

A. Denene Blackwood

The University of North Carolina at Chapel Hill
Institute of Marine Sciences
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Education:

12/00 Bachelor of Arts in Biology
University of North Carolina at Chapel Hill

8/88 Applied Associates of Science in Biotechnology
Alamance Community College, Graham, NC
With highest honors

Experience:

2002-present

The University of North Carolina at Chapel, Morehead City, NC
Institute of Marine Sciences
Research Specialist

Development of novel quantitative PCR assays for use in monitoring recreational water quality. These include development of *E. coli* and *Enterococcus* assays that have been used for validation by the EPA as a rapid method and also extensively by SCCWRP in epidemiological studies. Interested in molecular method development for alternative indicators for water quality monitoring. Assist peers with method development and technology transfer. Train and supervise graduate students and technicians in areas of microbiology and molecular biology. Participate in writing of grants and peer reviewed publications.

2001-2002

National Oceanic and Atmospheric Administration (through Oak Ridge Institute of Science Education), Beaufort, NC
Research Fisheries Biologist

Investigated the production of DMS by phytoplankton as a result of oxidative stresses such as UV radiation, hydrogen peroxide exposure, copper toxicity, pH, and iron limitation.

1991-2001

The University of North Carolina at Chapel Hill, Chapel Hill, NC
Department of Orthopaedics
Research Technician III

Performed research using primary and established cell lines to investigate effects of drugs on the expression of epitopes of novel proteins associated with osteoarthritis. Collaborated with several investigators in the School of Medicine and performed clinical research trials. Investigated bone metabolism in children with cerebral palsy and lung transplant patients with cystic fibrosis.

1989-1991

Genetic Design Inc., Greensboro, NC
DNA Paternity Laboratory
Supervisor

Supervised over 13 technicians. Directed activities in the laboratory that related to specimen accessioning and processing. Executed various aspects of human genomic DNA isolation, restriction enzyme digests, spectrophotometry, horizontal gel electrophoresis, and modified southern blots in a production lab.

1988-1989

Organon Teknika, Durham, NC
Infectious Diseases
Process Technician (group leader)

Oversaw operations involving antigen coating of 96-well plates, tubes, plastic beads, and glass slides and the bulking and filling of reagents used in diagnostic test kits. Operated of lyophilizers, autoclaves, and various filling equipment. Prepared the reagents used in the coating and filling labs which included large quantities of radioisotope and potentially biohazardous materials.

1988

Roche Biomedical Laboratories, Inc., Burlington, NC
Bio-Vet Laboratory,
Veterinary Technician

Performed numerous diagnostic assays such as ELISAs, agglutination tests, titers, and Ouchterlony diffusion assays relating to feline, canine, and equine diseases.

1986-1988

Carolina Biological Supply Co., Inc., Burlington, NC
Animal Tissue Culture and Biotechnology Laboratories
Lab Technician

Practiced cell culture methods used in the maintenance of established insect and mammalian cell lines. Prepared, repackaged, and shipped chemicals, solutions, living materials, and perishables for resale to educational institutions. Performed a variety of molecular biology techniques. Prepared reagents and materials for workshops sponsored by The North Carolina Biotechnology Center and Cold Spring Harbor Laboratories. The workshops gave high school biology teachers hands on experience in molecular biology techniques.

1986

Alamance Community College, Graham, NC
Microbiology Laboratory
Teaching Assistant

Prepared media plates and bacterial cultures for student use. Assisted students with techniques used in microbiology such as counting colonies, streaking, inoculation, staining, and identification of unknowns

Peer-Reviewed Publications:

Shanks O, Sivaganesan M, Peed L, Kelty C, **Blackwood AD.**, Greene MR, Kinzelman J, Anaevea T, Bushon RN, Stelzer EA, Singiallano C, Wanless D, Griffith JF, Cao Y, Weisberg S, Harwood V J, Staley C, Oshima K, Varma M, Haugland RA, Noble RT. Inter-laboratory comparison of real-time PCR methods for quantification of general fecal indicator bacteria. Submitted Environ Sci Technol.

Conn KE, Habteselassie MY, **Blackwood AD**, Noble RT. Microbial water quality before and after the repair of a failing onsite wastewater treatment system adjacent to coastal waters. Accepted, Journal of Applied Microbiology.

Krometis LA, Noble RT, Characklis GW, **Blackwood AD**, Sobsey MD. Assessment of *E. coli* partitioning behavior via both a culture-based method and qPCR. Submitted, Journal of Environmental Quality.

Habteselassie MY, Kirs M., Conn KE, **Blackwood AD**, Kelly G, Noble RT. 2011. Tracking microbial transport through four onsite wastewater

treatment systems to receiving waters in eastern North Carolina, USA. In press. *Journal of Applied Microbiology*.

Kirs M, Harwood VJ, Fidler AE, Gillespie PA, Fyfe WR, **Blackwood AD**, Cornelisen CD. Source tracking faecal contamination in an urbanized and a rural waterway in the Nelson-Tasman region, New Zealand. *NZ Journal Marine and Freshwater Research*, 45: 43-58, 2011.

Noble RT, **Blackwood AD**, Griffith JF. Comparison of QPCR-based and traditional methods for rapid quantification of *Enterococcus sp.* and *E. coli* in recreational waters. *Appl Environ Microbiol*, 76: 7437-7443, 2010.

Converse RR, **Blackwood AD**, Kirs M, Griffith JF, Noble RT. Rapid QPCR-based assay for fecal *Bacteroides* spp. as a tool for assessing fecal contamination in recreational waters *Water Research*, 43: 4828-4837, 2009.

Wetz JJ, **Blackwood AD**, Fries JS, Williams ZF, Noble RT. Trends in total *Vibrio* spp. and *Vibrio vulnificus* concentrations in the eutrophic Neuse River Estuary, North Carolina, during storm events. *Aquat Microb Ecol*, 53: 141-149, 2008.

Morris CA, **Blackwood AD**, Kirs M, Buttigieg ND, Morgan RR, Hogan JJ, Weeks I, Noble RT. Comparison of transcription-mediated amplification and growth-based methods for the quantitation of *Enterococcus* bacteria in environmental waters. *Appl Environ Microbiol*, 74: 3319-20, 2008.

Shanks OC, Atikovic E, **Blackwood AD**, Lu J, Noble RT, Domingo JS, Seifring S, Sivaganesan M, Haugland RA. Quantitative PCR for detection and enumeration of genetic markers of bovine fecal pollution. , 74:745-52, 2008.

Noble RT, Griffith JF, **Blackwood AD**, Fuhrman JA, Gregory JB, Hernandez X, Liang X, Bera AA. Multitiered approach using quantitative PCR to track sources of fecal pollution affecting Santa Monica Bay, California. *Appl Environ Microbiol*, Feb:72:1604-12, 2006.

Aris RM, Lester GE, Caminiti M, **Blackwood AD**, Hensler M, Lark RK, Hecker TM, Renner JB, Guillen U, Brown SA, Neuringer IP, Chalermkulrat W, Ontjes DA. Efficacy of alendronate in adults with cystic fibrosis with low bone density. *Am J Respir Crit Care Med*, 169: 77-82, 2004.

Brown SA, Ontjes DA, Lester GE, Lark RK, Hensler MB, **Blackwood AD**, Caminiti MJ, Backlund DC, Aris RM. Short-term calcitriol administration improves calcium homeostasis in adults with cystic fibrosis *Osteoporos Internl*, 14: 442-449, 2003.

Noble RT, Allen SM, **Blackwood AD**, Chu W, Jiang SC, Lovelace GL, Sobsey MD, Stewart JR, Wait DA. Use of viral pathogens and indicators to differentiate between human and non-human fecal contamination in

microbial source tracking comparison study. *J Water Health*, 1: 195-207, 2003.

Aris RM, Lester GE, Caminiti M, **Blackwood AD**, Hensler M, Lark RK, Heckler TM, Renner JB, Guillen U, Brown SA, Neringer IP, Chalermkulrat W, Ontjes DA. Efficacy of alendronate in cystic fibrosis adults with low bone density. *Am J Respir Crit Care Med*, 169:77-82, 2004.

Brown SA, Ontjes DA, Lester GE, Lark RK, Hensler MB, **Blackwood AD**, Caminiti MJ, Buckland DC, Aris RM. Short-term calcitriol administration improves calcium homeostasis in adults with cystic fibrosis. *Osteoporosis Internl*, 14: 442-449, 2003.

Aris RM, Ontjes DA, Buell HE, **Blackwood AD**, Lark RK, Caminiti M, Brown SA, Renner JB, Chalermkulrat W, Lester GE. Abnormal Bone Turnover in Cystic Fibrosis Adults *Osteoporosis Internl*, 13:151-157, 2002.

Larson CM, Kelley SS, **Blackwood AD**, Banes AJ, Lee GM. Retention of the native chondrocyte pericellular matrix results in significantly improved matrix production. *Matrix Biology*, 21: 349-359, 2002.

Aris RM, Ontjes DA, Buell HE, **Blackwood AD**, Lark RK, Brown SA, Caminiti M, Chalermkulrat W, Renner JB, Lester GE. Abnormal bone turnover in cystic fibrosis adults. *Osteoporosis International*. 13: 151-157, 2002.

Brown SA, Ontjes DA, Aris RM, Lester GE, Lark RK, Hensler MB, **Blackwood AD**, Caminiti MJ. Short-term calcitriol administration improves calcium homeostasis in adults with Cystic Fibrosis. *Journal of Bone and Mineral Research* 16: S223. Supplement I Sep 2001.

Lester GE, Toussiant LG, **Blackwood AD**, Bos GD. Cartilaginous extracellular matrix of failed, massive, osteoarticular allografts. *Clin Orthop Rel Res*, 382: 13-20, 2001.

Aris RM, Lester GE, Renner JB, Winders AW, **Blackwood AD**, Lark RK, Ontjes DA. Efficacy of pamidronate for osteoporosis in cystic fibrosis patients following lung transplantation. *Am J Respir Crit Care Med*, 162: 941-6, 2000.

Aris RM, Stevens A, Ontjes DA, **Blackwood AD**, Lark RK, Hensler M, Neringer IP, Lester GE. Adverse alterations in bone metabolism are associated with lung infection in adults with cystic fibrosis. *Am J Respir Crit Care Med*, 162: 1674-1678, 2000.

Lark RK, Lester GE, Ontjes DA, **Blackwood AD**, Hollis BW, Hensler MM, Aris RA. Diminished and erratic absorption of ergocalciferol in adult cystic fibrosis patients. *Amer J Clin Nutr*, 73: 602-606.

Lester GE, **Blackwood AD**, Lark RK, Ontjes DA, Aris RM. Adverse alterations in bone metabolism due to lung infection in Cystic Fibrosis. *J Bone Mineral Research*, 15: SU387 Supplement 1 Sep 2000.

Carlson CS, Loeser RF., Johnstone B, Tulli HM., Dobson (**Blackwood**) **DB**, and Caterson B. Osteoarthritis in Cynomolgus Maques II. Detection of modulated proteoglycan epitopes in cartilage and synovial fluid. *J. Orthop Res.* 13: 399, 1995.

Technical Reports

Noble RT, **Blackwood AD**, Griffith JF, McGee CD, Weisberg SB. Comparison of rapid QPCR-based and culture-based methods for enumeration of *Enterococcus* sp. and *Escherichia coli* in recreational waters. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 2009. Southern California Coastal Water Research Project. Costa Mesa, CA. (*Peer-reviewed*)

Converse RR, **Blackwood AD**, Kirs M, Noble RT, Griffith JF. Rapid QPCR-based assay for fecal *Bacteroides* spp. as a tool for assessing fecal contamination in recreational waters. S. B. Weisberg (ed.). Southern California Coastal Water Research Project Annual Report 2009. Southern California Coastal Water Research Project. Costa Mesa, CA. (*Peer-reviewed*)

Noble R T, Griffith J F, **Blackwood AD**, Fuhrman JA, Gregory JB, Hernandez X, Liang X, Bera AA, Schiff K. Multi-tiered approach using quantitative polymerase chain reaction for tracking sources of fecal pollution to Santa Monica Bay, California. 2006. pp. 181-193 in: S.B. Weisberg and K. Miller (eds.), Southern California Coastal Water Research Project 2005-06 Biennial Report. Southern California Coastal Water Research Project. Westminster, CA. (*Peer-reviewed*)

Presentations:

Rhodes SM, **Blackwood AD**, Gonzalez R, Greene M, Noble RT. Quantification of *Vibrio spp.* in the meat, mantle fluid and surface waters in oysters. ASM General Meeting, New Orleans, LA. May 2011.

Bushon R, Kinzelman J, Noble R, Dorevitch S, **Blackwood D**. Comparison of rapid and culture methods for indicator bacteria through wastewater treatment. ASM General Meeting, New Orleans, LA. May 2011.

Anan'eva T, Kinzelman J, **Blackwood D**, Bushon R, Dorevitch S, Noble R. Examination of within and across laboratory qPCR inhibition from nationally

distributed water samples. National USEPA Beaches Meeting, Miami, FL, March 2011.

Blackwood AD. Examining a range of approaches available for rapid beach water quality testing. Invited speaker. National USEPA Beaches Meeting, Miami, FL, March 2011.

Blackwood D, Converse R, Anan'eva T, Kinzelman J, Bushon R, Dorevitch S, Noble R. Multi-laboratory evaluation of quantitative-PCR for rapid indicator performance using multiple platforms and chemistries in inland lakes and rivers. National USEPA Beaches Meeting, Miami, FL, March 2011.

Gonzalez R, **Blackwood AD,** Conn KE, Greene MR, Noble RT. Predicting fecal indicator bacteria during storms in rural and agriculturally-dominated coastal systems. National USEPA Beaches Meeting, Miami, FL, March 2011.

Noble RT., **Blackwood AD,** Paerl HW, Luettich RA, Whipple AC, Neve, R. The ecology of autochthonous and allochthonous pathogens during extreme events. American Society for Limnology and Oceanography Ocean Sciences Meeting, San Juan, Puerto Rico, February 2011.

Hatcher SM, Binder E, **Blackwood AD,** Conn KE, Helmy T, Oliver JD, Noble RT. The Interplay of Estuarine Dynamics and Pathogenic Members of the *Vibrio* Genus. American Society for Limnology and Oceanography Ocean Sciences Meeting, San Juan, Puerto Rico, February 2011.

Gonzalez R, **Blackwood AD,** Conn KE, Noble RT. Assessment of fecal contamination sources, loading, and the role of reservoir fecal indicator bacteria in management of shellfish harvesting waters. 111th National ASM Meeting, San Diego, CA May 2010

Stumpf CS, Noble RT, Thompson S, Piehler MF, **Blackwood AD.** Combining molecular, hydrological, and conventional approaches for accurate characterization and source identification of fecal contamination in coastal creeks. 111th National ASM Meeting, San Diego, CA May 2010.

Blackwood AD. What is microbial pollution and why be concerned? Invited speaker. Controlling Microbial Pollution in Your Community, Coastal Training Program, NC Research Reserve, April 7 2010.

Blackwood AD. Emerging technology: Rapid detection methods. Invited speaker. Controlling Microbial Pollution in Your Community, Coastal Training Program, NC Research Reserve, April 7 2010.

Blackwood AD. Determination of fecal contamination signatures in Mill Dam Creek, a Coastal Virginia Creek. Virginia Lakes Water Association, Richmond, VA, March, 2010.

Habteselassie M, Kirs M, **Blackwood D**, Kelly G, Noble RT. Onsite wastewater Treatment systems and their impact on surface water quality in eastern North Carolina. November 2009. National Meeting of the American Soil Association.

Blackwood AD, Converse RR, Griffith JF, Noble RT. Rapid QPCR-based methods for measuring recreational water quality at Southern California Beaches. 109th General Meeting of the American Society for Microbiology, Philadelphia, PA , 2009.

Blackwood AD and Noble RT. Rapid Quantitative PCR Method for Quantification of *Bacteroides* as an Alternative Indicator of Fecal Contamination. 108th General Meeting of the American Society for Microbiology, June 1-5, 2008, Boston, MA.

Blackwood AD and Noble RT. Molecular methods as tools for improved management of recreational waters. Invited speaker at 108th General Meeting of the American Society for Microbiology, June 3, 2008, Boston, MA.

Noble RT, **Blackwood AD**, Couliette AD, Piehler MF, White NM. Understanding the impact of stormwater on the coast of North Carolina, USA. American Society for Limnology and Oceanography Ocean Sciences Meeting. Orlando, FL. March 2008.

Shanks OC, Atikovic E, Sivaganesan M, Seifring S, **Blackwood AD**, Lu J, Santo Domingo J, Noble RT, Haugland RA. Development of real-time PCR assays for quantification of cow fecal pollution. ASM National Meeting. Toronto, Ontario, Canada, 2007.

Blackwood AD and Noble RT. Rapid QPCR based approaches for determining recreational water quality. Invited speaker, National Beaches Conference, October 11-13, 2006, Niagra Falls, NY.

Blackwood AD, Yu S, Gregory JB, Noble RT. Rapid QPCR assays for *Escherchia coli* and *Enterococcus* in Recreational Waters: Equivalent to existing methods?. 106^h General Meeting of the American Society for Microbiology, May 21-25, 2006, Orlando, FL.

Noble RT, Bean TJ, **Blackwood AD**, Line DE, Parker JK, White NM. Source tracking studies: developing specific, quantitative markers for watershed studies. USDA National Water Conference, San Antonio, TX. February 2006.

Blackwood AD and Noble RT. Comparison of TaqMan and Scorpion multiplex assays for use as indicators of fecal contamination in environmental waters. 105th General Meeting of the American Society for Microbiology, June 5-9, 2005, Atlanta, GA.

Blackwood AD and Noble RT. Development of a multiplex quantitative PCR assay using species-associated bacterial indicators with specific types of fecal pollution in environmental water samples. 104th General Meeting of the American Society for Microbiology, New Orleans, LA May 23-26, 2005.

Characklis GW, **Blackwood AD**, Fries JS, Noble RT. The role of particle-mediated transport in the ecology of human pathogens in the Neuse River Estuary, NC, USA. ASLO Summer Meeting. Savannah, GA. June 2004.

Noble RT, **Blackwood AD**, Gregory JB. Combining traditional and novel molecular methods to discriminate and quantify fecal contamination in recreation and shellfish harvesting waters. American Society for Limnology and Oceanography and The Oceanography Society, Joint Ocean Research Conference, February 15-20, Honolulu, HI, 2004.

Michelou VK, Noble RT, **Blackwood AD**. Impacts of lysogeny in a highly eutrophic lagoonal estuary, the Neuse River Estuary. Annual Biomedical Research Conference for Minority Students, October 15-18, San Diego, CA, 2003.

Blackwood AD, Gregory JB, Noble RT. Determination of the quantitative relationship between indicator bacteria and viral pathogens in recreational waters using quantitative PCR. 103rd General Meeting of the American Society for Microbiology, May 18-22, Washington, DC, 2003.

Gregory JB, **Blackwood AD**, Noble RT. Environmental conditions dictate RNA extraction methods for detecting human viruses in recreational waters by quantitative RT-PCR. 103rd General Meeting of the American Society for Microbiology, May 18-22, Washington, DC, 2003.

Noble RT, **Blackwood AD**, Gregory JB, Paerl HW, Peierls BJ, Piehler MF. Understanding interactions among viral, bacterial, and phytoplankton assemblages as indicators of estuarine ecosystem health. American Society for Limnology and Oceanography, Aquatic Sciences Meeting, Salt Lake City, UT, February 8-14, 2003.

Lester G, **Blackwood A**, Bos G, Toussaint L, Evans A. Failed osteoarticular allografts show variable loss of matrix proteoglycans. 46th Annual Meeting, Orthopaedic Research Society, Orlando, FL, March 12-15, 2000.

Lester GE, **Blackwood AD**, Aris RM, Lark RK, Hollis BW, Ontjes DA. Lack of efficacy of intramuscular of ergocalciferol in healthy adults. 21st Annual Meeting, American Society for Bone and Mineral Research, St. Louis, MO, September 30-October 4, 1999.

Lark RK, **Blackwood AD**, Ontjes DA, Aris RM, Hollis BW, Lester GE. Abnormal oral absorption of ergocalciferol in adults with cystic fibrosis. 21st

Annual Meeting, American Society for Bone and Mineral Research, St. Louis, MO, September 30-October 4, 1999.

Lester GE, **Blackwood AD**, Weinhold PS, Roe SC, Evans AJ, Caterson B. Comparison of proteoglycan composition and localization in menisci from normal, ACL-transected, and ACL-reconstructed canine knees. 45th Annual Meeting, Orthopaedic Research Society, Anaheim, CA, February 1-4, 1999.

Lester G, Ontjes D, **Blackwood A**, Winders A, Aris R. Bone mineral density and markers of bone turnover in cystic fibrosis patients following lung transplantation. 45th Annual Meeting, Orthopaedic Research Society, Anaheim, CA, February 1-4, 1999.

Lester, GE, Ontjes, DO, **Blackwood, AD**, Winders, AW, Aris, RM. Effect of pamidronate on markers of bone turnover in post-lung transplant, cystic fibrosis patients with osteoporosis. 2nd Joint Meeting ASBMR/IBMS, San Francisco, CA, December 1-6, 1998.

Larson CM, Kelley SS, **Blackwood AD**, Banes AJ, Lee GM. Retention of the chondrocyte's native pericellular matrix results in significantly improved matrix production. 44th Annual Meeting, Orthopaedic Research Society, New Orleans, LA. March 16-19, 1998.

Kelley SS, **Blackwood AD**, Caterson B, Lee GM Retention of the *in vivo* formed pericellular matrix affects proteoglycan synthesis *in vitro*. 43rd Annual Meeting, Orthopaedic Research Society, Atlanta, GA. February 18-22, 1996.

Johnstone B, Bullard K, Dobson (**Blackwood**) **D**, Caterson B, Spezia P, Gillogly S Analysis of proteoglycan markers of cartilage catabolism. Presented at the Southern Connective Tissue Society, Winston-Salem, NC. April 28-30, 1993.

Patents and Inventions:

US Patent: Enterococcus and Fecal Bacteroides for Rapid Water Quality Assessment. US2010/042889, Published February 10, 2011.

US Patent: Methods and compositions for the detection and quantification of *E. coli* and *Enterococcus*. US2008/0233572, Published September 25, 2008.

Awards:

USEPA Scientific and Technological Achievement Award Level I for The development of quantitative real-time PCR methods for the detection of human and cow fecal pollution, 2010.

A. Denene Blackwood – Sr. Microbiologist

Ms. Denene Blackwood has been involved with development and utilization of molecular techniques for 24 years. She holds a Bachelors of Arts in Biology from the University of North Carolina at Chapel Hill and an Applied Associates of Science from Alamance Community College. In addition, she has taken numerous graduate level courses and participated in several workshops and work groups focusing on environmental microbiology, development of molecular techniques and rapid methods, and microbial source tracking. She has been employed with the University of North Carolina at Chapel Hill (UNC-CH) from 1991-2000 and 2002 through present. She currently is performing work in the assessment of microbial contaminant fate and transport to receiving waters, using both culture based and molecular methods to assess the hydrological patterns of stormwater, with a focus the microbial contaminant impact to recreational and shellfish harvesting waters. Ms. Blackwood's other interests lie with the development of and testing of rapid (<2 hours) real-time quantification methods for bacteria such as *E. coli* and *Enterococcus* in beach waters and the quantification enteric and bacterial human pathogens in a variety of environments including stormwater, wastewater, and nuisance flow impacts on coastal areas. Previous areas of experience include sample tracking, database management, and coordination of clinical studies and recruitment of study participants with the UNC-CH. Clinical subjects' confidentiality had to be maintained and experiments had to conform to university guidelines for research on human subjects. While at UNC-CH, Ms. Blackwood, also performed multiple studies involving animal biomedical research which also required strict adherence to university procedures relating to the use and care of animals maintained for research purposes. Analysis of clinical and research samples involved immunohistochemistry, FPLC, GC, gel chromatography, radiochemistry, ELISAs, production of monoclonal antibodies, ultracentrifugation, SDS-PAGE, and molecular techniques. Ms. Blackwood has work experience in clinical diagnostic laboratories (Genetic Design and Roche Biomedical) acquisition and analyzing samples for paternity and a variety biochemical markers. In addition, Ms. Blackwood has worked in production of diagnostic radioimmunoassays and ELISAs for infectious diseases at Organon Teknika, which required adherence to industry QA/QC standards. Ms. Blackwood has also participated and organized workshops with focus on community education and outreach (UNC-CH and Carolina Biological Supply).

Sample Tracking and Coordination Support

For over 20 years, Ms. Blackwood has provided sample tracking and coordination for a broad range of interests. Most recently, while at UNC-CH, she has maintained sample tracking databases for several epidemiological, source tracking, and storm water studies, with one study lasting over 7 years. She also coordinated sample collection from clinical research subjects, animal research subjects, with one database containing over 5000

samples. While employed at Genetic Design, Ms. Blackwood was responsible for tracking of 500 samples per day and while at Roche, Ms. Blackwood also assisted with sample tracking and coordination of testing.

Quality Assurance/Quality Control Support - Application of U.S. EPA QA/QC Guidance and Requirements

Most recently while under the employment of UNC-CH, Ms. Blackwood has followed U. S. EPA QA/QC guidance and requirements specifically while performing Methods 1600, 1601, 1602, 1606, and 1607. She has also been involved in two EPA multilab studies which followed specific EPA QA/QC guidelines. Ms. Blackwood has also helped draft methods, following EPA QA/QC guidelines, for use in the establishment of rapid molecular methods that were subsequently used for recreational water quality monitoring in Orange County, CA (summer of 2010) and Los Angeles County, CA (summer 2011). In addition, as laboratory manager and senior analyst, Ms. Blackwood is instrumental in development of the QA/QC standards used for sample collection and analysis for the laboratory maintained at the Institute of Marine Sciences at UNC-CH. Additionally, Ms. Blackwood set-up QA/QC standards used in analysis of clinical samples for clinical and animal research studies as established by the Institutional Review Board (UNC-CH) and UNC Hospitals Clinical Research Center. As a process technician at Organon Teknika, Ms. Blackwood maintained Document History Records for the manufacture of diagnostic test kits, which involved the use of strict QA/QC guidelines set by the industry as Standard Operating Procedure and Best Lab Management Practices.

Database Management and Computer Programs

During Ms. Blackwood's 24+ years of laboratory experience, she has set-up and maintained several sample databases (UNC-CH, Genetic Design, Roche Biomedical). She has used SigmaPlot, SAS, Microsoft EXCEL and ACCESS, and written code in SQL, FORTRAN, and BASIC.

Sample/Chemical Handling Support

Ms. Blackwood has direct experience in providing sample and chemical handling support to UNC-CH, Genetic Design, Organon Teknika, Roche Biomedical, and Carolina Biological Suppl. Drawing on her extensive laboratory experience, Ms. Blackwood provides support for sample acquisition

and storage, and, has procured, stored, and managed environmental chemical and sample inventory and storage according to appropriate Standards for 10+ years in environmental laboratories.

Preparation and Provision of Standards

As part of her duties at Organon Teknika, Ms. Blackwood has produced specialty reference standards used in diagnostic RIA and EIA test kits. She has provided non-routine reference standards for use as part of one multilab and several epidemiological studies, and for use in recreational water quality monitoring using rapid molecular methods while at UNC-CH.

Sampling Support

Throughout her career, Ms. Blackwood has contributed to, drafted, or reviewed Sampling and Analysis Plans for grants specifically relating to storm water, nuisance run-off, and water bodies affected by point and non-point sources. She has provided sample container, preservation, and analytical methodology recommendations. Ms. Blackwood has coordinated development of her laboratory's sampling guidelines, participated in sample collection training, and has coordinated the collection of thousands of environmental samples as a laboratory manager.

Test Methods Development and Evaluation Support

Throughout her career, Ms. Blackwood has been involved in the development, evaluation, and validation of analytical methods. While at Carolina Biological Supply, she validated methods used as part of a workshop series conducted by the North Carolina Biotechnology Center in conjunction with Cold Spring Harbor Laboratories to educate high school teacher in basic molecular biology techniques. She has developed several ELISAs that measure biochemical markers of osteoarthritis (UNC-CH). Most recently, Ms. Blackwood was instrumental in the development of several novel rapid molecular methods used in recreational water quality monitoring and microbial source tracking.

Expert and Peer Review

Ms. Blackwood has acted as an anonymous reviewer of articles submitted to several high impact journals such as Water Research and Applied and Environmental Microbiology. She has also provided support to consulting firms employed by the EPA.

Meeting and Workshop Support

Ms. Blackwood has provided developmental and logistical support for workshops, meetings, conferences, and training sessions for several agencies over her career. She has prepared and presented numerous MS PowerPoint presentations at national conferences such as the American Society for Microbiology and the EPA BEACHES meetings. She has participated in numerous training meetings (SCCWRP) as well as technical project meetings.