of Medicine. Dr. Pchhal is an expert in the areas of erythrocyte enzymology, polycythemia, hemoglobin variants, and thalassemias. His expertise in these areas provides strength for hematology testing in special genetics, molecular genetics, and molecular oncology.

PATRICIA REVELO, MD, PHD  
**Medical Director, Renal Pathology**  
Dr. Revelo is the medical director of renal pathology at ARUP and an associate professor of pathology at the University of Utah School of Medicine. Dr. Revelo received her MD from the Central University of Ecuador School of Medicine and her PhD in pathology from the Federal University of Minas Gerais in Brazil. She completed a fellowship in renal pathology at Vanderbilt University Medical Center and is certified by the American Board of Pathology. Her research interests include mechanisms of chronic allograft and antibody mediated-rejection in kidney, heart, and pancreas transplants, molecular mechanisms of prostate carcinoma development and progression, and transgenic mouse models of acute tubular injury.

ALAN L. ROCKWOOD, PHD  
**Scientific Director, Mass Spectrometry**  
Dr. Rockwood is the scientific director of the Mass Spectrometry Laboratory at ARUP, a clinical associate professor of pathology at the University of Utah School of Medicine, and an adjunct research collaborator for the Chemistry Department at Brigham Young University. He is a member of the American Association for Clinical Chemistry, American Society for Mass Spectrometry, and the Indian Society for Mass Spectrometry. Dr. Rockwood received his PhD in chemistry from Utah State University.
GEORGE M. RODGERS III, MD, PHD
Medical Director, Hemostasis and Thrombosis
Dr. Rodgers is the medical director of the Hemostasis and Thrombosis Laboratory at ARUP and a professor of medicine and pathology at the University of Utah School of Medicine. Dr. Rodgers received his PhD in pharmacology and his MD from the Tulane University School of Medicine. He is certified in internal medicine by the American Board of Internal Medicine and in hematology by the American Board of Pathology. Dr. Rodgers is the co-editor of Wintroub's Clinical Hematology.

WADE SAMOWITZ, MD
Medical Director, Solid Tumor Molecular Diagnostics and Histology
Staff Pathologist, Anatomic Pathology
Dr. Samowitz is a medical director of solid tumor molecular diagnostics and histology, and a staff pathologist for the Anatomic Pathology Division at ARUP, as well as a professor of pathology at the University of Utah School of Medicine. He received his MD from SUNY Downstate, and completed residency training in anatomic pathology at the University of Chicago and fellowships in gastrointestinal pathology at Johns Hopkins Hospital. Specializing in gastrointestinal pathology and the molecular genetics of colorectal cancer, Dr. Samowitz is the medical director for numerous molecular tests in gastrointestinal cancer and other tumors, including microsatellite instability by IHC and PCR, mutational testing for BRAF, HRAS, and NRAS, evaluation for molar pregnancy, and specimen identification.

JUAN ROSAI, MD
Consultant Surgical Pathologist
Dr. Rosai is a consultant surgical pathologist at ARUP and an adjunct professor of pathology at the University of Utah School of Medicine. He received his MD at the University of Buenos Aires School of Medicine in Argentina, and completed his pathology residency at the Hospital Regional Mar del Plata in Argentina and at the Washington University School of Medicine and Barnes Hospital in St. Louis, where he also attained his fellowship training in surgical pathology under Dr. Lauren V. Ackerman. Dr. Rosai’s awards include the USCAP President’s Award in 2012 and the IAP Pathology Gold Medal for outstanding contributions in international pathology education and research in 2010. He has published 32 books, book chapters, and monographs, and more than 390 peer-reviewed papers. He is the primary author of Rosai and Ackerman’s Surgical Pathology, the world’s preeminent textbook of surgical pathology.

MOHAMED E. SALAMA, MD
Medical Director, Hematopathology
Dr. Salama is the assistant medical director of the Hematopathology Laboratory at ARUP, and an associate professor of pathology and director of the Hematopathology Fellowship Program at the University of Utah School of Medicine. Dr. Salama received his MD from Cairo University and completed a hematopathology fellowship at the University of New Mexico and a surgical pathology fellowship at Stanford University. He is certified by the American Board of anatomic pathology and hematology. His areas of interest span all aspects of hematopathology, including morphology and specialized studies of bone marrow and lymph node.

ROBERT SCHLABERG, MD, MPH
Medical Director, Microbial Amplified Detection, Virology, and Fecal Chemistry
Assistant Medical Director, Virology and Molecular Infectious Disease
Dr. Schlaberg is the medical director of the Microbial Amplified Detection, Virology, and Fecal Chemistry laboratories and an assistant medical director of the Molecular Infectious Disease laboratories at ARUP, as well as an assistant professor of clinical pathology at the University of Utah School of Medicine. He received his MD and doctor medicine degrees at the Julius-Maximilians-University in Wuerzburg, Germany and his master of public health at the Mailman School of Public Health at Columbia University in New York City, where he also served as a postdoctoral fellow. Dr. Schlaberg trained in clinical pathology at the Columbia University College of Physicians & Surgeons, where he was the chief clinical pathology resident. He is certified in clinical pathology by the American Board of Pathology and was awarded the Young Investigator Award by the Academy of Clinical Laboratory Physicians and Scientists.

KRISTI J. SMOCK, MD
Medical Director, Hemostasis/Thrombosis
Dr. Smock is a medical director of the Hemostasis/Thrombosis Laboratory at ARUP and an associate professor of pathology at the University of Utah School of Medicine. She received her MD from the University of Utah and completed residency training in anatomic and clinical pathology and fellowship training in hemopathology at the University of Utah. She is board certified by the American Board of Pathology in anatomic and clinical pathology with subspecialty certification in hematology. She is a fellow of the College of American Pathologists and American Society for Clinical Pathology and an active member of several other professional organizations, the North American Specialized Coagulation Laboratory Association, International Society on Thrombosis and Haemostasis, and American Society of Hematology. Dr. Smock has research interests in a variety of areas related to hemostasis/thrombosis.

ROBERT SCHMIDT, MD, PhD, MBA
Director, Center for Evidence-Based Diagnostic Research
Dr. Schmidt is a medical director of informatics at ARUP Laboratories and an assistant professor of pathology at the University Of Utah School Of Medicine. He received his medical degree from the University of Sydney and completed his residency training at the University Of Utah School Of Medicine. He received an MS in bio chemical engineering at MIT, an MBA at the University of Chicago, a PhD in operations management at the University of Virginia, and an MMed in clinical epidemiology from the University of Sydney. Dr. Schmidt’s medical research focuses on diagnostic testing and includes comparative effectiveness, cost-effectiveness, and utilization analyses of diagnostic tests, as well as operations and technology management related to diagnostic testing.

PATRICIA R. SLEV, PHD
Medical Director, Serological Hepatitis/Retrovirus
Co-Medical Director, Immunogenetics
Dr. Slev is the medical director of the Serological Hepatitis/Retrovirus Laboratory and co-medical director of Immunogenetics at ARUP, and an assistant professor of pathology at the University of Utah School of Medicine. She received her PhD in immunology and laboratory medicine from the University of Florida, Gainesville and completed a fellowship in clinical chemistry at the University of Utah. Previously, she served as an assistant medical director at ARUP Laboratories in both the Special Chemistry and Serological Hepatitis/Retrovirus laboratories.

KRISTI J. SMOCK, MD
Medical Director, Hemostasis/Thrombosis
Dr. Smock is a medical director of the Hemostasis/Thrombosis Laboratory at ARUP and an associate professor of pathology at the University of Utah School of Medicine. She received her MD from the University of Utah and completed residency training in anatomic and clinical pathology and fellowship training in hemopathology at the University of Utah. She is board certified by the American Board of Pathology in anatomic and clinical pathology with subspecialty certification in hematology. She is a fellow of the College of American Pathologists and American Society for Clinical Pathology and an active member of several other professional organizations, the North American Specialized Coagulation Laboratory Association, International Society on Thrombosis and Haemostasis, and American Society of Hematology. Dr. Smock has research interests in a variety of areas related to hemostasis/thrombosis.
Dr. South is a medical director for the Cytogenetics, Genomic Microarray, and Genetic Processing laboratories at ARUP and an associate professor of pediatrics and pathology at the University of Utah School of Medicine. She received her PhD from the John Hopkins School of Medicine in human genetics and completed a postdoctoral research fellowship in prenatal genetics at the John Hopkins Hospital and a clinical cytogenetics fellowship at the University of Utah School of Medicine. She is board certified in clinical cytogenetics by the American Board of Medical Genetics. Dr. South is the director of the ABMG-certified training program in clinical cytogenetics and a faculty member in the genetic counseling training program at the University of Utah. Her research interests include the development of new technologies for enhanced detection and characterization of chromosome abnormalities.

Dr. Strathmann is a medical director of toxicology at the University of Utah School of Medicine. He received his PhD in pathology and laboratory medicine and a master of science in bacteriology from the University of Wisconsin-Madison, where he also served as a postdoctoral associate in the Department of Pathology. Dr. Strathmann completed a postdoctoral fellowship in clinical chemistry at the Johns Hopkins Medical Institutions in Baltimore, Maryland. He has previously been awarded the Past-Presidents’ Scholarship by the American Association for Clinical Chemistry, as well as a Distinguished Abstract Award from the National Academy of Clinical Biochemistry. Dr. Strathmann is board certified in clinical chemistry by the American Board of Clinical Chemistry.

Dr. Straseski is a medical director of endocrinology at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. She received her PhD in pathology and laboratory medicine at the University of Rochester in New York, completed a clinical chemistry fellowship at the University of Washington in Seattle, and is ABCC board certified in clinical chemistry.

Dr. Weiss served as ARUP’s chief medical officer and director of laboratories from 1993 until 2002, director of business development from 2002 until 2003, president and chief operating officer from 2003 until 2009, and executive vice president from 2009 until 2010. Dr. Weiss is a professor of pathology at the University of Utah and is board certified in anatomic/clinical pathology, microbiology, and hematology by the American Board of Pathology. Dr. Weiss is past chairman of the board of the American Clinical Laboratory Association and past president of the American Pathology Foundation. He is a fellow of the College of American Pathologists and the American Society for Clinical Pathology. Dr. Weiss received his MD from Creighton University and an MBA from the University of Utah, where he completed his residency training.

Dr. Voelkerding received his MD from the John Hopkins School of Medicine and a fellowship and a past-president of the Association for Molecular Pathology. Dr. Voelkerding received his MD from the University of Cincinnati College of Medicine and is certified by the American Board of Pathology in Clinical Pathology and by the American Board of Pathology and the American Board of Medical Genetics in Molecular Genetic Pathology. His research interests include the development and diagnostic translation of new molecular technologies with a current emphasis on genomic sequencing and its application in medical practice.

Dr. Toydemir completed a postdoctoral associate in the Human Genetics Department at the University of Utah and his MD at the University of Ankara School of Medicine in Turkey. He was the recipient of the 2007 James W. Prahl Award for Outstanding Contributions by a Graduate Student in the biological or biomedical science at the University of Utah and is a member of the American Society of Human Genetics and Turkish Society of Medical Genetics.

Dr. Witt received his MD from Creighton University and an MBA from the University of Utah, where he completed his residency training.
CARL T. WITTWER, MD, PHD
Medical Director and Technical Vice President, General Flow Cytometry
Dr. Wittwer is a medical director and technical vice president of the General Flow Cytometry Laboratory at ARUP and a professor of pathology at the University of Utah School of Medicine. He is an associate editor of Clinical Chemistry and is best known for developing techniques in rapid-cycle PCR and real-time PCR. Dr. Wittwer received his MD from the University of Michigan School of Medicine and his PhD in biochemistry from Utah State University. He is board certified in anatomic and clinical pathology by the American Board of Pathology.

XINJIE XU, PHD, FACMG
Medical Director, Cytogenetics and Genomic Microarray; Assistant Medical Director, Molecular Hematopathology/Oncology
Dr. Xu is a medical director of the Cytogenetics and Genomic Microarray laboratories and an assistant medical director of the Molecular Hematopathology/Oncology Laboratory at ARUP, as well as an assistant professor of pathology at the University of Utah School of Medicine. Dr. Xu received her PhD in genetics from the University of Wisconsin-Madison and completed a clinical cytogenetics fellowship at the University of Wisconsin-Madison and a clinical molecular genetics fellowship at Boston University. Her research interests include the identification of novel molecular markers in cancer and the development of novel diagnostic tools for genetic testing.

HOLLY ZHOU, MD, MS
Pediatric Pathologist
Dr. Zhou is the director of the Pediatric Pathology Fellowship at Primary Children’s Hospital and an associate professor of pathology at the University of Utah School of Medicine. She received her medical degree from Fujian Medical College of China, where she also completed an MS in endocrinology. Subsequently, Dr. Zhou completed a research fellowship in endocrinology at the University of Maine, and both an AP/CP residency and a pediatric pathology fellowship at New York University. She is board certified by the American Board of Pathology in both anatomic and clinical pathology and pediatric pathology. Dr. Zhou is a member of the United States & Canadian Academy of Pathology and the Society for Pediatric Pathology. Her research interests include pediatric bone and soft tissue tumors.

TATIANA YUZYUK, PHD
Assistant Medical Director, Newborn Screening and Biochemical Genetics
Dr. Yuzuk is an assistant medical director of the Newborn Screening and Biochemical Genetics laboratories at ARUP and an assistant professor of pathology at the University of Utah School of Medicine. She received her PhD in biochemistry and molecular biology at SUNY Upstate Medical University and served as a clinical biochemical fellow at the University of Utah. Dr. Yuzuk’s research interests include galactosemia and lysosomal storage disorders.
ARUP’s division managers are dedicated to providing quality patient care while leading their divisions and supporting employees’ efforts to develop a customer-focused culture. The division managers invest time and energy to cultivate a working environment where employees can commit themselves to the principles of service excellence.

MARK E. ASTILL, MS
Vice President, ARUP Institute for Clinical and Experimental Pathology
Mr. Astill is a technical vice president at ARUP, with more than 30 years experience in both academic and industrial research and development (R&D). He is the division manager of R&D, Specialized Technologies and Manufacturing, and Technology Transfer. Mr. Astill is also a member of the ARUP Institute for Clinical and Experimental Pathology Executive Committee. He received his MS in medical laboratory science and his BS in biology from the University of Utah.

MARTHA BALE, MS, MT(ASCP)
Vice President, Infectious Disease
Ms. Bale is a technical vice president and division manager of the Infectious Disease laboratories at ARUP. She has more than 40 years of experience. Ms. Bale received her BS in medical technology from the University of Michigan and her MS in clinical laboratory sciences from the University of Utah.

JO D. FONTENOT, MS, MT(ASCP)
Vice President, University Hospital and Clinics Clinical Laboratory
Ms. Fontenot is a technical vice president and division manager for the Clinical Laboratories located at the University of Utah Health Sciences Center, the Huntsman Hospital South Jordan and Redwood Health Centers. Ms. Fontenot has more than 30 years of experience and is certified by the American Society for Clinical Pathology (ASCP) in medical technology. She received her BS and MS degrees in medical laboratory science from the University of Utah.

MARK E. ASTILL, MS
Vice President, ARUP Institute for Clinical and Experimental Pathology
Mr. Astill is a technical vice president at ARUP, with more than 30 years experience in both academic and industrial research and development (R&D). He is the division manager of R&D, Specialized Technologies and Manufacturing, and Technology Transfer. Mr. Astill is also a member of the ARUP Institute for Clinical and Experimental Pathology Executive Committee. He received his MS in medical laboratory science and his BS in biology from the University of Utah.

SUE GARR, MT(ASCP)
Vice President, Support Services
Ms. Garr is a technical vice president and division manager of Support Services at ARUP, and has more than 25 years of clinical laboratory experience. She received her BS in medical technology from Weber State University and is certified by the American Society for Clinical Pathology (ASCP) in medical technology.

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GORDON NELSON, C(ASCP), NRCC-TC
Vice President, Chemistry Division
Mr. Nelson is a technical vice president and division manager of the Chemistry Division at ARUP. The Chemistry Division includes Analytic Biochemistry, Clinical Drug Abuse Testing, Mass Spectrometry 1, Mass Spectrometry 2, Toxicology, Trace Elements and Calculi, Automated Core, Automated Endocrinology, Electrophoresis Manual Endocrinology, Manual Endocrinology, and Special Chemistry laboratories. Mr. Nelson has more than 20 years of laboratory experience. He is certified in chemistry by the American Society for Clinical Pathology (ASCP) and as a toxicological chemist by the National Registry of Certified Chemists. He is an inspector for the National Laboratory Certification Program conducted by the Division of Health and Human Services. Mr. Nelson received his BS degree from the University of Utah.

NANCY PITSTICK, MT(ASCP)
Vice President, Immunology Division
Ms. Pitstick is a technical vice president and division manager of the Immunology and Serological Hepatitis and Retrovirus laboratories at ARUP. Ms. Pitstick has more than 40 years of laboratory experience, most notably in the areas of blood banking, apheresis, and immunology. She is a member of the American Association of Clinical Chemists (AACC) and the Association of Medical Laboratory Immunologists. Ms. Pitstick received her BA in biology from Western Michigan University and completed an internship in medical technology at Pontiac General Hospital.
The group managers at ARUP provide their staff members with the training and mentoring necessary to succeed and respond to customers’ needs across all levels of responsibility. Each group manager strives to motivate and teach the skills necessary to provide exceptional patient care.

ARUP’s technical supervisors are educated professionals and medical technologists who develop strategies to identify technical improvement opportunities and speed turnaround times. Technical supervisors support and communicate management decisions based on providing quality, timely results in a cost-effective manner.

JUDY GRAY, MT(ASCP), CG(ASCP)
Group Manager, Integrated Genetics and Oncology
Ms. Gray is the group manager of the Integrated Oncology and Genetics Division, overseeing the Cytogenetics/Genomic Microarray, Maternal-Fetal Screening/RBC, and Biochemical Genetics laboratories. She has over 25 years of laboratory experience and is certified by the American Society for Clinical Pathology in medical technology and cytogenetics. She received her bachelor’s degree in medical technology from the University of South Florida.

RYAN GREER, MS, I, C(ASCP)
Assistant Vice President, Group Manager, Chemistry III Group
Mr. Greer is the group manager of the Chemistry III Group at ARUP, which includes oversight of the high-volume Automated Core and Automated Endocrinology Testing laboratories. He has more than 12 years of laboratory experience, including three years as a research and development technologist, three years as a lead technologist in Autoimmune Immunology, and five years as a technical supervisor of Microbial Immunology II. Mr. Greer received a BS in biology/chemistry from Westminster College in Salt Lake City, Utah and an MS in laboratory medicine and biomedical science from the University of Utah. He is certified by the American Society for Clinical Pathology (ASCP) in immunology and chemistry.

KENNETH HAWKER, MT(ASCP)
Assistant Vice President, Night Operations Manager
Mr. Hawker is an assistant vice president and night operations manager at ARUP. He has more than 35 years of laboratory experience, with 20 years at the management level and has been with ARUP since 1999. Mr. Hawker received his BS from Arlington Baptist College and his laboratory training in the U.S. Air Force. He is certified as a clinical laboratory scientist by the American Society for Clinical Pathology (ASCP) and as a medical technologist by the American Medical Technologists.

TRACY HENION, CLS(ASCP)
Evening Operations Manager, Technical Operations
Ms. Henion is the evening operations manager at ARUP. She has more than 30 years of laboratory experience, with more than 20 of those years spent at ARUP. Ms. Henion began her career as an MLT, earning an AAS degree at Alfred College in New York. After relocating to Utah, she earned her BS in clinical laboratory science at Weber State College, graduating with honors.

WARREN HUNT, BS
Assistant Vice President, Group Manager, Chemistry II Group
Mr. Hunt is a technical assistant vice president and group manager of the Chemistry II Group at ARUP. He has more than 25 years’ experience in clinical chemistry. His roles include management of the Toxicology and Mass Spectrometry laboratories, as well as the Mass Spectrometry Engineering group with a primary focus on LC-MS/MS and elemental analysis by ICPMS. He received a BS in Biology from Middle Tennessee State University.

MICHAEL JURETICH MBA, MT(ASCP)
Group Manager, Integrated Oncology and Genetics
Mr. Juretich is the group manager of Anatomic Pathology and has over 15 years of pathology laboratory management experience. His responsibilities include overseeing the Cytology, Histology, Gross Dissection, Autopsy, Animal Research Histology, Anatomic Pathology Processing, Transcription, and Electron Microscopy laboratories. Mr. Juretich received his BS degree from Weber State University and his MBA from the University of Utah.
LUCINDA MANNING, MT(ASCP), RN
Assistant Vice President, University Hospital and Clinics Transfusion Services, Immunohematology Reference Lab (IRL)
Ms. Manning is a technical assistant vice president and the group manager of Transfusion Services located at the University of Utah Hospitals and Clinics and the Immunohematology Reference Laboratory located at ARUP. She has more than 35 years experience in the clinical laboratory and is a long-time member of CLMA and the American Association of Blood Banks. Ms. Manning received her BA in biology from Capital University in Columbus, Ohio and is certified by the American Society for Clinical Pathology (ASCP) in medical technology. She also holds an RN license in Ohio and Utah.

DIANA MOHL, MS, MT(ASCP) MP
Assistant Vice President, Molecular Diagnostics, Infectious Disease Division
Ms. Mohl is a technical assistant vice president and the group manager over molecular diagnostic testing in the Infectious Disease Division at ARUP. Her position includes oversight of the Molecular Infectious Disease, Sequencing Infectious Disease, Molecular Hepatitis and Retrovirus, and Molecular STD Testing laboratories. Ms. Mohl has more than 15 years of experience in molecular diagnostic and infectious disease testing. She received her BS in biochemistry and medical technology and MS in molecular biology from Eastern Michigan University. She is certified by the American Society for Clinical Pathology (ASCP) in medical technology, with a specialist certification in molecular pathology.

CINDY MEADOWS, MB(ASCP)
Group Manager, Genetics Group I, Genetics Division
Ms. Meadows is the group manager in the Genetics Division, overseeing the Molecular Genetics, Fragment Analysis, and Genetics Sequencing laboratories at ARUP. She has nearly 20 years of experience in genetics, with more than 10 of those years at ARUP as a research and development technologist and as a supervisor of the Molecular Hematopathology and Molecular Genetics laboratories. Ms. Meadows received her BS degree from the University of Utah and is certified by the American Society for Clinical Pathology (ASCP) as a molecular biology specialist.

ROBBIE MYATT, MHE, MT(ASCP)SI
Assistant Vice President, Immunology Group I
Mr. Myatt is a technical assistant vice president and the group manager of Immunology Group I at ARUP. He has more than 12 years of laboratory experience and expertise, with more than five of those years served as lead or supervisor in the Microbial Immunology I and Immunology Core laboratories. Mr. Myatt completed the ASCP specialist certification in immunology and an MS in health education in medical technology.

MILES MERRELL, MT(ASCP)
Assistant Vice President, Group Manager, Chemistry Group I
Mr. Merrell is the group manager of Chemistry Group I at ARUP and has more than 25 years of laboratory experience, including three years at ARUP as the technical supervisor of the Clinical Drug Abuse Testing Laboratory. Mr. Merrell received his MT degree at Brigham Young University and is certified by the American Society for Clinical Pathology (ASCP) in medical technology.

KAARIN NISBET, MT(ASCP)
Group Manager, Support Services
Ms. Nisbet is a group manager for the Central Support Services II Division at ARUP. Her responsibilities include managing Client Services and Exception Handling. She has more than 20 years of management experience in healthcare and reference laboratory settings. Ms. Nisbet received a BS degree in Bacteriology from the University of Idaho in Moscow Idaho and completed an internship for Medical Technology at Scripps Memorial Hospital in La Jolla, California.

PATTY MILLER, MT, MP(ASCP)
Assistant Vice President, Group Manager, Integrated Oncology and Genetics Group II, Oncology
Ms. Miller is the group manager of oncology at ARUP. She has more than 20 years of laboratory experience, certified by the American Society for Clinical Pathology (ASCP) in medical technology, and has her ASCP categorical in molecular biology. She received her BS in medical technology from the University of Northern Colorado.

DAVID ROGERS, C(ASCP)
Assistant Vice President, Support Services Central
Mr. Rogers is a technical assistant vice president and group manager for the Central Support Services I Division at ARUP. His role includes managing Specimen Processing and local couriers. He has more than 15 years of experience at ARUP and served as IT project manager of ARUP’s Millennium LIS conversion. Mr. Rogers received his BS in zoology/chemistry from Weber State University and is certified in chemistry by the American Society of Clinical Pathology (ASCP).
DENISE TUCKER, BS
Assistant Vice President, Enterprise Customer Relation Management Manager
Ms. Tucker is a technical assistant vice president and group manager for the Central Support Services II Division at ARUP. Her responsibilities include managing Client Services and Exception Handling. She has more than 20 years of management experience in healthcare and reference laboratory settings. Ms. Tucker received a BS degree in business from Westminster College in Salt Lake City, Utah.

KAREN VILLNAVE, MT(ASCP)
Assistant Vice President, Immunology Group II
Ms. Villnave is a technical assistant vice president and the group manager of Immunology Group II at ARUP. Immunology Group II includes Cellular and Innate Immunology, Flow Cytometry, Protein Immunology, and Serologic Hepatitis/Retrovirus laboratories. Ms. Villnave has more than 30 years of laboratory experience, with more than 15 of those years served at ARUP as a quality specialist of immunology and a technical supervisor of serologic and molecular hepatitis/retrovirus. Ms. Villnave received a BS in biology from Portland State University and completed an internship in medical technology from Oregon Health Sciences University.

DAVID WALL, MBA-GM, MLT
Assistant Vice President, Clinical Studies and Research, Reagent Production, Technology Transfer
Mr. Wall is a technical assistant vice president and the group manager of ARUP’s Clinical Studies and Research, the Reagent Production Laboratory, and Technology Transfer. Mr. Wall has more than 20 years of laboratory experience. He received his BS in animal science and genetics from the University of Utah and his MBA in global management from the University of Phoenix.

CLINT WILCOX, MLT(ASCP)
Central Support Services III
Mr. Wilcox is a technical assistant vice president and the group manager for the Central Support Services III Division at ARUP. His role includes managing Referral Testing, Bioengineering, and Automated Specimen Management. He has more than 20 years of laboratory and information-systems experience. Mr. Wilcox received his BS in management, computer information systems, from Park University in Parkville, Missouri.

CECELIA WRIGHT, MBA, MT(ASCP), CLS(NCA)
Vice President, University Hospitals and Clinics Phlebotomy and Support Services
Ms. Wright is a technical vice president and group manager of Phlebotomy and Support Services for the University of Utah Hospital. She has more than 20 years of laboratory and information systems experience and is certified in medical technology by the American Society for Clinical Pathology (ASCP) and the National Certification Agency. Ms. Wright received her BS in microbiology and medical technology from Idaho State University and her MBA from Westminster College in Salt Lake City, Utah.

LORI WILSON, MS MT(ASCP)
Group Manager, University of Utah Healthcare Clinical Laboratories
Ms. Wilson is a group manager for the University of Utah Healthcare Division at ARUP. Her responsibilities include managing the University Hospital, Huntsman Cancer Hospital, South Jordan Hospital and Redwood Clinic laboratories within the University of Utah Healthcare system. She has more than 25 years of experience in hospital and reference laboratory settings. Ms. Wilson received her BS and MS degrees in medical laboratory science from the University of Utah.

ZACH WILKEY, MLS (ASCP)CM, CQPAGROUP MANAGER, SUPPORT SERVICES Central Support Services III
Mr. Wilkey is a group manager in Support Services at ARUP and oversees the Referral Testing Laboratory, the Automated Specimen Management Group, and local transportation. He has more than 10 years of laboratory experience, including five years as a technologist in Infectious Disease, two years as a quality specialist in genetics, and three years as a technical supervisor in Referral Testing. Mr. Wilkey received his bachelor of science in medical technology from the University of Utah and is certified by the American Society for Clinical Pathology (ASCP) in medical laboratory science.
ANATOMIC PATHOLOGY AND ONCOLOGY

ARUP's Anatomic Pathology and Oncology Groups are staffed by more than 30 full-time faculty members providing high-quality diagnostic testing and consultative services and offers full-service pathology, from small biopsies to large resections, based on a diagnostic Centers of Excellence model encompassing a wide range of specialties.

The clinical practice of anatomic pathology is supported by several core laboratories. These core laboratories provide a full range of services, including routine histology, immunohistochemistry, electron microscopy, molecular diagnostics, and research support. The laboratories support a large menu offering of special stains and immunohistochemistry stains.

The Anatomic Pathology and Oncology Groups continue to update their state-of-the-art menu by offering a multitude of molecular techniques, such as next-generation sequencing, pyrosequencing, and fluorescent in situ hybridization (FISH) techniques for detection of gene amplification and/or mutation detection involving KRAS, EGFR, JAK2, CALR, and other gene sequences of therapeutic interest. Research in anatomic pathology and oncology improves not only ARUP’s ability to treat patients but also its fundamental understanding of disease mechanisms.

CENTERS OF EXCELLENCE

ARUP's Centers of Excellence is a consortium of world-renowned pathologists, each contributing expertise in a particular subspecialty of pathology. Consultative and diagnostic services are available to assist clients in providing the highest quality care available for their patients. Currently, the ARUP Centers of Excellence is home to specialists in the field of gastrointestinal pathology, oral and maxillofacial pathology, hematopathology, and molecular pathology.

LIST OF SPECIALTIES

- Autopsy pathology
- Bone and soft tissue pathology
- Breast pathology
- Cardiovascular pathology
- Cytogenetics
- Cytopathology
- Gynecology
- Non-gynecology
- Fine-needle aspiration
- Dermatopathology
- Endocrine pathology
- Genitourinary pathology
- Gynecological pathology
- Head and neck pathology
- Hematologic flow cytometry
- Hematopathology*
- Hepatic and gastrointestinal pathology*
- Molecular pathology*
- Muscle and nerve pathology
- Neuropathology
- Ophthalmologic pathology
- Oral and maxillofacial pathology*
- Pediatric and placental pathology
- Pulmonary pathology
- Renal pathology
- Research and developmental pathology
- Special hematology
- Transplant pathology

*Denotes a Centers of Excellence specialty

ONCOLOGY

The oncology testing menu offers a wide variety of testing designed to answer important clinical questions in the areas of prediction, diagnosis, prognosis, monitoring, and therapeutic triage of malignancies. The menu includes tests offered by different techniques based on diagnostic criteria and tumor type. Examples include comprehensive hematological disorder evaluation, including leukemia/lymphoma phenotyping by flow cytometry; chromosome analysis and molecular cytogenetics; hematopathology consultation; molecular pathology assays, including minimal residual disease evaluation by next-generation sequencing (NGS); clonality assessment using several molecular and flow cytometry techniques; and tissue antigen assessment by immunohistochemistry (IHC). There are also disease-specific assays and panels for disease evaluation, such as CLL and MM panel by FISH.
Tests are available for identifying many tumor-specific mutations or increased protein expression utilizing molecular techniques such as FISH, NGS, PCR, and pyrosequencing for different sample types, including qualitative and quantitative JAK2 by PCR and CALR for polycythemia vera and ERBB2 (HER-2/neu) by CISH, FISH, and IHC for increased expression in breast cancer. Diagnostic categories available include, but are not limited to, bladder cancer, breast cancer, colon cancer, Ewing sarcoma, gastrointestinal stromal tumors, glioblastoma, hematologic disorders, Kaposi sarcoma, neuroblastoma, oligodendroglioma, rhabdosarcoma, and synovial sarcoma.

A large menu of established tumor markers is available, including traditional markers such as CEA, CA-GI, and CA 27.29. New esoteric tumor markers include vascular endothelial growth factor, which detects oncogenic transformation; alpha fetoprotein, total and L3 percent, for hepatocellular carcinoma; soluble mesothelial-related peptides specific for malignant mesothelioma; and inhibin B, used for ovarian granulosa cell tumor.

**AUTOMATED CORE LABORATORY**

The goal of the Automated Core Laboratory is to automate processes and tests in order to provide improved turnaround time, efficiency, and quality. While automation is not new, ARUP is successful in automating many of its own esoteric tests, from endocrine hormones to tumor markers. Laboratory techniques used by this laboratory include immunoassays, colorimetric assays, and ion-selective electrodes. This laboratory is staffed 24 hours a day, seven days a week, and testing is performed as specimens arrive, not when batch volumes reach a certain size. Therefore, turnaround time can be as rapid as four to five hours from the time of receipt in the laboratory.

**CHEMISTRY**

The Chemistry Division performs a wide range of qualitative and quantitative analyses on body fluids such as blood, urine, and pleural, interstitial, and spinal fluid, as well as other materials, including tissue, meconium, feces, and calculi. The laboratories comprising this division are defined by discipline or technology used. High-throughput, automated technologies are heavily used in the Automated Core and Automated Endocrinology laboratories. This is in contrast to the Trace and Toxic Elements and Calculi and Manual Chemistry laboratories, which house both the high-throughput technology of ICP-MS and a lower-throughput of highly subjective FT-IR technique of calculi analysis. Other laboratories within the Chemistry Division include Analytic Biochemistry, Clinical Toxicology I, II, and III, Manual Endocrinology I, Manual Endocrinology II, Electrophoresis Manual Endocrinology, Mass Spectrometry I, Mass Spectrometry II, and Special Chemistry.

**CLINICAL PATHOLOGY**

ARUP’s clinical pathologists and laboratory scientists strive to identify the most important regulators of biological function and use this information to establish laboratory tests for medically relevant chemical compounds.

ARUP’s clinical laboratories are supported by active research in the areas of human genetics, immunology, infectious diseases, endocrinology, biochemical metabolism, therapeutic drug monitoring, toxicology, oncology, hemostasis, thrombosis, and transfusion medicine.

New technologies, such as tandem mass spectrometry, ion-coupled plasma mass spectrometry, ion-trap mass spectrometry, nucleic acid sequencing, rapid light cycling for PCR, and robotic specimen delivery and storage, are aggressively investigated and used. The clinical pathologists at ARUP are available for, and enthusiastic about, consultation, with a pathologist on call at all times.
ENDOCRINOLOGY
Clients can request consultation for interpretation of endocrine laboratory results or to determine the appropriate tests needed to aid in the diagnosis of clinical endocrine problems. Services include pediatric and adult functional testing, adrenal cortical, water metabolism, pituitary secretion, gonad responsiveness, thyroid, pancreas, growth status, bone metabolism, endocrine uniformity, and vitamin status. Laboratory techniques include immunoassays (i.e., radioimmunoassay, enzyme immunoassay, and chemiluminescent immunoassay), HPLC, cultured cell lines, extraction, chromatography, and tandem mass spectrometry. Samples are held for 30 days (60 days for tumor markers), allowing add-on testing to be performed on previously collected specimens.

GENETICS
The Genetics Division at ARUP provides a comprehensive test menu to assist physicians in the diagnosis of patients with genetic disorders and offers testing in the disciplines of molecular genetics, cytogenetics, maternal serum screening, genomic microarray, and biochemical genetics. Committed to providing high-quality genetic testing, ARUP continuously expands its test menu as new procedures and markers of clinical utility are identified. Medical directors and genetic counselors are available for pre- and post-test consultation and interpretation.

BIOCHEMICAL GENETICS
ARUP performs testing for many metabolic disorders that affect the body’s ability to produce or break down amino acids, organic acids, and fatty acids. Early identification of a metabolic disorder may prevent death as well as other serious health problems; thus, the supplemental newborn screening and inborn errors of metabolism menu at ARUP includes tests for more than 30 metabolic disorders in addition to the initial newborn screen. For some of these disorders, such as MCAD, VLCAD, and galactosemia, DNA testing for causative mutations is also available.

CYTOGENETICS
ARUP performs chromosome and FISH analysis for both constitutional and cancer diagnoses. Patients with indications such as intellectual disability, autism, recurrent fetal loss, and multiple congenital anomalies have the option of tests ranging from a classic karyotype analysis to FISH studies for specific microdeletion/microduplication syndromes or genomic microarray. Patients with confirmed or suspected cancer diagnoses have both chromosome and FISH analyses, as well as an oncology microarray, available to them. These studies may help determine the specific type of cancer present, predict disease course, or determine a course of treatment.

FISH
ARUP offers FISH technology as a complement to classical cytogenetic techniques for well-characterized microdeletion/microduplication disorders, such as DiGeorge syndrome, as well as for unique or family-specific imbalances identified by microarray. Testing of oncology specimens, whether the sample is blood, bone marrow, fresh tissue, or paraffin block, is available. Many disease-specific FISH panels, as well as individual probes, can assist in the diagnosis and monitoring of patients with cancer.
MATERNAL SERUM SCREENING
Maternal serum screening tests help identify pregnancies at increased risk for Down syndrome, trisomy 18, or open neural tube defects such as spina bifida. These tests have traditionally been performed in the second trimester and measure the levels of certain substances in maternal blood. Newer tests now combine first-trimester fetal ultrasound measurements along with measurements of chemical markers in maternal blood to predict risk. ARUP offers second-trimester as well as first-trimester, integrated, and sequential screens.

MICROARRAY
ARUP offers oligonucleotide and SNP-based microarray technologies as a complement to classical cytogenetic techniques. Both technologies identify unbalanced chromosomal abnormalities (loss and/or gain of DNA) in patients with unexplained abnormal phenotypes such as intellectual disability, dysmorphic features, congenital anomalies, and autism. The SNP-based array will also identify long contiguous stretches of homozygosity that may suggest an increased likelihood for a recessive condition or uniparental disomy. Microarrays for patients with hematological malignancies, as well as prenatal microarrays for testing of amniotic fluid, chorionic villi (CVS), and products of conception specimens are also available.

MOLECULAR GENETICS
ARUP offers more than 70 different DNA tests which can be utilized to detect mutation carriers, diagnose genetic disorders, test at-risk fetuses, and identify patients at high risk of developing adult-onset conditions such as Huntington disease or familial cancers. In addition, full-gene analysis is available for tests such as cystic fibrosis, beta globin, and hereditary hemorrhagic telangiectasia. ARUP also offers several next-generation sequencing multigene panels. Once a mutation is identified in a family, family-specific mutation testing is available.

HEMOSTOSIS/THROMBOSIS
The Hemostosis/Thrombosis Laboratory at ARUP performs more than 35,000 assays per month, most of which are performed daily. Services include comprehensive testing for thrombotic and bleeding disorders; plasminogen and antithrombin; protein C, protein S, and APC resistance; factor assays; inhibitor studies; thrombotic risk panels; von Willebrand studies; factor VIII carrier studies; and platelet aggregation studies.

ARUP’s Hemostasis/Thrombosis Laboratory actively develops and publishes protocols for coagulation testing. Interpretation with hemostasis consultation and expedited testing are also available upon request.

IMMUNOLOGY
ARUP’s Allergy and Immunology Division performs more than 500 immunologic tests used in the diagnosis of autoimmune and infectious disorders and immunodeficiencies. Techniques include capillary electrophoresis, multiplex bead assay, Western blotting, flow cytometry, nephelometry, chemiluminescent assay, indirect fluorescent assay, ELISA, and neutrophil or lymphocyte function assays. Services include, but are not limited to, allergy (more than 300 IgE-specific allergens) and histamine testing, adult and pediatric immunodeficiency testing, complement analysis, immunoglobulin and antibody testing/monoclonal gammopathies, cellular immunodeficiencies, serologic diagnosis (including bacterial, viral, mycoplasma, and parasitic infections), CD4 monitoring, anti-platelet and anti-neutrophil antibodies, fetal hemoglobin detection in fetomaternal hemorrhage, PNH assessment, and autoimmune disease testing.
INFECTION DISEASE
ARUP offers an extensive menu of infectious disease testing that complements the laboratory services of hospitals. With full-service analytical capabilities in all microbiology areas of antimicrobial susceptibility testing, bacteriology, mycobacteriology, mycology, parasitology, and virology, ARUP has the capability and expertise to perform an impressive range of testing, from the most routine bacterial cultures to the latest in molecular-based techniques, such as real-time qualitative and quantitative PCR, microorganism identification by 16s rDNA sequencing, MALDI-TOF, and viral genotyping. ARUP continually leads the clinical diagnostics field by offering the most up-to-date technology in infectious disease testing.

The bacteriology section performs routine microbiology testing for University of Utah Hospitals, as well as referral organism identification and pulse field gel electrophoresis for bacteria typing. The Special Microbiology Laboratory provides full-service mycobacteriology and mycology testing within a biological safety level three suite, as well as specialized antimicrobial testing.

The virology section offers spin-amplification isolation and/or direct detection of the cultivatable viruses. It also performs viral neutralization serologic tests for enteroviruses. The parasitology and fecal testing section provides full-service parasitology examination and rapid antigen detection for a variety of pathogens, especially in the areas of enteric and parasitic diseases.

The microbial amplified detection section provides molecular detection of sexually transmitted diseases and other testing for women’s health diagnosis. Molecular detection of many pathogens and viral load monitoring, is available in the molecular infectious disease and molecular hepatitis/retrovirus sections. The Sequencing Infectious Disease Laboratory provides viral resistance testing for HIV, HCV, CMV, and HBV, as well as organism identification by sequence analysis.

Laboratory consultation is available by the medical directors and faculty from the University of Utah School of Medicine, who have expertise in all areas of infectious diseases, parasitology and travel medicine, molecular techniques, virology, and mycology.

MASS SPECTROMETRY I AND II
ARUP offers an ever-increasing menu of testing by tandem mass spectrometry technology. The Mass Spectrometry laboratories focus on liquid chromatography tandem mass spectrometry (LC-MS/MS) but also house gas chromatography (GC/MS) instrumentation. Clinicians and clinical laboratories are benefiting from recent advances in mass spectrometry technology that provide for increased sensitivity and accuracy.

ARUP utilizes the most advanced LC-MS/MS instrumentation to provide assays that meet the needs of physicians who require very high sensitivity to aid in their diagnosis. Where traditional immunoassays fall short, the LC-MS/MS can provide increased sensitivity, lower detection limits, and low level accuracy.

Assays currently on this testing platform include testosterone in women and children (serum or plasma), adrenal steroids (serum or plasma), thyroid hormones (free T3 and free T4, serum or plasma), estrogens (estradiol and estrone, serum or plasma), bile acids (serum), antifungal triazole panel, and vitamin D.

Mass spectrometry is also utilized in therapeutic drug monitoring for sirolimus and everolimus (whole blood), with a panel test that includes other immunosuppressants in development. Catecholamines (urine), metanephrines (urine), cortisol (urine), cortisone (urine and serum), and dexamethasone (serum) complete the test menu for the Mass Spectrometry laboratories. Additional assays are in development.
NEUROLOGY
A broad test menu is available to assist in the diagnosis of myasthenia gravis, multiple sclerosis, other sensorimotor neuropathies, and paraneoplastic disease. A variety of test methodologies are employed, including isoelectric focusing, immunofixation electrophoresis, radioimmunoassay, enzyme immunoassay, immunoblot, radioreceptor assay, and IFA. Among the test-menu offerings are oligoclonal banding and antibodies to the following: acetylcholine receptor, neuronal and neuronal nucleus, ganglioside-monoisalic acid, striated muscle, myelin-associated glycoprotein, sulfate-3-glucuronyl paragloboside, and Purkinje cell.

PAIN MANAGEMENT
To ensure safe and effective pain therapy, current clinical practice guidelines recommend monitoring patients for adherence to prescribed pain medication with periodic drug tests. The purpose of testing is to verify use of prescribed medication (adherence) and confirm abstinence from non-prescribed drugs. However, drug testing strategies and test methods are not well standardized, presenting challenges both to the selection of the right test and to the interpretation of test results.

This area of testing is relatively new to many laboratory clients, and the requirements are different from traditional drugs of abuse testing. To assist clients with this transition, ARUP offers a complete suite of services focused on medically effective and cost-conscious test utilization. Services include screening and confirmation drug tests on two types of specimens: urine and blood.

Clients may access professional and operational consulting services through our medical directors and laboratory staff, and find a comprehensive list of resources on our website. For more information, visit www.aruplab.com/pain.
AUTOMATION
ARUP is one of the most automated laboratories in the United States. An 1,100-foot transport and sorting system with a capacity of 5,000 specimens per hour is one of the key elements. Equally important are three automated sorters that load finished specimens into storage trays (one of these has a speed of 4,000 specimens per hour) and a two-story automated storage and retrieval system (AS/RS), which is housed in the world's largest clinical laboratory freezer. The AS/RS capacity exceeds 2.3 million specimens, and individual specimens are robotically retrieved in less than 2.5 minutes. ARUP has also installed the world's first two automated thawing and mixing workcells. These units thaw and mix frozen specimens on the transport system at a rate of more than 1,000 per hour each, thus reducing preanalytical preparation time.

ARUP is committed to developing cutting-edge automation that improves the overall quality of testing and reduces turnaround time. ARUP's latest automation projects now under development involve the use of machine-vision systems to perform various automated quality inspections of specimens, including identifying specimens mislabeled with an incorrect patient name, measuring specimen volume, and detecting interfering substances in serum or plasma.

CENTRAL SPECIMEN PROCESSING LABORATORY
ARUP’s Specimen Processing Laboratory receives and organizes all incoming samples using a workflow process known as the single workstation. In this process, one person follows a specimen from its arrival at ARUP to its laboratory destination. This means that one person performs the entire specimen receiving process—manifesting, test requesting, labeling, splitting, aliquoting, and placing the samples on the automated track.

Specimen Processing also uses a rule-based computer software program known as Expert Specimen Processing or ESP. This program decreases order errors and improves turnaround time during processing. The Specimen Processing Laboratory uses a computer system that automates the process of specimen storage and retrieval. This system maintains accurate records of the exact physical location of each specimen in Specimen Processing, enabling quick retrieval when necessary. It also maintains control parameters that determine the proper length of time a specimen should be retained by ARUP and manages the specimen-discard process.

NEW TECHNOLOGY ASSESSMENT AND LICENSING/PHARMADX INITIATIVE
The main function of this department is to increase ARUP’s exposure to new test technologies developed outside of ARUP, coordinate evaluations of novel biomarkers and methodologies, and obtain licenses to utilize new technologies at ARUP when they fit ARUP’s esoteric focus and testing objectives. This department works closely with ARUP’s medical directors and clinical production groups to evaluate the medical value and appropriateness of new technologies. The department also explores new foundation projects, such as the PharmaDx Initiative that focuses on selective partnership with pharmaceutical companies.
RESEARCH AND DEVELOPMENT
Created in 1996, the ARUP Institute for Clinical and Experimental Pathology seeks to expand the quantity, quality, and utility of laboratory medicine. Since its inception, the institute has developed more than 1,000 tests that ARUP now performs in-house. Moreover, ARUP research scientists have shared their knowledge, experience, and new developments with the scientific community by publishing more than 2,000 original peer-reviewed research publications in leading journals.

The institute’s mission is to be at the forefront of innovative research and development in clinical and experimental laboratory medicine and to continually contribute to the profession.

SPECIALIZED TECHNOLOGY AND MANUFACTURING
The Reagent Production Laboratory at ARUP prepares reagents for in-house use. The laboratory also produces assay kits that may not be commercially available but are needed for patient testing, diagnosis, and management. This is especially true when new assays are in demand for patient care based on new discoveries in diseases and techniques but are too early to have any commercial benefit for the industry. ARUP’s Reagent Laboratory consists of two major areas: reagent production and tissue culture. The major function of the Reagent Production Laboratory is to prepare reagents and various gels for protein and DNA electrophoresis and to assemble assay kits; the Tissue Culture Laboratory provides cells for the Virology Laboratory and other uses.

The Specialized Technologies and Manufacturing Group at ARUP is also home to the Technology Transfer Department, which provides assistance with assay scale-up, validations, troubleshooting, and New York Department of Health submissions. Another department within this group is the Clinical Research and Studies Department, which helps facilitate research projects from external institutions.
TRANSFUSION MEDICINE SERVICES

ARUP Blood Services is a Utah-based blood-donation center, wholly owned by the University of Utah, and is the sole provider of blood products for the University of Utah Hospital, Huntsman Cancer Hospital, Primary Children’s Hospital, and Shriners Hospital for Children. These facilities provide many unique services to Utah patients, including specialized surgical procedures, trauma care, cancer treatment, bone marrow transplants, organ and tissue transplants, and the only burn care center in the Intermountain West. Because of the specialized care these hospitals provide, they use nearly 25 percent of all the blood transfused in Utah.

ARUP Blood Services strives to continually improve patient care by providing a safe and adequate supply of blood and blood products for local patients in need. In addition, the Transfusion Services Department provides full-service blood-banking services, including blood typing, screening, crossmatching, antibody workups, component modifications, and other laboratory testing for all patients receiving blood products at these institutions.

The Immunohematology Reference Laboratory (IRL) is one of only 55 laboratories in the United States that is accredited by the American Association of Blood Banks (AABB). AABB accreditation represents an extremely high level of performance and medical expertise, including reliable consultation assistance for patient clinical diagnosis relating to immunohematology problems. The IRL provides 24-hour expert assistance in resolving complex immunohematologic problems and in locating serologically compatible rare blood for transfusion. Medical directors and staff provide clinical consultation and test interpretation for resolution of complex antibody problems.

Services include the Donath-Landsteiner test, isohemagglutinin titers, resolution of warm and cold auto antibodies, multiple antibodies, clinically significant antibodies to high-frequency antigens, extended red cell phenotypes, ABO discrepancies, red cell phenotypes on cells with positive direct antiglobulin tests, prenatal antibody studies, and classification of polyagglutinable red blood cells.

UNIVERSITY HOSPITALS AND CLINICS CLINICAL LABORATORY

Phlebotomy and Support Services

The University Hospitals and Clinics Clinical Laboratory provides laboratory testing for University of Utah Health Care. Services provided by these laboratories include hematology, hemostasis, special and general chemistry, stat toxicology, therapeutic drug monitoring, limited microbiology, and urinalysis. Testing services are performed for local clients, as well as national ARUP clients.

The Phlebotomy Department provides phlebotomy services for inpatient units and outpatient clinics at the Huntsman Cancer Hospital, University Hospital, University Neuropsychiatric Institute, and Madsen Clinic.

The Support Services Department encompasses client services, exception handling, and specimen processing for these same organizations. In addition, Phlebotomy and Support Services collects, processes, and ships numerous study specimens.