Center for Innovation in Point-of-Care Technologies for HIV/AIDS at Northwestern University

Third Annual Symposium
March 3-4, 2021
Presented Virtually

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C-THAN@northwestern.edu

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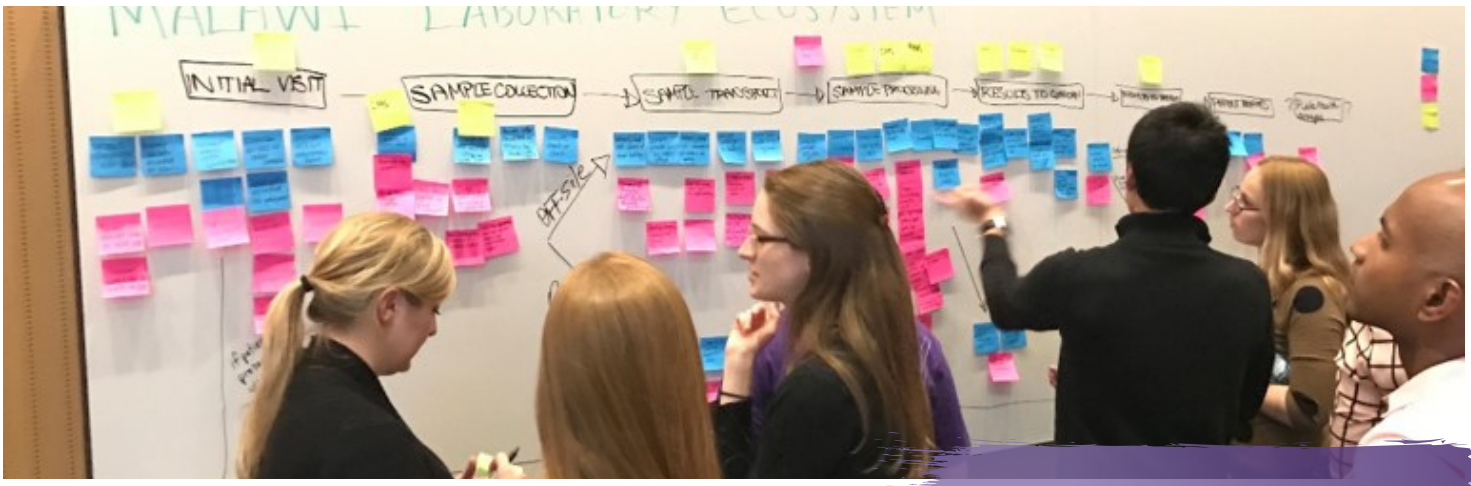


Dear Friends and Colleagues of C-THAN,

It is with great pleasure that we welcome you to our third annual C-THAN Symposium and Workshop. C-THAN's mission is to support the development and facilitate commercialization of a pipeline of point-of-care technology designed to meet the clinical needs of people who live with HIV/AIDS in low- and middle-income countries.

We have attendees from all our clinical and engineering sites including Northwestern University sites in Chicago and Evanston, University of Cape Town, University of Stellenbosch, University of Sciences, Techniques and Technologies of Bamako, University of Lagos, University of Ibadan, University of Jos, and Muhimbili University of Health and Allied Sciences as well as members of our External Advisory Board, our NIH Science and Program Officers, our pilot project awardees and other guests.

It is a very exciting time for us with the initiation of our 7 Year Three pilot projects as well as our previous years described in this booklet, and the recent release of our first solicitation for Year Four pilot projects (also enclosed).

We would like to thank everyone who has contributed to the planning of this meeting: our key Northwestern colleagues Kate Klein and Kristen Weber.

We are always happy to hear from our community, so don't hesitate to reach out to us at s-mcfall@northwestern.edu and r-murphy@northwestern.edu.

Sincerely,
Rob Murphy, MD and Sally McFall, PhD

Agenda

Third Annual Symposium and Workshop

Wednesday, 3 March 2021

**Times are in Central Time Zone (CST)*

8:00	Opening Session Welcome Introductions	 Rob Murphy, Sally McFall All
8:30	C-THAN Overview	Rob Murphy, Sally McFall
8:40	Fogarty Program: Goals and Objectives	Laura Povlich, Brad Newsome
8:50	NIAID: Goals and Objectives	Diane Lawrence, Karen Lacourciere
9:00	NIBIB/POCTRN	Tiffany Lash
9:10	External Advisory Board Expertise and Advice	Christina Katlama, Louis Pizarro, Tim Block, Julian Gordon, Deydi Moussa, Lesley Scott, Lewis Roberts
9:20	RADx and DASH	Rob Murphy and Sally McFall/Chad Achenbach
9:40	USTTB BME Department	Almoustapha Maiga

Agenda

Third Annual Symposium and Workshop

Wednesday, 3 March 2021

**Times are in Central Time Zone (CST)*

9:50	Technology Development Core Discussion	Sally McFall
10:10	Break (20 mins)	
10:30	Clinical Validation Core Discussion	Chad Achenbach
10:40	LFA for Rapid Detection of HBV	David AuCoin/Jacob Sorensen
11:00	Technology Training Core Discussion	Kara Palamountain
11:10	Transportation to Support POC Deployment	Mphatso Kachule
11:30	Publications /Presentations	Mamoudou Maiga
12:00	Adjourn for the day	

Agenda

Third Annual Symposium and Workshop

Thursday, 4 March 2021

**Times are in Central Time Zone (CST)*

8:00	Welcome	Rob Murphy, Sally McFall

Year 01 Project Reports (10 min presentations, 5 min Q&A)

8:10	HCV Core Antigen	Sally McFall
8:25	Smartphone-based Measurement of TST Induration	Tania Douglas
8:40	Small Transcription Activating RNAs	Julius Lucks
8:55	Optimizing Sputum Cup for TB (Y1 & Y3)	Chris de Villiers, Nardus Koekemoer
9:10	Break (10 mins)	
9:20	Fluorescent p24 for Infant Diagnosis	Diana Hardie, Sally McFall
9:35	Highly Sensitive Multiplex PCR for HIV/TB	Mamoudou Maiga

Agenda

Third Annual Symposium and Workshop

Thursday, 4 March 2021

**Times are in Central Time Zone (CST)*

Year 02 Project Reports (10 min presentations, 5 min Q&A)

9:50	Salvaged Xpert Study (SAX-TB)	Grant Theron
10:05	Oral Swab Diagnosis of HIV-TB	Gerard Cangelosi
10:20	Patterned Blood Spot Cards	Charles Mace
10:35	Simple Reaction Detection of HIV-1 Resistance in RLS	Mark Sharkey /Mario Stevenson
10:50	Break (10 mins)	

Year 03 Pilots - Description of Projects

11:05	POC HIV Viral Load Assay	Benjamin Miller
11:20	Field-friendly Creatinine Test	Mark Styczynski

Agenda

Third Annual Symposium and Workshop

Thursday, 4 March 2021

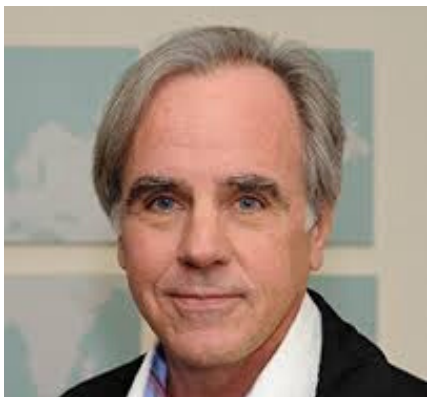
**Times are in Central Time Zone (CST)*

11:35	A Whole Blood TB/HIV LF assay	Nick Borain
11:50	Automated TB Sputum Microscopy	Mamoudou Maiga
12:05	Break (10 mins)	
12:15	Rapid Test for HIV, HBV & HCV	Robert Gish /Anthony Sorge
12:30	HPV in MSM Using GeneXpert	Almoustapha Maiga
12:45	Final Questions/Comments/Closing	
13:00	Meeting Close	

C-THAN Principal Investigators

Sally McFall, PhD

McFall is the Co-Director of the Admininstrative Core, MPI of C-THAN, and Director of the Technology Development/Refinement Core. Dr. McFall is Director of Research, Center for Innovation in Global Health Technologies (CIGHT) in the Department of Biomedical Engineering at the McCormick School of Engineering & Applied Sciences. Dr. McFall has extensive experience in leading point-of-care technology development projects for infectious diseases such as HIV, tuberculosis, and hepatitis designed specifically for low and middle income countries. She also facilitates networking of the team with the other POCTRN centers. Dr. McFall has participated as either an investigator or principal investigator on 4 different projects sponsored by the POCTRN via the Center for Point-of-Care Technologies Research for Sexually Transmitted Diseases, The Center for Point-of-Care Technologies for Disaster Readiness, and Center to Advance POC Diagnostics for Global Health. She recently founded a start-up company, Minute Molecular Diagnostics (M2Dx), with David Kelso and Kara Palamountain as co-founders, to market POC testing in high resource settings with the goal of developing applications for low resource settings as funding allows.



Rob Murphy, MD

Murphy is Professor of Medicine and Biomedical Engineering at Northwestern University where he is founding Executive Director, Institute for Global Health and John P. Phair Professor of Infectious Diseases. Dr. Murphy's primary research and clinical interest is in viral infections. His research includes drug development of new antiretroviral drugs and vaccines for HIV and viral hepatitis and the scale-up of therapy for AIDS, tuberculosis and malaria in sub-Saharan Africa. Dr. Murphy was the Country Director for Harvard's President's Emergency Plan for AIDS Relief (PEPFAR) program at its inception in 2004. He is Principal Investigator for NIH-supported research training grants in Nigeria and Mali involving HIV-related malignancies and HIV and mycobacterial disease. He is co-investigator on three Medical Education Partnership Initiative (MEPI) faculty development grants at the Universities of Jos, Ibadan and Lagos, in Nigeria. He is the Director of Extramural Programs in HIV and Tuberculosis at the University of Bamako in Mali. Dr. Murphy was recently awarded two NIH center grants involving epigenomics of common HIV-related cancers in Nigeria and another developing point-of-care devices and assays that can be used to treat, monitor or prevent HIV-associated conditions in Africa. He is a founding board member of the Northwestern Global Health Foundation and faculty director of the online Master of Science in Global Health graduate degree program through the School of Professional Studies.

National Institutes of Health (NIH) Representatives

Karen Lacourciere, PhD

Karen Lacourciere serves as a Program Officer in NIH/NIAID in the Tuberculosis, Leprosy and Other Mycobacterial Diseases section of the Respiratory Diseases Branch. She oversees a portfolio of grants and contracts that conduct research on tuberculosis, leprosy and non-tuberculosis mycobacteria, including systems biology and other "omics" approaches, early stage drug discovery and mechanisms of drug resistance, tuberculosis diagnostic development and similar topics. Dr. Lacourciere received her B.S. degree in Biochemistry from the University of Massachusetts and her Ph.D. in Biochemistry from Johns Hopkins University.

Tiffani Lash, PhD

Lash serves as a Program Director/Health Scientist Administrator at the National Institutes of Health. She manages the research portfolios for the Biosensors, Platform Technologies, and mHealth programs at the National Institute of Biomedical Imaging and Bioengineering (NIBIB). Lash is also the Program Director for the NIBIB Point of Care Technologies Research Network, consisting of three centers charged with developing point-of-care diagnostic technologies through collaborative efforts that merge scientific and technological capabilities with clinical need. Lash earned her Ph.D. in Physical Chemistry from North Carolina State University via a collaboration between the Departments of Chemistry and Chemical and Biomolecular Engineering. Her interdisciplinary research interests include microfluidics, biopolymers with controlled molecular architecture, and biosensor technologies.

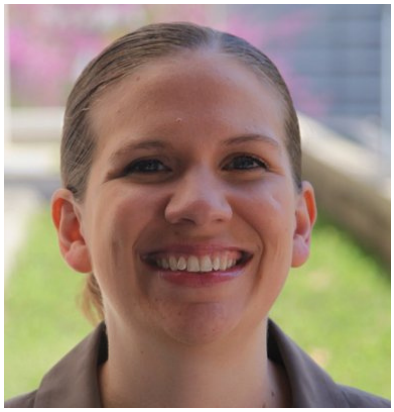
Diane Lawrence, PhD

Diane Lawrence is a Program Officer in the Division of AIDS at the National Institute of Allergy an Infectious Diseases, part of the National Institutes of Health. She oversees a portfolio of grants and has developed funding opportunities related to basic HIV persistence and immunology research, including the Martin Delaney Collaboratories for HIV Cure Research, as well as technology development for self-test HIV diagnostics. She also oversees the NIH HIV Reagent Program resource (www.HIVReagentProgram.org), providing no-cost research materials to investigators worldwide, and she has served on several NIH committees related to diagnostics research, career development and research training. Dr. Lawrence received her B.A. degree in Psychology and Biological Sciences from Carnegie Mellon University and her Ph.D. in Neuroscience from the University of Rochester. Prior to joining NIAID, she studied neuroimmunology and neurotropic infections, and served as an Associate Director for the AIDS Research Program at the National Institute on Drug Abuse.

National Institutes of Health (NIH) Representatives

Brad Newsome, PhD

Brad Newsome, Ph.D., is a Health Scientist Administrator (Program Officer) in the Division of International Training and Research (DITR) at the Fogarty International Center, part of the U.S. National Institutes of Health (NIH). Brad oversees a global health research portfolio geared toward advancing mobile and digital health, point-of-care technologies, data science and innovation, dissemination and implementation research, and medical/research capacity building efforts. Brad is a biomedical scientist trained at the interface of materials engineering, toxicology, environmental public health, and science policy, with research geared toward holistically addressing global health concerns associated with environmentally-induced non-communicable diseases. Prior to Brad's career at the Fogarty International Center, he led the global health and implementation research portfolio at NIH's National Heart, Lung, and Blood Institute (NHLBI), and served as a AAAS Science and Technology Policy Fellow in the NIH Office of the Director. Brad is a humanitarian at heart, driven by the idea that diverse, global partnerships drive our best, most effective, most informed, and most equitable health innovations.



Laura K. Povlich, PhD

Laura Povlich is a Program Director in the Division of International Training and Research at the Fogarty International Center, part of the National Institutes of Health, where she was previously an American Association for the Advancement of Science (AAAS) Science & Technology Policy Fellow. Dr. Povlich has administered a portfolio of grants that covers a range of research, research training, and research education projects related to global health technology, with a significant focus on information and communication technology. She currently is a coordinator for a new NIH Common Fund program – Harnessing Data Science for Health Discovery and Innovation in Africa (DS-I Africa). Prior to working at Fogarty, Dr. Povlich was the 2011-2012 Materials Research Society/Optical Society Congressional Science and Engineering Fellow in the Office of Congressman Sander Levin. Dr. Povlich earned a B.S.E. in Materials Science and Engineering and a Ph.D. in Macromolecular Science and Engineering, both from the University of Michigan. Her research focused on the synthesis of functionalized conjugated polymers for biological sensor applications and for neural probe and prosthetic device electrode coatings.

C-THAN Executive Advisory Board

Timothy M. Block, PhD

Block is President and Co-founder of the Hepatitis B Foundation; its research arm, the Baruch S. Blumberg Institute; and the Pennsylvania Biotechnology Center. His work, with Baruch S. Blumberg, Anand Mehta and Raymond Dwek, pioneered the use of glycoproteomics for detection of biomarkers of liver cancer, leading to the use of Golph2/GP73 and core fucosylated serum proteins as risk stratifiers for liver cirrhosis and hepatocellular carcinoma. His work with Ying Su led to use of "microDNA" detected in the urine as a cancer marker. More recently, he and his colleagues (Ju-Tao Guo, Hai-Tao Guo, Andy Cuconati) have identified small molecule inhibitors of hepatitis B virus, which are in clinical phase human testing today. He has received numerous honors, including election to the US National Academy of Inventors (2017), Hon. Medical Doctors Degree from the Bulgarian National Academy, Fellow, American Association for the Advancement of Science and Fellow, Glycobiology The University of Oxford. With his wife, Joan, he is co-recipient of the American Association for Liver Diseases' first Distinguished Public Service Advocacy Award (2021). He is scientific co-founder of several life sciences companies, co-inventor on 20 issued patents and 23 applications, has co-authored more than 270 scholarly papers, and was named a "Visionary in Hepatitis" by the World Hepatitis Alliance in 2017. He is also Adjunct Professor at Geisinger Commonwealth School of Medicine and the University of Pennsylvania Perelman School of Medicine.

Julian Gordon, PhD

Gordon received his education at University of London, Kings College, undergraduate and graduate studies in the department of Maurice Wilkins, followed by a postdoctoral fellowship at University of Copenhagen Microbiology Institute. He was then Research Associate at the University of Uppsala, Sweden. He did ground-breaking work in protein synthesis at Rockefeller University in New York as Assistant Professor. He took up a position as group leader in the Friedrich Miescher Institute, Basel, Switzerland, inventing the Western Blot technique, now widely used. As Senior Research Fellow at Abbott Labs, Chicago, he invented lateral flow immunochromatography, which became the underlying technique in home pregnancy testing. Retired from Abbott, now Adjunct Professor at Northwestern University Biomedical Engineering and Chief Scientific Office of Inspirotec Inc., commercializing a method for measuring allergens in the air. A passionate runner, having completed 77 marathons.

C-THAN Executive Advisory Board

Christine Katlama, MD

Katlama is a Professor of Infectious Diseases at Sorbonne University in Paris (France). She is head of the AIDS clinical care unit and Co-Director of HIV clinical research at the iPLESP (Pierre Louis Institute of Public Health and Epidemiology) - INSERM U943 research unit. Professor Katlama is actively involved in the ANRS (French National Agency for HIV Research) and heads their antiretroviral strategy research group. Katlama has worked in HIV since 1982 and was involved in the HIV-2 discovery in 1986. Her group first demonstrated the impact of HAART on immune reconstitution and works extensively in the field of new drugs, viral resistance, novel antiretroviral strategies and HIV cure. In 2001, she founded ORVACS, an international network for research in immune strategies including HIV cure. Katlama is actively involved in the NEAT ID European Network. In 2003, she founded SOLTHIS, a non-governmental organization which supports access to HIV care in West Africa. She is also the founding member and president of AFRAVIH (Francophone alliance of healthcare stakeholders against HIV and chronic viral infections) and as President, organized the AFRAVIH conferences in Casablanca, Geneva, Montpellier, Brussels, and Bordeaux in 2010, 2012, 2014, 2016 and 2018, respectively. Under her stewardship, AFRAVIH also initiated the first Mediterranean conference (AFRAMED) for HIV, HBV, and HCV in 2015, and she is now preparing the third AFRAMED in Morocco. Katlama is also past President and board member of the European AIDS Clinical Society (EACS) and is currently in charge of the EACS educational programme. With her group , she is running several implementation programmes of HIV clinical care in Mali and Algeria. She has published over 700 articles on HIV clinical science.

Louis Pizarro, MD

Pizarro is the Team Lead at Unitaid, which works with partner organizations to leverage innovation for global health. He previously worked as a clinical physician before joining Solthis in 2004, an NGO working on health system strengthening in Africa, first as Head of Mission in Niger - where he supported the Nigerian government in the establishment of the National Program for Access to HIV/AIDS Treatment, then as CEO beginning in 2006. Louis Pizarro is also the current leader of Coordination Sud's health commission - a French platform of international development NGOs. Aside from his medical training, he holds a degree in Political Sciences from Sciences Po and a Health MBA from EHESP/LSE/ESCP Europe. Louis Pizarro has been teaching global health issues at Sciences Po since 2007, first for the "Development Economics" Master, then for the Global Health concentration. He also teaches Global Health and development at La Sorbonne, Bordeaux University, and Paris VI/Paris VII.

C-THAN Executive Advisory Board

Lewis Roberts, MD, PhD

Roberts is the Peter and Frances Georgeson Professor in Gastroenterology Cancer Research and a Consultant in the Division of Gastroenterology and Hepatology at the Mayo Clinic, where he is Director of the Hepatobiliary Neoplasia Clinic, Co-Chair of the Hepatobiliary Cancer Disease Group of Mayo Clinic Cancer Center, Co-Principal Investigator of the Mayo Specialized Program of Research Excellence (SPORE) in Hepatobiliary Cancers, Associate Director of Pre-Doctoral Programs in the Center for Clinical and Translational Sciences, and Director for Research at Mayo Clinic School of Medicine. Dr. Roberts earned his medical degree from the University of Ghana Medical School, a PhD in Physiology and Biophysics from The University of Iowa, and completed postgraduate training in Internal Medicine, Gastroenterology and Hepatology, and Cancer Genetics at Mayo Clinic.

Lesley Scott, PhD

Scott is an Associate Professor and Head of Research and Development in the Department of Molecular Medicine and Haematology and iLEAD (Innovation in Laboratory Engineered Accelerated Diagnostics) in the School of Pathology, Faculty of Health Science at the University of the Witwatersrand, Johannesburg in South Africa. Lesley has a PhD in Molecular Medicine with >20 year experience in accelerating innovative HIV and TB diagnostics and quality programs from concept to implementation to improve patient care. Lesley developed the “dried culture spot” technology used as a companion molecular TB diagnostic now distributed to 27 countries through a spinoff company from WITS University called SmartSpot Quality. She is a Laboratory Director for the AIDS Clinical Trial Group (ACTG), and continues to supervise PhD/MSc/MMed/Biomedical Engineering students within the academic environment.

Moussa Seydi, MD

Moussa Seydi is the Head of the Infectious and Tropical Disease Clinic at the University Hospital of Fann and Professor of Infectious Diseases at Cheikh Anta Diop University of Dakar, Senegal. He is also the coordinator of the Regional Center for Clinical Research and Training which is also a site of the French National Agency for Research on AIDS and Hepatitis (ANRS) in Senegal. His current research interest include primarily HIV-1, HIV-2, viral hepatitis infections, tuberculosis and emerging infectious diseases. He is author of more than 150 peer-reviewed publications and currently holds several research funding awards.

C-THAN Site PI's

Oche Agbaji, MBBS

Agbaji is a Professor of Nephrology and HIV Medicine at the College of Medical Sciences, University of Jos, and a Consultant Physician and Nephrologist with the Jos University Teaching Hospital (JUTH), Jos, Nigeria. He graduated from the Ahmadu Bello University, Zaria, Nigeria with an MBBS degree in 1987. Agbaji is a fellow (FMCP) of the National postgraduate medical college of Nigeria (NPMCN); and has been an examiner of the NPMCN since 2005. He is a member of the American College of Physicians (MACP). Agbaji has been the Principal Investigator of the PEPFAR-supported HIV program and the ART team lead at JUTH since 2009. Among other duties, he has been a member of the National Task team on ART of the Federal Ministry of Health of Nigeria since 2010. Agbaji is one of the principal investigators of the CDC-sponsored Implementation Science project titled: Reaching 90% target of HIV viral suppression: The role of point of care viral load monitoring in resources constrained settings since 2016 (U01GH002109-02 revised-CDC). Agbaji coordinates the HIV outcomes theme of the 'Support of Training and Mentoring in Nigeria for Academics' (STAMINA) grant (D43TW010130-FIC/NIH) at the University of Jos (2015-date). He had been a co-investigator in the 'Northwestern and Jos University Research Training Program in HIV and Malignancies' (1D43TW009575 NIH/ FIC) since 2014. Agbaji has been PI and Co-Investigator of several NIH and Industry sponsored projects. Agbaji has over 95 publications in peer reviewed journals.

Akinwale Coker, PhD

Coker was the Head of Department of Civil Engineering, University of Ibadan, Ibadan, Nigeria, between 2014 and 2018. He had earlier served as Acting Head of the same Department from 2008 to 2010. He can leverage on over 10 years of management experience of personnel, materials, infrastructural, and financial resources at the university level. His research experience in Environmental Health Engineering dates back to 1991 when he joined the University of Ibadan (UI) as a Lecturer II, rising to full Professorship in 2010. He had received funding for research from US-based McArthur Foundation (2003), UK-based Lady Wulfrun Fellowship (2007), British Council (2011), UK Department For International Development (2015), British Royal Society (2018). In 2013, he was appointed as the University of Ibadan Coordinator of the Biomedical Engineering (BME) Programs. On this basis, Coker was the UI Site Principal Investigator (2013-2018) of a NIH-funded project entitled “Developing Innovative Interdisciplinary Biomedical Engineering Programs in Africa”. He is also the UI Site Principal Investigator (2019-2022) of the Newborn Essentials Solutions and Technologies (NEST) 360° Project. In September 2020, Coker led a multidisciplinary research team at the University of Ibadan to win two grants, awarded by the Institute for Global Health, Northwestern University, for research on COVID-19.

C-THAN Site PI's

Souleymane Diallo, MD

Diallo is Military specialist of TB and Respiratory diseases, and Director of SEREFO (TB and HIV research and Training Center) at the University of Sciences, Techniques and Technologies of Bamako (USTTB). He has trained and supervised over 100 medical students with their graduation thesis. At SEREFO, he oversee the administration, education, and research of 28 faculty and staff working in the BSL-3 tuberculosis and viral hemorrhagic laboratories, virology and immunology laboratories. In addition, he was responsible for training of the staff and implementing the tuberculosis control program nationwide, and specifically, he developed specialized programs for patients with the most serious disease, including those with multi-drug resistance (MDR).

Tania Douglas, PhD, MBA

Tania Douglas is a professor in the Division of Biomedical Engineering at the University of Cape Town, where she holds a Research Chair in Biomedical Engineering and Innovation. She completed degrees in electrical/electronic and biomedical engineering at the University of Cape Town, Vanderbilt University and the University of Strathclyde, and conducted postdoctoral research in image processing at the Japan Broadcasting Corporation. She also completed an MBA at the University of Cape Town. Her research interests are medical imaging, image-based mobile health (mHealth), and health innovation management. She is a fellow of the South African Academy of Engineering, a member of the Academy of Science of South Africa, and a Fellow of the International Academy for Medical and Biological Engineering. She is the Editor-in-Chief of Global Health Innovation, an electronic open-access journal focusing on social and technological innovation for improved health and healthcare; this journal arose from an NIH-funded partnership between Northwestern University and the Universities of Cape Town, Lagos and Ibadan.

Eligius Lyamuya, MD, PhD

Lyamuya is a Professor of Microbiology and Immunology at Muhimbili University of Health and Allied Sciences (MUHAS). He is a Fellow of the Tanzania Academy of Sciences (FTAAS) since 2013, Fellow of the College of Pathologists of East, Central and Southern Africa (FCPath ECSA) since 2014, and a Fellow of the African Scientific Institute since 2015. He has researched largely in sexually transmitted infections particularly HIV; Molecular Epidemiology of bacterial pathogens; Immunology of infectious diseases; Antimicrobial Chemotherapy; and Promotion of research ethics. He is currently the MUHAS site PI for an NIH-funded Project called 'Northwestern University Point-of-care AIDS Technology Center (NU-PACT)' and a Laboratory Coordinator for a EDCTP-funded Project titled 'Cohort preparation for the project titled: A combination, comparative efficacy study in Africa of diverse HIV-1 subtype-C DNA, MVA & protein/adjuvant vaccine regimens with pre-exposure prophylaxis (PrEPVacc.)'.

C-THAN Site PI's

Akinniyi (Niyi) Osuntoki, PhD

Osuntoki is a Professor of Biochemistry in the College of Medicine, University of Lagos and former Acting Head of the Department of Biomedical Engineering and Acting Head of the Department of Biochemistry, University of Lagos and Adjunct Professor of Molecular Biology and Biotechnology at the Nigerian Institute of Medical Research. Osuntoki's current research focuses on the development of probiotics from indigenous fermented foods, ecofriendly bioremediation processes, identification of molecular biomarkers, and investigating polymorphisms in selected genes as potential markers for diagnostic applications. He was University of Lagos site Principal Investigator for the N.I.H. sponsored program "Developing Innovative Interdisciplinary Biomedical Engineering Programs in Africa." Osuntoki leads a multidisciplinary research and development team in the University of Lagos involved in the development of low cost/low technology needs-based healthcare solutions.

Grant Theron, PhD, MSc

Theron is a Professor in the Division of Molecular Biology and Human Genetics, Faculty of Medicine and Health Sciences, Stellenbosch University (SU), in Cape Town, South Africa. He is a member of the DSI-NRF Centre for Excellence in Tuberculosis Research and the South Africa Medical Research Council Centre for Tuberculosis Research, both of which are embedded in SU. He leads the Clinical Mycobacteriology and Epidemiology (CIME) group, compromised of 40 post-graduate trainees, laboratory technicians, and a clinical recruitment team. CLIME's core research interests is the diagnosis of tuberculosis and drug-resistance. He is a European and Developing Countries Clinical Trial Partnership Senior Fellow. He has published ~100 papers in international peer-reviewed journals and registered a patent. He has done clinical trials of tuberculosis diagnostics throughout Africa. This work, and systematic reviews and meta-analyses he co-led, have informed international policy. His overarching goal is to drive African-led world-class research that advances the diagnosis of tuberculosis while promoting young scientists.

C-THAN Symposium Attendees

Chad Achenbach, MD, MPH

Achenbach is an Associate Professor in the Department of Medicine and Division of Infectious Diseases at Northwestern and leader of the C-THAN Clinical Core. Achenbach has been working in HIV-related clinical and translational research for about 20 years including clinical trials of novel therapies, epidemiology of co-morbidities, outcomes of ART, and global HIV research development. His recent research focuses on ways to improve health and minimize risk for cancer and cardiovascular diseases among individuals with HIV aging on ART. He has started a research program in collaboration with the Department of Preventive Medicine on molecular markers of aging (telomere length and DNA methylation) and risk for HIV-associated age-related diseases.

Daivd AuCoin

Dr. AuCoin received a B.S. from the University of Massachusetts at Amherst (1993) followed by a M.S. (1999) and Ph.D. in Cell and Molecular Biology from the University of Nevada, Reno (2002). Dr. AuCoin completed a postdoctoral fellowship at Stanford University (2005). He lectures on medical microbiology to School of Medicine medical students and recently assisted in the creation of a new undergraduate major, Microbiology and Immunology (MI), through the College of Science at the University of Nevada, Reno. The primary focus of the AuCoin laboratory is to develop diagnostics and therapeutics for infectious diseases. Current funding includes grants and contracts through the National Institute of Allergy and Infectious Diseases and multiple Department of Defense Agencies. All these projects rely on the identification of secreted or circulating microbial antigens that can be targeted for diagnosis of disease. The AuCoin laboratory has developed a novel platform technology termed "In vivo Microbial Antigen Discovery" or InMAD to identify such secreted antigens. InMAD is currently being utilized to identify candidate diagnostic antigens secreted during infection with Burkholderia pseudomallei (melioidosis), Aspergillus fumigatus (invasive aspergillosis) and Francisella tularensis (tularemia). Other recent projects include development of a rapid diagnostic test for Ebola virus in collaboration with a private sector partner.

Nick Borain

Borain has 25 years of lateral flow test development experience and has personally developed more than 30 assays both for internal use and under contract for companies such as Abbott Laboratories, Pfizer and British Biocell International. In 1994, as technical manager of Abbott Diagnostics Division in Johannesburg, he was tasked with developing lateral flow assays suitable for use in challenging locations in Africa, with emphasis on infectious diseases with high levels of social impact. To this end, Borain spent 3 years collaborating on site with PATH in Seattle, Abbott Diagnostics in Chicago, and Alchemy Laboratories in Scotland. In 1997, he manufactured a highly cost effective (<0.50USD), appropriate technology malaria test entirely using South African antibodies. This test became a world leader in the category and was manufactured for 10 years at up 1 million tests per month. With an order forecast from Abbott Laboratories, he resigned and founded Vision Biotech in 1999, producing HIV, malaria and syphilis tests for the sub-Saharan, South American and Asian market. In 2009, the company was sold to Alere. In 2013, he founded Lateral Flow Laboratories, especially to continue developing assays for neglected, high impact African diseases, most notably HIV and Tuberculosis.

C-THAN Symposium Attendees

Gerard Cangelosi, PhD

Dr. Cangelosi's research focuses on pathogen detection in clinical and environmental samples, and epidemiology of infectious diseases. Working in both the public and private sectors, his research teams have generated 10 patents and over 75 publications in relevant areas including tuberculosis (TB) and related diseases, food- and water-borne pathogens, and healthcare-associated infections. These activities share a strong emphasis on translation and global health impact.Aspects of Dr. Cangelosi's research have resulted in diagnostic product launches and company start-ups. Recently he led a U.S. – South African consortium to validate oral swab analysis (OSA) as a highly novel, non-invasive means to diagnose TB in adults and children. In other consortia he has developed point-of-care diagnostic devices for TB. He has led or co-led IRB-approved human subject protocols for infectious disease sample acquisition in Washington, Oregon, Florida, Bangladesh, South Africa, and Kenya.Dr. Cangelosi teaches Environmental Health courses on environmental change, microbiomes, and environmental pathogens. He has mentored over 25 graduate and undergraduate students.

Chris de Villiers

Chris founded Sinapi biomedical (2007), an engineering company that develops medical devices with the purpose of solving healthcare challenges in an affordable and practical way. He started his career as engineer in the SA Naval Engineering Bureau, worked as Production Manager in the food industry (increasing volumes by 60%) and oversaw the manufacturing of innovative wind-up energy devices (350 people). Sinapi initially developed a more effective chest drain and unique nutritional storage and feeding devices. In collaboration with PATH, the South African Medical Research Council and Grand Challenges Canada Sinapi developed and manufactures the affordable Ellavi Uterine Balloon - to help save the lives of mothers bleeding after giving birth. In collaboration with Northwestern University (C-THAN) and Grand Challenges Explorations Sinapi developed a sputum cup optimized for GeneXpert tuberculosis testing. Today Sinapi is a sustainable and profitable concern selling unique medical devices, all developed and manufactured in-house. The Sinapi Chest Drain range is one of the known brands in South Africa and in Europe. Sinapi employs 150 people, occupies factory space of +/-2000sqm and sells to more than 30 countries.

Bassirou Diarra, MD, MSc, PhD

Bassirou is Assistant Professor at the Faculty of Medicine and Dentistry of the University of Sciences, Techniques and Technologies of Bamako (USTTB), and head of SEREFO/UCRC BSL-3 laboratory for TB, and viral hemorrhagic. He has a broad background in molecular and clinical microbiology, with specific training and expertise on transmission dynamics and the immune response to tuberculosis infection, especially in individuals who are co-infected with HIV, and or with drug resistant tuberculosis. His current research interest include understanding the immuno-genetics factors associated with the geographical restriction of M. africanum infections in West Africa, and the dynamics of TB immune response during treatment and the contribution from the microbiome and HLA. In addition, he has a broad experience in 'One Health wrking on animal's samples for Tuberculosis, and other emerginginfectious diseases. Thus, during the 2014 Ebola Outbreak in West Africa, he playeda principle role in the confirming the diagnosis of Ebola inactivation in our BSL-3 and by molecular techniques.

C-THAN Symposium Attendees

Robert G. Gish, MD

Dr. Gish was first in Pharmacy School at the University of Kansas and then obtained his medical degree from the University of Kansas Medical School in Kansas City, Kansas. He completed a 3-year internal medicine residency at the University of California, San Diego, and a 4-year gastroenterology and hepatology fellowship at the University of California, Los Angeles which included transplant medicine. Dr. Gish is a fellow of the American Association for the Study of Liver Disease, the American Society of Transplantation and American College of Physicians. He has served on the editorial boards of American Journal of Gastroenterology, Hepatology, Journal of Hepatology, Digestive Diseases and Sciences, and Gastroenterology, among many others. He co-authored a public health policy for liver health in Vietnam focusing on HBV and is also assisting with the development of viral hepatitis health care policies in Georgia, Armenia, and the Philippines. He was a major early contributor to decipher methods for the detection of hepatitis B and C virus and characterizing their epidemiology and clinical presentation in humans. He was involved in studies that led to the genotypic classification strategies and methods now in use worldwide. He has published more than 700 original articles, abstracts, and book chapters. Robert G. Gish, MD, is currently an Adjunct Professor of Medicine at the University of Nevada Schools of Medicine in Las Vegas and in Reno. He serves as an Adjunct Professor of Pharmacy at Skaggs School of Pharmacy and Pharmaceutical Sciences at UCSD, a Clinical Professor of Medicine at Loma Linda University as well as a Staff Physician at Loma Linda University's Liver Transplant Clinic in Las Vegas. In addition, he is also Medical Director of the Asia Pacific Health Foundation in San Diego, CA and of the Hepatitis B Foundation in Doylestown, Pennsylvania. Dr. Gish is currently seeing patients, both in-person and via telemedicine, at various clinics in San Diego, Folsom, San Jose, Santa Rosa, Las Vegas/Reno and via Telemed2U.

Matt Glucksberg, PhD

Matt Glucksberg is a Professor of Biomedical Engineering and the Director of the Center for Global Health Technologies at Northwestern University. The CIGHT team works with health professionals in Africa to build medical devices for the developing world, mostly related to point-of-care diagnostics and neonatal and infant care. CIGHT is also committed to promoting the development of biomedical engineering degree programs at universities across the globe. Prof. Glucksberg is the co-founder and co-director of the Global Health Technologies Program, which has since 2006 brought undergraduate engineering students to Cape Town to develop devices and processes to improve health care in resource-poor environments.

C-THAN Symposium Attendees

Diana Hardie, MBChB, M.Med

Hardie is a pathologist (Clinical virologist) at the National Health Laboratory Service, South Africa. Since 2003 she has headed the diagnostic virology laboratory at Groote Schuur Hospital. Her functions include: overseeing the diagnostic virology laboratory, verification and release of laboratory results, clinical consultation, infectious diseases ward rounds, overseeing development of new ("in house") diagnostic assays, implementation of new commercial diagnostic assays according to clinical needs, and laboratory management. Since 2006 Hardie has been head of the virology expert committee for NHLS. (A body consisting of senior virologists from each academic centre that provides guidance to the organization on diagnostic and academic matters.)
She has taught medical virology and immunology to medical students and science undergraduates since 1994. She has taught modules on immunology, viral evasion of host defences and emerging viruses since 1992 for the BSc honours course at UCT.

Robert Havey, MD

Havey is the Founder and Director of Northwestern's Global Health Initiative and the Deputy Director of Northwestern's Institute for Global Health. He is an active clinician in Internal Medicine and serves as the Medical Director of Northwestern Primary and Specialty Care as well as a Vice President of Operations for Northwestern Medicine Healthcare. Havey is a Clinical Professor of Medicine at Northwestern's Feinberg School of Medicine.

Claudia Hawkins, MD

Hawkins is Associate Professor of Medicine and Infectious Diseases, Global Health Faculty Member and Director of the Division of Infectious Diseases' Viral Hepatitis HIV/ Co-infection Program at Northwestern. Dr. Hawkins has over 10 years clinical and research experience in HIV and chronic viral hepatitis B (HBV) and C (HCV) in both domestic and international settings including Tanzania, Nigeria, Brazil, Thailand, and South Africa. Dr. Hawkins' research primarily focuses on the epidemiology of HIV and viral hepatitis co-infection; associated long-term co-morbidities; novel diagnostics for viral hepatitis; and antiviral treatment outcomes. She also leads and participates in clinical trials investigating new therapeutic, and potentially curative, agents for HBV through the NIH-funded AIDS Clinical Trials Group.

C-THAN Symposium Attendees

Lisa Hirschhorn, MD, MPH

Hirschhorn is a physician trained in Infectious Disease and HIV and Professor of Medical Social Science and Psychiatry and Behavioral Health at Northwestern University Feinberg School of Medicine Medical School, Associate Director of the Center for Global Cardiovascular Health, faculty at University of Global Health Equity and Senior Director for implementation and Improvement Science at Last Mile Health, a non-profit supporting community health delivery for remote populations. Hirschhorn's research focuses on how to better measure and improve quality and implementation of effective practices in maternal and child health, primary care, HIV, and other conditions using implementation research and quality improvement methods.

Jane Holl, MD, MPH

Dr. Holl is a Professor of Neurology at the University of Chicago. Previously Professor of Pediatrics, Preventive Medicine, and Medicine and Director of the Center for Healthcare Studies and Center for Education in Health Sciences within the Institute for Public Health and Medicine, at the Feinberg School of Medicine. The Center for Healthcare Studies is the home for health services and outcomes research at the Feinberg School of Medicine and has approximately 45 faculty and affiliated faculty and 30 staff. The Center for Education in Health Sciences is the home for four master's programs, an Integrated PhD Program in Health Sciences, and post-doctoral and pre-doctoral training programs in health services and outcomes research. The Center has nearly 200 students and trainees and approximately 60 faculty. Holl is a general pediatrician and health services and outcomes researcher who has been extramurally funded for over 20 years by the NIH, AHRQ, and major foundations for research, ranging from health insurance coverage to patient safety and healthcare quality, and system intervention design and implementation in a wide range of clinical disciplines. Holl is the 2018 recipient of the John M. Eisenberg Excellence in Mentoring Award from AHRQ.

Lifang Hou, MD, PhD

Hou's research focuses on identifying molecular biomarkers of cancers, as well as the role of and intersection between environmental exposures and infections and cancer-related epigenetics. One of Dr. Hou's principal areas of expertise has been examining DNA methylation biomarkers of cancer risk, including gene-specific and genome-wide DNA methylation profiles,to provide potential analytic tools for the early detection and prevention of cancer in numerous diverse populations. Expertise in both of these areas raised Dr. Hou's prominence among American cancer researchers, culminating in an appointment by National Cancer Institute to the Blue Ribbon Panel for White House's Cancer Moonshot Initiative, helping direct the course of US cancer research for the next 10 years. Dr. Hou currently leads an NCI-funded consortium to study "Epigenomics of HIV-Associated Cancers in Nigeria," and since 2016, has led a Fogarty International Center funded training program to train scientists in Nigeria to conduct research on HIV-associated cancers.

C-THAN Symposium Attendees

Mphatso Kachule

Mphatso holds a Bachelor of Education degree and is currently reading towards a Masters in Strategic Management. Mphatso is the Country Director for Riders for Health Malawi. Mphatso leads a team of just over 100 to implement various projects and programs in Riders for Health Malawi including a successful national sample transport program. Mphatso works closely with the Ministry of Health and other Health focused organizations in Malawi. Prior to joining Riders Mphatso worked for Voluntary Services Overseas on a UKAID funded Health project.

Kate Klein, MA, MPH

Klein serves as the Senior Administrative Director at Northwestern's Institute for Global Health. She is responsible for the effective operations of the Center's research and administrative activities as well as the development, oversight, and management of international education in clinical medicine and research opportunities for Feinberg students. Mrs. Klein oversees the integration of all international educational programs for Northwestern's Feinberg School of Medicine and is responsible for developing and maintaining the school's global educational partnerships.

Nardus Koekemoer

Nardus started his career in 2011 at Hansen Industrial Gearboxes as Applications Design Engineer analyzing, consulting, designing and managing quality drive assembly packages for the industrial/mining sector. In 2016, he completed his Masters in Engineer at the University of Stellenbosch, focusing on nuclear and renewable energy technologies. He joined Sinapi biomedical in Sept '16 as a R&D Engineer bridging the gap between concept design and market requirement and also assisting in design, statistical & mathematical analysis, and regulatory compliance of current and new medical devices.

C-THAN Symposium Attendees

Julius B. Lucks, PhD

Lucks is Associate Professor of Chemical and Biological Engineering at Northwestern University. As a Hertz Fellow at Harvard University, he researched problems in theoretical biophysics including RNA folding and translocation, viral capsid structure and viral genome organization, under David R. Nelson. As a Miller Fellow at UC Berkeley in the laboratory of Adam P. Arkin, he engineered versatile RNA-sensing transcriptional regulators that can be easily reconfigured to independently regulate multiple genes, logically control gene expression, and propagate signals as RNA molecules in gene networks. With Arkin, Jennifer Doudna and Lior Pachter, he also lead the team that developed SHAPE-Seq, an experimental technique that utilizes next generation sequencing for probing RNA secondary and tertiary structures of hundreds of RNAs in a single experiment. This breakthrough and the many technologies that build off of this concept is now being used to uncover the role of RNA structure in regulating fundamental cellular processes across the genome.

Charles Mace, PhD

Charlie earned his BS from Le Moyne College in 2003, followed by an MS (2006) and PhD (2008) from the University of Rochester in the laboratory of Prof. Benjamin Miller. He was then a postdoctoral research assistant in the laboratory of Prof. George Whitesides at Harvard University from 2008–2011. Prior to joining the faculty at Tufts in 2013, he was a senior scientist at Diagnostics For All.

Almoustapha Maiga, PhD

Dr. Almoustapha I. MAIGA, PhD is an Associate Research Professor and molecular virologist at Faculty of Pharmacy, University of Sciences Techniques and Technologies of Bamako in Mali. Dr. Maiga has conducted medical research for about the last 15 years to understand the molecular epidemiology of HIV drug resistance, clinical and biological management of HIV infected patients, emerging viral infections like Ebola, dengue, SARS-COV-2 and other viral diseases. Dr Maiga is the Director of the Department of Medical Biology at the teaching and University hospital of Gabriel Toure in Bamako. He is also the Head of Molecular and Epidemiology of HIV drug resistance laboratory at the University Clinical Research Center and the Research and Training Center for HIV/Tuberculoisis at the University of Sciences Techniques and Technologies of Bamako (USTTB). He is the vice President of the National Scientific Committee for HIV treatment and clinical management with the Ministry of Health in Mali. He is member of two working groups at the National Agency for Research on AIDS and Viral Hepatis (ANRS) in France. He is also general secretary of a young African Association for research and antimicrobial resistance in Africa called “AAAMR”, member in many international societies like SOTHIS, Expertise France, RESAPSI, IAS and others. He is also member of scientific committee of many regional and international conferences in worldwide and scientific groups. He is collaborating with Northwestern University in Chicago, Pitie-Salpetriere Hospital at Sorbone University and University Pierre and Marie-Curie in Paris and others.

C-THAN Symposium Attendees

Mamoudou Maiga, MD, PhD

Maiga is co-investigator in the C-THAN's Technology Development, Clinical and Administration Cores. He is a Research Associate Professor at the Northwestern University Department of Biomedical Engineering, where he serves as Director of Translational Research for the Center for Innovation in Global Health Technologies (CIGHT). He has a broad background in molecular and clinical microbiology. His research work focuses primarily on novel treatment, microbiome and diagnostic strategies for tuberculosis, non-tuberculous mycobacteria (NTM), and HIV. He developed at Johns Hopkins pre-clinical innovative methodologies for tuberculosis breath tests using isotopically-labeled urease, carbon monoxide and isoniazid-nitrogen, some of which are being currently clinically evaluated. He also has expertise in microbiome sequencing and pathogens' whole genome sequencing.

Benjamin Miller, PhD

Benjamin L. Miller received his undergraduate degrees from Miami University (Ohio) in Chemistry (B.S.), Mathematics (A.B.), and German (A.B.) in 1988, and a Ph. D. in Chemistry in 1994 from Stanford University. Following a stint as an NIH postdoctoral fellow at Harvard, he joined the University of Rochester faculty in 1996. He is currently Dean's Professor of Dermatology, Biochemistry and Biophysics, Biomedical Engineering, Materials Science, and Optics. His laboratory works on novel optical chem- and biosensors, with particular interests in integrated photonics and sensors for cost- and resource-sensitive applications. Miller is a founder of Adarza BioSystems, Inc., and is the Academic Lead for Integrated Photonic Sensors in AIM Photonics. He is a Fellow of the AAAS, OSA, and AIMBE.

Tinashe E. M. Mutsvangwa, PhD

Mutsvangwa received the B.Sc. degree in electrical/electronic engineering and the M.Sc. and Ph.D. degrees in biomedical engineering, all from the University of Cape Town, Cape Town, South Africa, in 2003, 2005, and 2009,respectively. He is currently a Senior Lecturer in biomedical engineering and health innovation and design with the University of Cape Town. His research projects center on the application of image and image analysis methods for computer-aided diagnosis. Topics span from 3-D reconstruction of bone, X-ray imaging, statistical shape and appearance modelling, 3-D morphometrics, diagnosis of TB via mobile phone imaging, computer-assisted Fetal Alcohol Syndrome screening, facial characterization of mental disorder patients to stereo photogrammetry, 3-D geometric morphometrics, machine learning, and pattern recognition methods as applied to analysis of the human form and the use of mixed-reality for aiding orthopaedic diagnosis, Dr.Mutsvangwa received the research-based University Chair of Excellence Fellowship from 2012 to 2014.

C-THAN Symposium Attendees

Martin Nieuwoudt, PhD

Nieuwoudt has degrees in Physiology and Nuclear Medicine, and a PhD in Bioengineering from the University of Pretoria (UP). From 2002 until 2011 Martin worked as a Researcher and Manager for a Tissue Engineering and Molecular Biology Lab located in the Dept of Immunology at UP. From 2011 to 2017 Martin was employed as a Modelling Researcher at SACEMA at Stellenbosch University (SU). His studies at SACEMA focused for the most part on the Immune system in states of Health and Disease. In particular, merging Mathematical models with empirical Biomarker data to improve Statistical methodologies and to inform Public-health decision-making regarding mostly Anti-retroviral treatment outcomes. Martin also furthered his education in the Commercialisation of Intellectual Property and Strategic Management at SU. At present, Martin is appointed as Professor in the Dept. of Mechanical and Mechatronic Engineering and is the Director for the Institute for Biomedical Engineering (IBE) at SU. He is the SA Director for the Northwestern (NU, Chicago, USA) Global Health Technologies study abroad program at Stellenbosch University. He also has an Adjunct Professor position at NU.

Kara Palamountain, MBA

Kara Palamountain is a Research Associate Professor at the Kellogg School of Management and a Lecturer of Global Health. Palamountain has managed over 50 Kellogg field research teams conducting market entry analysis for medical technologies in over a dozen countries (Botswana, Brazil, Cambodia, China, India, Kenya, Lesotho, Malawi, Mozambique, Namibia, Nigeria, South Africa, Swaziland, Tanzania, Uganda, Vietnam and Zambia). Palamountain is Co-Principal Investigator of a $68M grant, Newborn Essential Solutions and Technologies, or NEST360°, which aims to reduce the neonatal mortality rate by scaling life-saving medical devices within the health systems of four African countries. Palamountain has also served as an external reviewer for various projects under consideration by the Bill & Melinda Gates Foundation and a peer reviewer for Grand Challenges Canada. She also authored "Exploring the Case for a Global Alliance for Medical Diagnostics Initiaitive" published in Diagnostics,"Perspectives On Introduction And Implementation Of New Point-Of-Care Diagnostic Tests" and "Opportunities And Challenges For Cost-Efficient Implementation Of New Point-Of-Care Diagnostics For HIV And Tuberculosis" published in the Journal of Infectious Diseases, and "Optimizing tuberculosis case detection through a novel diagnostic device placement model: The case of Uganda". Ms. Palamountain is also the President of the Northwestern Global Health Foundation. Prior to her work at the Northwestern Global Health Foundation and at Kellogg, Kara worked as a management consultant in Deloitte's Healthcare practice for over six years (1998-2002; 2004-2006). She received her MBA from Kellogg in 2004 and her BBA from the University of Texas at Austin in 1998.

C-THAN Symposium Attendees

Lele Rangaka

Rangaka is a Clinical Associate Professor of Global Health within the Institute of Global Health, University College London (UCL), UK, and an international expert in HIV-associated TB (HIV/TB). She has held several prestigious fellowships including from the Wellcome Trust and European and Developing Countries Clinical Trials partnership. She is also an honorary Associate Professor at the University of Cape Town (UCT), South Africa, affiliated to the School of Public Health, Division of Epidemiology & Biostatistics, and the Wellcome Trust Clinical Infectious Diseases Research Initiative-Africa. Rangaka conducts translational research in the diagnosis and prevention of tuberculosis in vulnerable populations. She leads SA-UK work in the areas of TB in pregnancy, preventive therapy for DR and DS TB as well as Digital Health Innovation for HIV/TB care.

Jacob Sorensen

Jacob is a 5th year PhD student currently enrolled in the combined MD/PhD program at the University of Nevada, Reno School of Medicine, and is preparing to apply to Internal Medicine residency programs in 2022. After seeing potential in an unfunded project and with the help of his advisor and several collaborators, Jacob took on the role as a primary author for a C-THAN proposal. Jacob's research focuses on a promising HBV biomarker (HBcrAg), as well as its adaption for point-of-care testing. His work has resulted in a working assay prototype while also elucidating interesting data regarding HBcrAg and its relation to existing HBV diagnostics. Jacob's advisor is David AuCoin, PhD who chairs the Department of Microbiology and Immunology at the University of Nevada, Reno School of Medicine. David's lab, also known as the Diagnostics Discovery Laboratory (DDL), aims to reduce the global burden of disease through the development of novel rapid diagnostics that are sensitive, specific, and affordable. DDL is an academic lab that also engages the private sector through cooperative research and licensing of technology.

Anthony Sorge

Tony Sorge has been in biotechnology since 1984. Named San Diego's Entrepreneur of the Year, Tony is a natural-born visionary with an inherent knack for identifying innovative new technologies. Tony has had business/academic relationships with some of the brightest minds in the industry including two Nobel Laureates, Dr. Gerald Edelman (succeeded in creating a precise model of an antibody molecule) and Kary Mullis (Inventor of the Polymerase Chain Reaction Technique). One of his greatest accomplishments includes founding Stratagene, a successful biotech company that was acquired by Agilent for over $245M. Utilizing his international perspective and experience, Tony has created the foundation for a global corporation poised to be the go-to company for this disruptive diagnostics solution.

C-THAN Symposium Attendees

Mario Stevenson, PhD

The HIV/AIDS Institute at the University of Miami Miller School of Medicine is led by Mario Stevenson, Ph.D., who serves as Director. Dr. Stevenson is Chief of the Division of Infectious Diseases in the Department of Medicine, Director of the AIDS Clinical Research Unit, Co-Director of the Miami Center for AIDS Research (CFAR) and Co-Director of its Developmental Core and Professor of Medicine. An internationally recognized leader in the field of HIV/AIDS, Dr. Stevenson received his doctorate from the University of Strathclyde in Glasgow, Scotland in 1984. He performed postdoctoral studies at the University of Nebraska Medical Center and was a professor at that institution from 1993-1995. He conducted a research sabbatical at National Institute for Medical Research in London in 1990. In 1995, he joined the Program in Molecular Medicine at the University of Massachusetts Medical Center. Dr. Stevenson was previously the David Freelander Chair of AIDS Research and Director of the Center for AIDS Research at the University of Massachusetts Medical School. His research is aimed at uncovering the functions of viral accessory genes, mechanisms of viral persistence and immunopathogenicity as well as cellular factors influencing virus-host cell interplay.

Mark Styczynski, PhD

Mark Styczynski is an Associate Professor in the School of Chemical & Biomolecular Engineering at the Georgia Institute of Technology in Atlanta, Georgia, USA. He received a B.S. from the University of Notre Dame in 2002 and a Ph.D. from the Massachusetts Institute of Technology in 2007, both in chemical engineering, and then did postdoctoral work in comparative functional genomics at the Broad Institute through 2009. During his training he was an NSF Graduate Research Fellow and an NIH Kirschstein-NRSA Postdoctoral Fellow. One of the main foci of his Georgia Tech research group is the development of minimal-equipment, low-cost, visually interpretable, field-deployable diagnostic assays. He has developed biosensors using whole cells as well as cell-free reactions, with an emphasis to date on nutritional epidemiology - specifically, deficiencies of vitamins and minerals. He was also the president of the Metabolomics Association of North America from 2017-2020.

FLUORESCENT P24 AG ASSAY TO INCREASE SENSITIVITY OF EARLY INFANT DIAGNOSIS OF HIV

CO-PI'S: SALLY MCFALL AND DIANA HARDIE

HIV PCR testing is the gold standard test for early infant diagnosis of HIV infection. However, a major limitation is that samples have to be sent to a laboratory for testing and this can delay diagnosis of HIV infected infants and linkage to care. Thus the development of a point of care assay with a near equivalent sensitivity to PCR would be a major breakthrough. The LYNX HIV-1 p24 Ag assay was developed by the Center for Innovation in Global Healthcare Technologies (CIGHT) to diagnose infants at the point of care. The test uses an instrument for disrupting immune complexes by heat treatment, and a p24 antibody linked to carbon nanoparticles which is read visually to detect HIV p24 viral antigen at 10-12 molar level. Previous iterations of this assay were tested in the diagnostic virology laboratory at Groote Schuur Hospital in 2009 and 2012 (HREC REF 172/2009 and 491/2009). In the laboratory, the analytical sensitivity corresponds to 95% clinical sensitivity. However, in field testing in Mozambique, the clinical sensitivity fell to 71.9% (1). Despite the lower clinical sensitivity, the LYNX test performed at the point-of-care had the potential to provide test results to up to 81% more patients compared to the laboratory-based test which have long turnaround times leading to high numbers of patients lost to the system do to loss-to-follow up.

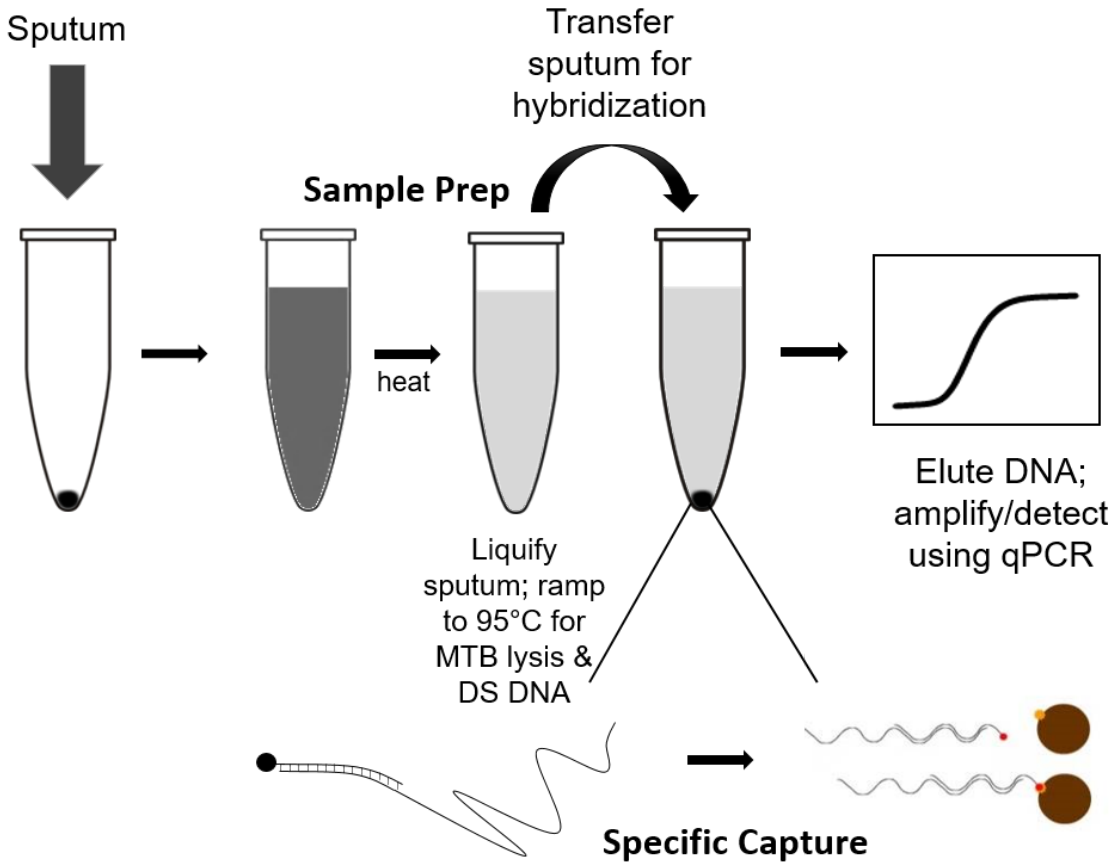
A root-cause analysis was performed to determine why the test clinical sensitivity fell during the field trials. One significant source of error was in reading the test when the test line had low density. To improve sensitivity, the assay was redesigned. In the new test design, the biotinylated capture antibody is the same as in the carbon test, and the label antibody is linked to Europium particle instead of carbon nanoparticle. Preliminary unpublished studies have demonstrated that the fluorescent assay has up to 25-fold greater sensitivity than the carbon assay. In addition, a reader has been added to detect the signal.

A pilot validation is planned in the Groote Schuur Hospital Diagnostic Virology laboratory to test the new assay. Residual samples (EDTA whole blood) from HIV-exposed infants will be used. The new Lynx assay will be compared with the current gold standard molecular EID assay in use in the laboratory, namely the Roche version 2 HIV PCR assay currently performed on the CAP/CTM platform. Gold standard positive and negative samples will be used in the evaluation to determine the sensitivity and specificity of the redesigned Lynx assay.

HIGHLY SENSITIVE MULTIPLEX QPCR FOR DETECTING HIV-ASSOCIATED TUBERCULOSIS (TB) AND NON-TUBERCULOUS MYCOBACTERIA (NTM) INFECTION

CO-PI'S: MAMOUDOU MAIGA AND SOULEYMANE DIALLO

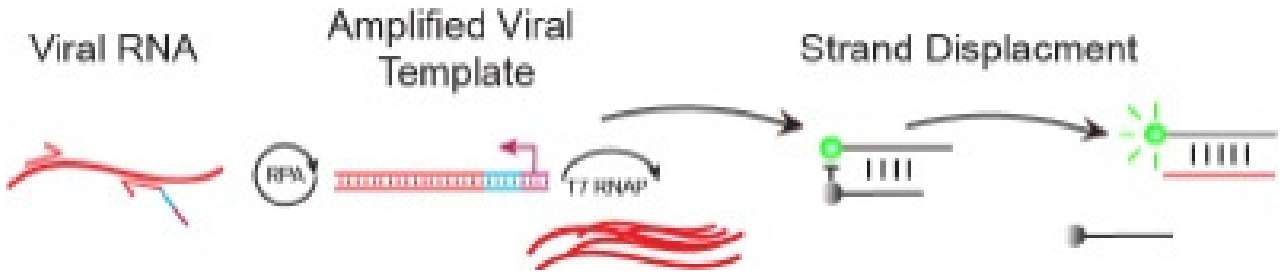
The prevalence of non-tuberculous mycobacteria (NTM) has been increasing worldwide. NTM infection is clinically indistinguishable from tuberculosis and poses significant challenges in diagnostic and patient management, especially in HIV-infected patients and chronically TB treated patients. Sputum smear microscopy, the most widely used diagnostic tool for TB, is more than 100 years old, fails to detect half of tuberculosis cases, and is unable to differentiate mycobacterial species. The Xpert MTB/RIF assay is widely used for TB detection, however, it is less sensitive than sputum culture (the current gold standard) and does not detect NTM infections. Our goal is to develop and evaluate a new highly sensitive Multiplex assay to detect TB and NTM infections in both HIV uninfected and infected. Our new assay showed a high analytic performance with limits of detection of 5 CFU/ml for both MTBC and MAC, as compared to the 10 CFU/mL limit for sputum culture and 131 CFU/mL for Xpert assay. This simultaneous diagnostic assay for MTB and NTM is very promising and will significantly improve management of patients in both developed and developing countries.



ACUTE HIV DETECTION ASSAYS WITH ISOTHERMAL AMPLIFICATION AND STRAND DISPLACEMENT VISUALIZATION

PI: JULIUS LUCKS

The technology we are developing links isothermal nucleic acid amplification with logic-based DNA strand displacement (SDA) for visual detection of pathogenic viral RNA (Fig. 1). In this approach, Recombinase Polymerase Amplification (RPA) is used to amplify a designed double-stranded DNA from input viral genomic material (DNA/RNA). This DNA serves as a template for T7 RNA polymerase transcription that produces an RNA designed to interact with a double-stranded DNA fluorophore quencher duplex. Strand displacement of the quencher strand by the RNA product results in a detectable output that can be visualized using simple 3D-printed devices. Specific advantages of this technology are that fluorophore quencher pairs can be deployed in tandem with an incredibly high degree of programmable orthogonality, potentiating the multiplexed detection of multiple viral species, serotypes, and SNP markers within the same test. The coupling of SDA to isothermal amplification serves to create two different check points reducing false positive rates. While off target amplification can occur during RPA, our methodology's readout only allows for signal generation following detection of the desired amplification product. Therefore, positive results require both the presence of the target virus for amplification, and the production of the correct oligonucleotide. Furthermore, SDA can be interfaced with downstream nucleic acid circuits to allow thresholding strategies for viral load quantification.



Schematic for viral detection utilizing RPA and strand displacement. Viral RNA is targeted within an RPA reaction using a primer set possessing a T7 promoter overhang. The resulting DNA template is then transcribed by T7 RNA polymerase (RNAP), which creates many copies of the target RNA (red). This target RNA can in turn displace the quencher strand from a quenched DNA duplex to generate a fluorescent signal.

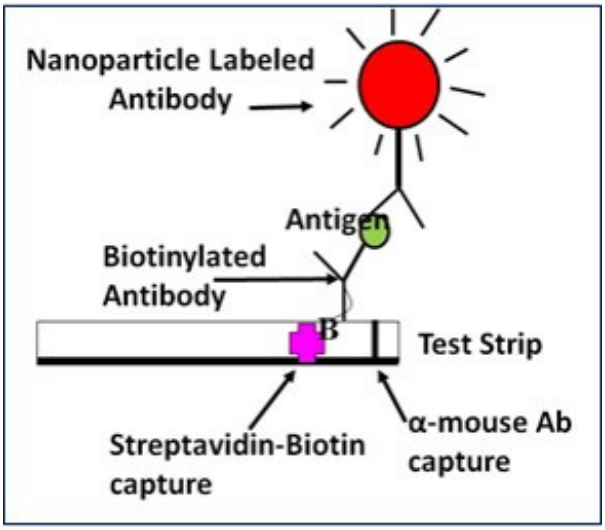
DEVELOPMENT OF HCV CORE ANTIGEN TEST TO DETECT ACTIVE HEPATITIS C INFECTION

PI: SALLY MCFALL

The lack of hepatitis C virus (HCV) diagnostic tests for decentralized settings is a major obstacle for treatment and prevention services particularly in LMICs. We aim to develop a POC HCV core antigen test as it will provide two major advantages over an antibody test: it detects active viral infection, and it detects the infections ~60 days earlier. The test will be composed of 3 steps: 1) separating plasma from blood; 2) extricating antigens from virions and immune complexes; and 3) detecting the antigen. The patented disposable device for separating blood cells from plasma developed for the LYNX p24 assay will be used for step one, and here we propose to develop a sample prep method and HCV core antigen immunoassay for steps 2 and 3 yielding an assay that can detect >90% of patients with active hepatitis C infection as described in the recently published target product profile.

Globally, approximately 115 million people have serological evidence of current or past HCV infection with 80 million of those having active chronic infection with detectable viral RNA. HIV-infected persons are more likely to be infected with HCV than non-HIV infected persons, and liver disease has emerged as a leading cause of morbidity and mortality in persons co-infected with HIV. With the advent of DAA (Direct Acting Antiviral) pharmacological agents, 95% of patients can be cured of HCV infection in as little as 12 weeks. Access to treatment is expanding rapidly in LMIC as a result of the availability of generic DAAs resulting in dramatic price reductions with the cost of a 2 drug treatment course nearing $100-200.

An HCV test for active infection will increase access to treatment especially in LMICs and remote populations. It will eliminate the initial serological screen so that a single test could diagnose viremic infection which is a high priority in Africa since a far greater number of patients test positive for anti-HCV antibodies without detectable RNA than in other locations. The central lab based Abbott Architect HCV Core Antigen test, one of the most sensitive immunoassays available with ~95% clinical sensitivity, can be used as a one-step test. This project will determine if a LFA could achieve acceptable sensitivity.



SMARTPHONE-BASED MEASUREMENT OF TST INDURATION FOR LATENT TB SCREENING

PI: TANIA DOUGLAS

Tuberculosis (TB) is caused by the organism Mycobacterium Tuberculosis (M.tb) and affects the lungs, but can also affect other parts of the body. TB is one of the leading causes of death in developing countries. A quarter of the world is estimated to have latent TB infection (LTBI). In LTBI, the M.tb is largely dormant but can produce a detectable immune reaction. LTBI indicates previous infection and can quickly progress to active TB, particularly in people with compromised immune systems, like those living with HIV/AIDS. Africa has more than double the global average of tuberculosis cases per 100 000 people, making it the most heavily burdened by the disease relative to population. In South Africa, it is estimated that there are 450,000 new infections every year. Presently, there are concerted efforts globally to eradicate both TB and HIV/AIDS. The United Nations resolution for sustainable development goals 70/1 of 2015, goal 3.3 states the need to eradicate these diseases by 2030. In South Africa, the government launched the national strategic plan (NSP) for HIV/AIDS, TB and STI's, aimed at reducing TB cases to 70% of current levels by 2022. Some of the strategies to achieve this include increasing coverage of preventive therapy, controlling infection by treating LTBI in high risk persons, TB screening in high risk persons and early anti-retroviral treatment for people living with HIV/AIDS.

The tuberculin skin test (TST), also known as the Mantoux test, is the most widely used method for detecting LTBI in the world today. The World Health Organization cites that 30 of the 68 countries that implement a systematic method of testing and treatment of LTBI solely rely on the Mantoux test for diagnosis; with the other 38 countries using a combination of the Mantoux and other diagnostic tests. The test is carried out by injecting tuberculin into a patient's forearm, which results in the formation of an induration on the skin after 48 to 72 hours. It is therefore necessary for patients to return to the healthcare facility for assessment of the outcome. During this second visit, a clinician measures the size of the skin induration using a ruler and pen. The result is classified as positive or negative based on the consensus threshold. An induration suggests possible prior sensitization with M.tb. One of the challenges faced by healthcare workers is that some of the patients subjected to the TST do not return to the clinic after the specified time for evaluation of the results. Self-assessment has been recommended as an alternative to increase the number of patients returning to the clinic. However, this may require training of patients, which may not be cost-effective. Methods for improving the efficiency of the TST would improve the monitoring and prevention of TB, towards achieving sustainable development goal 3.3.

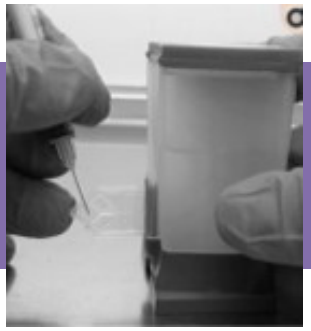
The aim of the proposed study is to address the gaps identified in the previous studies as described above. This will be achieved through the following objectives: (1) improving the user interface of the app; (2) technical optimisation of the 3D reconstruction process; (3) evaluating the usability of the proposed app; (4) clinical testing of the refined app.

OPTIMIZATION OF SPUTUM COLLECTION CUP FOR IN GENEXPERT

PI: CHRIS DE VILLIERS

High reject rates of collected sputum specimens prompted the initiation of a design project to develop an improved sputum collection cup in collaboration with clinical, academic and commercial partners from South Africa and the United States. Through the application of an iterative design process (>15 iterations), optimization of the sputum volume measurement and ease of closing and sealing the collection container lid, a new container design has been developed with a specification comprising “9” critical requirements suitable for the current clinic- and laboratory TB Xpert network, thus providing more efficient sputum sample preparation. Currently, the design is being clinically evaluated with further modifications expected to optimize the design from the results obtained from the clinical evaluation.

DEVELOPMENT AND EVALUATION OF A NEAR-POC USER-FRIENDLY DEVICE TO SALVAGE DNA FROM USED XPERT CARTRIDGES FOR FURTHER MOLECULAR DIAGNOSTIC TESTING.



PI: GRANT THERON

Globally, TB is the single biggest cause of death in PLWH. A major problem is ensuring that TB cases are placed on effective treatment quickly and this need is especially acute for PLWH, who have a high mortality. GeneXpert (Cepheid) is a molecular platform widely-deployed in central laboratories and well-resourced nearPOC settings. It uses disease-specific cartridges but the most common usage is for TB diagnosis (Xpert MTB/RIF, Xpert). Xpert only determines rifampicin susceptibility and not resistance for any of the critica second-line drugs required for multidrug-resistant (MDR)-TB treatment. The World Health Organization (WHO) and national programs recommend Xpert-positive rifampicin-resistant patients receive MTBDRsl, a DNA test for second-line resistance. In addition to often requiring culture (which is slow) and DNA extraction (which requires special equipment), MTBDRsl requires a new sputum specimen; hence patients need to return to health care facilities. A delay or failure to do so is common, leading to ineffective TB treatment and poor outcomes, particularly in PLWH have increased susceptibility. This requirement for multiple specimens for a full diagnosis results in attrition throughout the care cascade, increased laboratory workload and diagnostic delay, and increased patient and provider related treatment costs. There is need for a simple tool that eliminates the need for additional specimen collection. This can facilitate prompt diagnosis of second line resistance (or enable any further downstream DNA-based testing), hence reducing delay and/or mistreatment of possible drug-resistance. This will likely improve patient outcomes in TB, which is the single most important HIV-co-morbidity.

GeneXpert capacity, which can be used for many assays other than TB (e.g., viral load, hepatitis, strep) is exponentially scaling-up. Our approach provides an opportunity to capitalise on this momentum and existing infrastructure. In a proof of concept study (Venter et al., Sci Reports, 2017), we showed that accurate second-line drug testing using MTBDRsl on used Xpert cartridge extract (CE) that would otherwise be discarded is feasible and accurate. However, this required a manual procedure to remove pre-isolated DNA from cartridges, which is not viable in a busy routine laboratory setting. We now propose to develop a simple, safe, disposable tool to salvage extracted DNA from expended GeneXpert cartridges for further testing by taking advantage of the existing GeneXpert platform. This can obviate the need for additional sample collection and DNA extraction. Our solution proposes to 1) develop a working prototype and 2) evaluate its performance in routine diagnostic laboratory settings. Our approach is novel in that it 1) exploits spent material otherwise considered waste, taking advantage of the existing GeneXpert platform, which is proven to effectively homogenise sputum and concentrate and purify DNA, 2) eliminates the need for additional sample collection/processing, hence reducing diagnostic delays and all-round costs, 3) has potential applications for other HIV co-morbidities besides TB for which other GeneXpert cartridge-based assays exist, and 4) includes a multidisciplinary team with proven expertise that are already C-THAN members (Theron, clinical diagnostic evaluations; Niewoudt, biomedical engineers; Maiga, TB assay design; Tadokera, TB immuno epidemiology and implementation).

ORAL SWAB DIAGNOSIS OF HIV-TBFOR FURTHER MOLECULAR DIAGNOSTIC TESTING

PI: GERARD CANGELOSI

Tuberculosis (TB) is a highly significant co-infection of people with HIV. Diagnosis of pulmonary TB is routinely done by microbiological or molecular analysis of sputum, a viscous material derived from deep in human airways. Production of sputum requires coughing and is an occupational hazard to healthcare workers. Effort is required to consistently collect good-quality specimens, especially from HIV-coinfected adults and children, who often require invasive sputum induction procedures. Once collected, the viscosity of sputum makes it difficult to process, standardize, and analyze, especially at point of care (POC). Most TB transmission occurs between development of active disease and initiation of treatment. Therefore, active case finding could reduce transmission. Even in the context of routine TB diagnosis, many patients including HIV-coinfected patients cannot routinely produce sputum for testing. For all of these reasons, Fauci and Eisinger (2018) have called for “twenty first century diagnostic technologies that can detect Mtb in a variety of clinical specimens from multiple body sites in addition to sputum”. Alternatives to sputum for TB testing have been sought for years with limited success. Exhaled breath, saliva, blood, stool, and urine have been evaluated. Most of these specimens do not work as well as sputum, and none are conducive to high-throughput case finding. TB diagnosis would be greatly simplified by a new type of sample that is small in volume, safe, easy, and painless to collect, non-viscous, uniform in composition, and simple to handle and test at POC. This project seeks to address these needs.

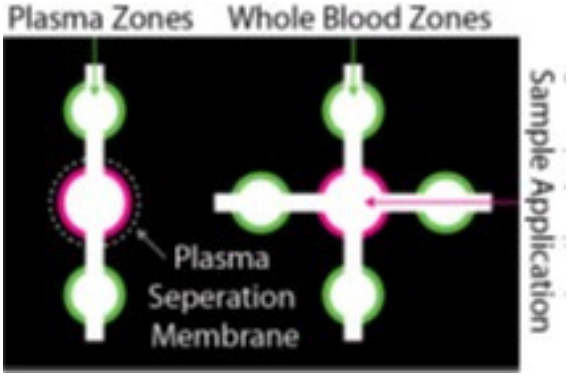
We hypothesize that oral swab analysis (OSA) can meet this need. In OSA the dorsum of the tongue is gently scraped with a disposable swab, which is then tested for Mycobacterium tuberculosis (Mtb) DNA by qPCR. Oral swabs are much easier to collect, handle, and process than other samples. Swabbing is painless, non-invasive, and requires just seconds; an entire workplace or classroom can be sampled in minutes. HIV coinfected patients and others who struggle to produce sputum are easily sampled by OSA. Preliminary results demonstrate that Mtb DNA routinely accumulates in diagnostically useful amounts on the tongues of TB patients, including HIV-coinfected patients. The diagnostic yield of OSA approaches that of sputum testing (92% sensitive relative to sputum testing in recent evaluations on adults). New preliminary data show that these evaluations used only a small portion of the tongue dorsum biofilm that can easily be collected for testing. Therefore, sensitivity can be enhanced by increasing sample volume. This project will 1) design and evaluate new high-capacity tongue swabbing methods, and 2)design and evaluate sample processing methods that exploit the unique advantages of swabs relative to sputum (small volume, low complexity, limited qPCR inhibition). OSA could facilitate new POC diagnostic strategies, improve diagnostic yields relative to sputum alone, and greatly simplify the care of sputum-scarce patients including HIV-co-infected patients. It could also facilitate active case finding, leading to reduced TB transmission in many settings. OSA is an entirely novel approach toward a long-standing diagnostic challenge.

PATTERNED BLOOD SPOT CARDS

PI: CHARLES R. MACE

Dried blood spot cards have been utilized globally to monitor HIV viral load for decades. Despite the widespread use of dried blood spot cards, there have been very few improvements to their design since they were introduced to clinical use (e.g., Whatman FTA cards, Noviplex plasma storage cards). Traditional dried blood spot cards are a passive medium for biofluid storage and have no method for sample purification or volume control. Since there are no defined wells or channels, blood samples can flow in any direction and are often heterogeneously distributed throughout the card. Because dried blood spot cards do not control sample volume or flow, substantial inconsistencies between applied samples or within a single spot can occur. Moreover, different card materials are required for different applications (i.e., plasma proteins vs DNA/RNA), which adds unnecessary cost and complexity to sample collection. Monitoring viral load requires purified plasma because infected blood cells can cause overestimations of the viral load and bias treatment decisions. However, liquid plasma samples require a trained phlebotomist, specialty equipment, and cold chain storage, which are not usually available in field settings. Dried plasma spot cards are currently only commercially available from a single company. These alternatives to traditional cards are expensive, require larger volumes of blood, and provide limited improvement to these century-old medical devices.

We pattern paper cards with hydrophobic barriers to accurately control blood and plasma volume and distribution—overcoming the outstanding difficulties associated with traditional dried blood spot cards.Channels delineate flow paths allowing for sample pretreatment, active sensing, and separation to be performed on the card without any additional input from the user or changing user workflow. Our patterned dried blood spot cards have the potential to permanently alter the way blood and plasma samples are collected on a global scale. Our approach will improve blood sample collection, stability, and integrity—leading to more dependable biomedical samples. These patterned cards improve sample quality and homogeneity by constraining volume input and flow while also allowing for simultaneous whole blood and plasma storage. Our cards can distribute and store discrete volumes of whole blood as well as plasma—a feature not currently possible with any dried blood or plasma spot card on the market to date. Our augmentations to traditional dried blood spot cards improve sample quality without altering user operation steps—allowing current users to feel more comfortable working with new technology. Enhancing sample output provides highly accurate insight to patient health and enables personalized treatment plans. False positives or negatives due to degraded samples delay proper treatment, which can stress the patient mentally, physically, and financially. Advancing patient treatment allows for reduced morbidity rates and improvement of overall quality of life.



SIMPLE REACTION DETECTION OF HIV-1 RESISTANCE IN RESOURCE LIMITED SETTINGS

PI: MARIO STEVENSON

Assessment of HIV-1 antiretroviral (ARV) drug resistance is essential to guide treatment decisions upon initiation of ARV or when changing a regimen that is failing. Despite widespread recommendations of performing ARV resistance testing, resistance tests are not available for most infected individuals living in low and middle-income countries (LMIC) due to high cost and limited infrastructure. In LMIC as many as 20% of individuals initiating therapy and as many as 90% of individuals failing therapy have HIV-1 with resistance to first line nucleoside and non-nucleoside reverse transcriptase inhibitors (NRTIs and NNRTIs, respectively). Therefore, people living with HIV-1 in LMIC are receiving suboptimal care and there is an urgent need to develop tools that will allow affordable and simple HIV-1 resistance testing, improve the care of those living with HIV, and limit the spread of HIV-1 drug resistance. Gold-standard resistance testing involves genotyping utilizing assays that are expensive and require centralized laboratories. Furthermore, genotype-based resistance assays generate much information that is unnecessary for the management of HIV-1 infection as resistance to the most common ARV emerges from a single point mutation. For this reason, development of rapid and inexpensive screening tools for HIV-1 antiviral drug resistance that can be used to identify those who will require full genotyping is urgently needed. Such a screening test has the potential of detect resistance mutations prior to initiating ARVs and when there is treatment failure, thereby optimizing treatment for the highly vulnerable population of people living with HIV-1 infection in LMIC.

Discidium Biosciences Inc. has followed an iterative process towards developing a point of care assay capable of revealing first-line HIV-1 resistance in real time. Our objective is to develop a simple, low cost assay for point-of-care that will serve as a screening tool to identify the most common HIV-1 mutations that confer resistance to the most used ARV in LMIC (K103N to NNRTI and M184V to NRTI). We have focused on three attributes we believe are essential for such an assay: 1. Single tube format; 2. No cold chain requirement - assay can be reconstituted from lyophilized reactants; and 3. Capacity to detect mutations in unprocessed plasma. Our approach relies on a unique form of Taq polymerase (HiDi Taq), which has an extraordinary requirement for a base pair match at the 3´ end of the primer-target duplex. When the 3´ nucleotide in a diagnostic primer is matched to a drug resistance mutation in the HIV-1 genome, PCR amplification products are generated ONLY if the mutation is present. No sequencing is required to reveal resistance mutations. We have developed a fluorescence approach that allows direct visualization of PCR products under a blue light source using lyophilized reactants. The assay is one step in that amplification and readout occur in the same tube, and it can be done in clinic settings with minimal laboratory infrastructure. This simple assay will provide all information the healthcare provider requires to determine the need for full genotyping, and guide the best course of treatment.

LATERAL FLOW IMMUNOASSAY FOR RAPID DETECTION OF HEPATITIS B CORE RELATED ANTIGEN (HBCRAG) TO AID IN MANAGEMENT OF CHRONIC HEPATITIS B (CHB) INFECTION

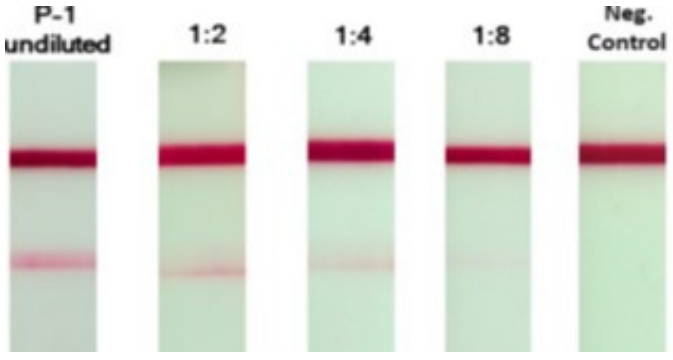
PI: DAVID AUCOIN

The hepatitis B core related antigen (HBcrAg) represents an emerging clinical biomarker in the management of chronic hepatitis B virus (HBV) infection. Serum HBcrAg levels exhibit a unique correlation with HBV replication, and a rapidly growing body of research supports integrating HBcrAg assessment into standard clinical practice. Using antibodies generated in our laboratory, we have developed a novel point-of-care (POC) capable HBcrAg detecting lateral flow immunoassay (LFI), as well as a HBcrAg antigen-capture enzyme-linked immunosorbent assay (ELISA). Despite the existence of an effective vaccine, worldwide, an estimated 292 million individuals are chronically infected with HBV1, resulting in over 600,000 deaths annually. Existing antiviral therapies for treating CHB are rarely curative, and 20-30% of adults with CHB go on to develop cirrhosis or hepatocellular carcinoma (HCC)2. Between 5-15% of all HIV positive individuals are coinfected with HBV. Patients with CHB often appear asymptomatic regardless of whether their infection is in an active or inactive state, and therefore require lifelong clinical surveillance to evaluate the need for treatment modification. After diagnosis and the initiation of treatment, HIV/HBV coinfected patients must be closely monitored for failed suppression of either infection. Existing HBV therapies are rarely curative and coinfected patients carry an increased risk of HBV reactivation, which is associated with an accelerated progression to cirrhosis and hepatocellular carcinoma (HCC). Additionally, no single diagnostic test can sufficiently assess HBV infection status on its own. As a result, healthcare providers adhere to complex CHB management guidelines that routinely call for testing anywhere from 3-7 different HBV serum biomarkers3 Subsequently, long-term management of CHB represents a particularly resource-intensive process4. Globally, it is thought that less than 5% of those with CHB are aware of their infection status and only 1% of eligible patients are receiving antiviral therapy5. The World Health Organization (WHO) has specifically cited a need for more affordable diagnostics to estimate HBV viral load, so that providers in all settings are able to make optimal treatment decisions

Specific Aims:

1: Test and validate HBcrAg LFI and ELISA prototypes using well characterized HBV samples and controls to determine: limit of detection, reproducibility, linearity, recovery, and correlation with HBV DNA.

2: Validate reactivity of HBcrAg assay prototypes across a broad range of HBV samples including: multiple genotypes, coinfected status, various phases of infection, and treatment type.



OPTIMIZED SAMPLE TRANSPORTATION TO SUPPORT POC DEPLOYMENT INFORMATION SHARING AND MOTORCYCLE ROUTING IN DIAGNOSTIC NETWORKS

PI: KARA PALAMOUNTAIN

Due to limited resources, most diagnostic and disease monitoring services in sub-Saharan Africa are currently delivered through a network of clinics (where samples are collected) and central laboratories (where samples are analyzed). However, such centralized diagnostic networks have resulted in inordinate diagnostic delays - partly due to inefficiencies in the supply chains required to transport samples and results between clinics and laboratories. With an aim to address such delays, there has been significant increase in the deployment of point-of-care (POC) devices in many countries of sub-Saharan Africa. These devices do not require the same infrastructure as the large-scale equipment used in centralized labs and therefore allow for timely diagnosis at the health clinics.However, POC devices have limited processing capacity, compared to that of the centralized laboratories. Similarly, the unit cost of sample testing is higher for POC devices. This means that POC devices are not expected to meet all diagnostic demand in a given country. This limitation has become more pressing with ever increasing demand experienced by diagnostic networks, due to the increased emphasis on viral load monitoring (VLM) of patients receiving antiretroviral therapy (ART) for HIV - a key tenet of the 90-90-90 goals. As a result, most countries in subSaharan Africa will have to rely on a hybrid system of POC devices and centralized labs to meet diagnostic demand.

An often overlooked aspect of centralized diagnostic networks is the sample transportation (ST) system which enables the physical transportation of samples (e.g., dried blood spots, plasma, or sputum samples) from health clinics to laboratories as well as of results back to clinics. An ongoing challenge in such systems is to develop and implement cost-effective ST operations, particularly given the aforementioned increase in sample volumes. Similar to POC device deployment, improving ST operations is a clear opportunity to reduce diagnostic delays. In recent years, some countries (including Malawi) have implemented formal nationwide systems (through NGOs or MOHs) that operate on a predetermined schedule of courier visits to clinics and laboratories. However, such push systems are likely to lead to high frequency of unnecessary trips- defined as couriers spending a day visiting clinics that have collected no new samples.

Thus far, the joint impact of improved ST systems and the deployment of POC devices has not been studied. We propose to examine POC deployment and ST optimization in the context of a diagnostic system which meets demand through a mixture of centralized molecular laboratories and POC devices deployed to health facilities. Such an approach would develop an optimal deployment strategy for POC devices by jointly evaluating its impact with improved ST operations.

POC HIV VIRAL LOAD ASSAY

PI: BENJAMIN MILLER

We propose to advance development of a prototype hand-held diagnostic technology suitable for simple, enzyme-free detection of HIV viral load. While the focus of the pilot project is strictly on viral load determination, this assay consumable is being designed “from the ground up” to also enable CD4 count, and, in future work, determination of HIV-associated comorbidities (for example, co-infection with tuberculosis) and protein markers of inflammation.

Building on extensive work in the Miller group on the development of novel optical biosensors, the system will consist of an inexpensive, disposable assay strip. This assay strip leverages three key innovations for HIV viral load determination. The first of these is Hairpin Cascade Amplification (HCA), an enzyme-free, DNA nanotechnology approach to nucleic acid detection. Hairpin DNA cascades have been proven to significantly amplify RNA signals, avoiding the need for enzymatic nucleic acid amplification and the sensitive reagents and equipment involved. The second primary innovation is the use of a probe design methodology developed by our group that employs secondary structure analysis of probe target sites to identify the most accessible portions of the viral genome for nucleic acid assays, and the most appropriate secondary structure for probe oligonucleotides. Finally, we have developed a unique method for patterning microfluidic channels in paper that is robust, compatible with roll-to-roll manufacturing, and enables single-step production of assay consumables. Imaging and analysis of the assay results will be accomplished using a standard cell phone camera and integrated cell phone app.

FIELD-FRIENDLY CREATININE TEST

PI: MARK STYCZYNSKI

Chronic kidney disease (CKD) is a common comorbidity of HIV that can irreparably damage kidneys, making routine monitoring of renal function recommended by clinical practice guidelines for persons living with HIV prior to initiating most antiretroviral and other common therapies, to avoid causing or accelerating the development of CKD. Cardiovascular disease is also a common co-morbidity of HIV, and assessment of kidney function is important for safely prescribing pharmacotherapy to treat and control hypertension, ischemic heart disease, heart failure, and other cardiovascular diseases.

The difficulties faced by people in LMICs with limited healthcare infrastructure in accessing the resources required for regular renal function monitoring place a substantial burden on this vulnerable population and the healthcare facilities that serve them. In these areas, monitoring of renal function is not widespread because the current standard of care requires a cold chain, trained technicians, and expensive equipment.

The proposed solution – a creatinine biosensor – will overcome these limitations through an easily interpretable visual colorimetric output and stability at room temperature. The biosensor will be adapted from an existing laboratory assay which enzymatically converts creatinine, a renal function biomarker, to sarcosine. In the existing assay, creatinine concentration can be quantified by the accumulation of a red pigment that is generated as sarcosine is oxidized. We will first adapt the existing assay for visual interpretation via implementation of an in-field calibration strategy that will allow for accurate readout of creatinine concentrations despite potential variability in serum sample makeup between patients. This is accomplished through inclusion of a set of standard reactions that are saturated in the target analyte but limited by the pigment/dye precursor. We will then begin a more substantial overhaul of the assay, using the sarcosine-responsive transcription factor SouR to drive a multi-color reporting system (with a similar calibration approach) that provides a significant advantage over the single-color output yielded by the existing assay. The end result in either case is a spectrum of calibration standards that indicate a range of creatinine concentrations. The test administrator can then match the color of the test reaction to the color standards to determine the patient's serum creatinine in a semi-quantitative manner. Because the biosensor as described uses a cell-free expression system, the required biological components can be freeze-dried onto a paper or lateral flow strip-like substrate and rehydrated with patient serum, obviating the need for a cold chain for shipment and storage.

This biosensor will be developed through completion of three deliverables: integration of our sample-specific parallel calibration strategy into the existing enzymatic assay, implementation of this assay on a lateral flow strip-like substrate, and transition from the single-color reporter used in the existing enzymatic assay to the more readily interpretable multi-color reporter. Successful completion of these aims will result in a self-calibrating creatinine biosensor more accessible to patients suffering from chronic kidney disease as a comorbidity of HIV in LMICs.

A WHOLE BLOOD TB/HIV LF ASSAY

PI: NICK BORAIN

TB/HIV comorbidity effects patient outcomes and patient management profoundly, and due to testing limitations, are inadequately addressed, especially in limited resource settings and diagnostic facilities typically found in third world countries. Current testing regimes for TB and HIV typically use different analytes, are often performed in separate sites and take differing times to report results, requiring data management to combine the data for clinical use. The aim of this application is to satisfy this need with a cost-effective TB/HIV triage serology assay.

Lateral Flow Laboratories has developed a TB serology assay against 4 antigens that demonstrate promising sensitivity and specificity. Currently, all serum samples being tested are also tested for presence of HIV infection. The presence of HIV co-infection reduces the diagnostic performance of the assay and is an important clinical marker for patient management. In equal measure, the presence of TB in a patient with HIV has implications for patient prognosis and potentially would lead to a more aggressive therapeutic intervention. The advantage of this solution lies in the ability to produce a rapid (15min) result from a single test cassette. The assay will be easy to use, need no refrigeration, and require limited training to use. The TB antibody detection component of the assay is complete and functional. Currently, the HIV assay is being performed separately, and the aim of this work is to incorporate the HIV detection into the same cassette, using a single collected sample and buffer run. LFL currently manufacture an WHO accredited HIV assay, and the work proposes to incorporate this know-how into the TB assay.

AUTOMATED TB SPUTUM MICROSCOPY

PI: MAMOUDOU MAIGA

As one of the top 10 leading causes of death worldwide, tuberculosis (TB) remains a significant public health problem.2 In 2018 alone, approximately 10 million new TB cases and 1.4 million TB-related deaths were reported with nearly 95% of cases occurring in low- and middle-income countries (LMICs).2 Increasing rates of multi- and extensively-drug resistant TB in conjunction with the HIV epidemic are significant additional barriers to achieving the United Nations goal of TB elimination by 2035.3 High TB endemic settings face many obstacles in making accurate and rapid diagnosis of TB, delivering timely appropriate treatment, and preventing infection spread. Specifically, TB endemic countries are hampered by a lack of advanced diagnostic technology, limited numbers of skilled technicians, inadequate clinical testing infrastructure, and the high costs of diagnostic testing reagents and kits. Most patients have to come back another day and visit for results and treatment initiation.

We propose a smartphone-based point-of-care (POC) TB diagnostic system and automated protocols that requires minimum amount of technician effort and training requirements and significantly reduced turnaround time for results availability, thus allowing for diagnosis and initiation of drug treatment at the same visit. Our team recently developed a method that uses sodium dodecyl sulfate (SDS) to improve TB slide readability/clarity (Figure 1) and technicians' safety by inactivating the bacilli.1 This technical improvement in sputum smear microscopy (SSM) slides makes the slides clearer and easier to read, which opens the door for using an imaging platform to automatically read the slides.1First, we developed a semi-automated system, using a sputum cup prefilled with SDS to immediately inactivate M. tuberculosis. A technician prepares the slide and, then, the slide is dried and stained using a commercially-available slide dryer and stainer. This application seeks to combine and refine these components to create a fully-automated system. Our aims are: 1) Develop a Fully-automated TB SSM System; 2) Develop an Android phone attachment and application to capture SSM images; 3) Evaluate the Clinical Proof-of-Principle of the Fully-automated SSM System.

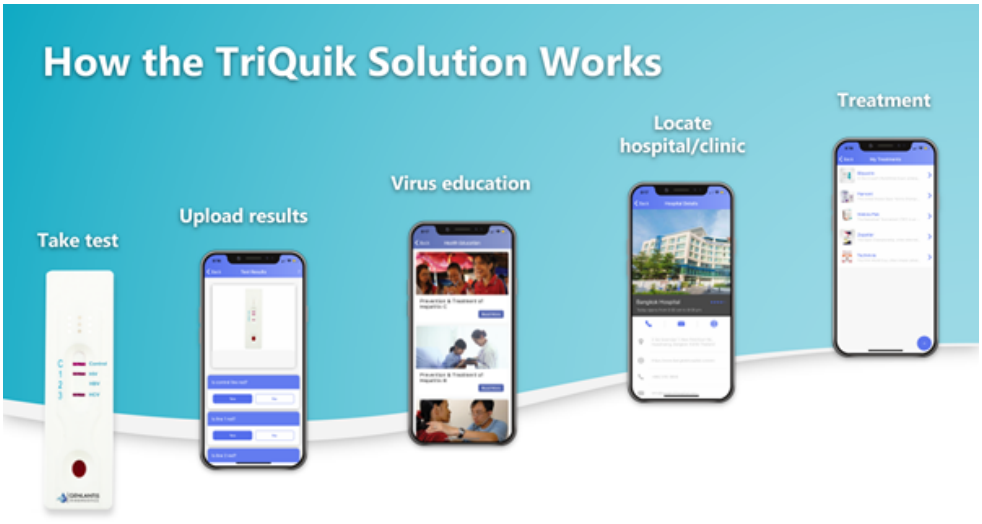
RAPID TEST FOR HIV, HBV & HCV

PI: ANTHONY SORGE AND ROBERT GISH

In most industrialized nations (USA, Canada, Europe), more than two thirds of individuals infected with HBV (hepatitis B virus) or HCV (Hepatitis C Virus), and between 15% and 30% of HIV-positive individuals are unaware that they are infected. This lack of knowledge represents a direct health threat to infected individuals and their families, and is dangerous for public health in general. Hence a Simultaneous HIV-, HBV-, and HCV-rapid tests could help improve infection awareness and links vulnerable populations to proper care and treatments where available.

The solution is to provide a fast, easy, and cost-effective test to expand testing worldwide. Genlantis Diagnostics offers such a solution in the TriQuik Rapid Diagnostic Test (RDT) for HIV, HBsAg & HCV. TriQuik is a double sandwich immunochromatographic assay that detects the presence of HBsAg, HCV antibodies and HIV 1/2 virus antibodies in human blood. Specific HIV and HCV antigens and monoclonal antibodies specific against HBsAg are 1) conjugated with colloidal gold and deposited on a conjugate pad, and 2) immobilized on the test line of the Test Zone (Line T1 for HIV, line T2 for HBsAg, line T3 for HCV) on the nitrocellulose membrane. When a whole blood, serum or plasma sample is added, the gold-antigen/antibody conjugates are rehydrated and the HBsAg, HCV antibodies and/or HIV1/2 virus antibodies, if any in the sample, will interact with the gold conjugates. The antigen-antibody-gold complex will migrate towards the test window until the Test Zone (T) where they will be captured by immobilized specific antigen/antibodies, forming visible pink line(s) (T1, T2 and/or T3); indicating positive result(s). If HBsAg, HCV antibodies and/or HIV1/2 virus antibodies are absent in the sample, no pink line will appear in the Test Zone (T), indicating a negative result. To serve as an internal process control, a control line should always appear at Control Line (C) after the test is completed. Absence of a pink Control Line is an indication of an invalid result.

The TriQuik RDT is a rapid test that can be administered by low level health care providers or can be self-administered by most people, requires no special tools or equipment, produces rapid results within 20 minutes or less, and is cost effective especially when compared to all other alternatives. The current kit format includes one TriQuik test cassette, one alcohol swab, one disposable lancet, and one band aid. This kit format makes the overall kit usage extremely easy and convenient.



HPV IN MSM USING GENEXPERT

PI: ALMOUSTAPHA I MAIGA

Human papillomavirus infection (HPV) remains a major public health concern, especially in low- and middle-income countries (LMICs) where the majority of HPV-associated cancers occur. Men who have sex with men (MSM) are at high risk of exposure to HPV infection and of anal pre-cancerous and cancerous lesions; and the risk is greater with in HIV-infected individuals. However, in Africa, data about HPV prevalence, subtypes, and associated cancerous lesions are limited, particularly in this population.

Capacity and access to laboratories that performing HPV test are limited in LMICs and further complicated by MSM being hard-to-reach population, primarily due to stigma from whom it is difficult to obtain samples and who are often lost to follow-up. Thus, a real-time PCR assay for a self-collected anal sample could be a feasible strategy to diagnose, treat and prevent HPV infection and associated lesions in this population.

This study seeks to compare, for HIV-infected MSM in Bamako, Mali, the GeneXpert HPV (Cepheid®) test and the gold-standard, real-time, PCR technology AnyplexII HR Detection kit (Seegene®) using self-collected anal swab samples. The study would also help to determine HPV prevalence and HPV subtypes among HIV-infected MSM, in order to be able to evaluate the impact of HPV vaccination in this population. Indeed, as we learned in cervical HPV-infection in women in West Africa, we hypothesize that anal HPV infection and associated lesions in MSM will be caused by several subtypes that differ from the most commonly detected HPV16.

By comparing the two methods of HPV testing, we hope that the use of GeneXpert for HPV testing will provide a feasible and reliable molecular biology alternative that costs less than the gold standard, can use self-collected anal samples, and is adapted to the technical capacities of LMICs' laboratories.

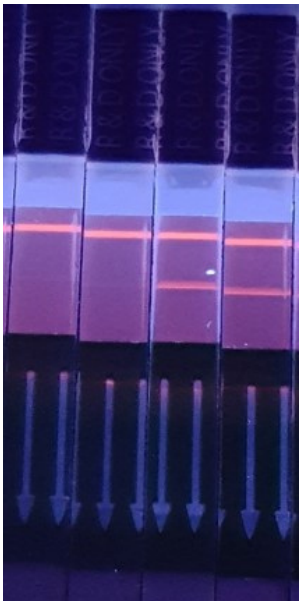
OPTIMIZATION OF SPUTUM COLLECTION CUP FOR IN GENEXPERT

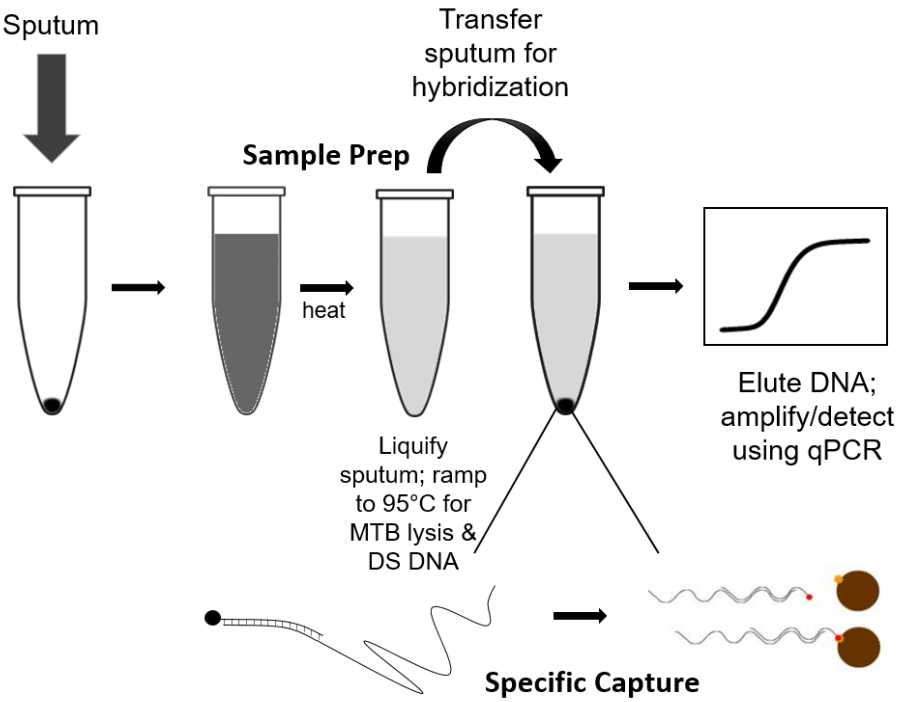
PI: CHRIS DE VILLIERS

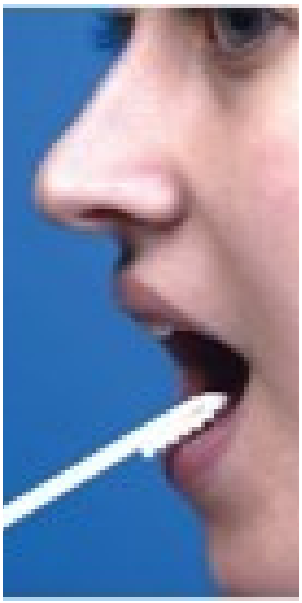
High reject rates of collected sputum specimens prompted the initiation of a design project to develop an improved sputum collection cup in collaboration with clinical, academic and commercial partners from South Africa and the United States. Through the application of an iterative design process (>15 iterations), optimization of the sputum volume measurement and ease of closing and sealing the collection container lid, a new container design has been developed with a specification comprising “9” critical requirements suitable for the current clinic- and laboratory TB Xpert network, thus providing more efficient sputum sample preparation. Currently, the design is being clinically evaluated with further modifications expected to optimize the design from the results obtained from the clinical evaluation.

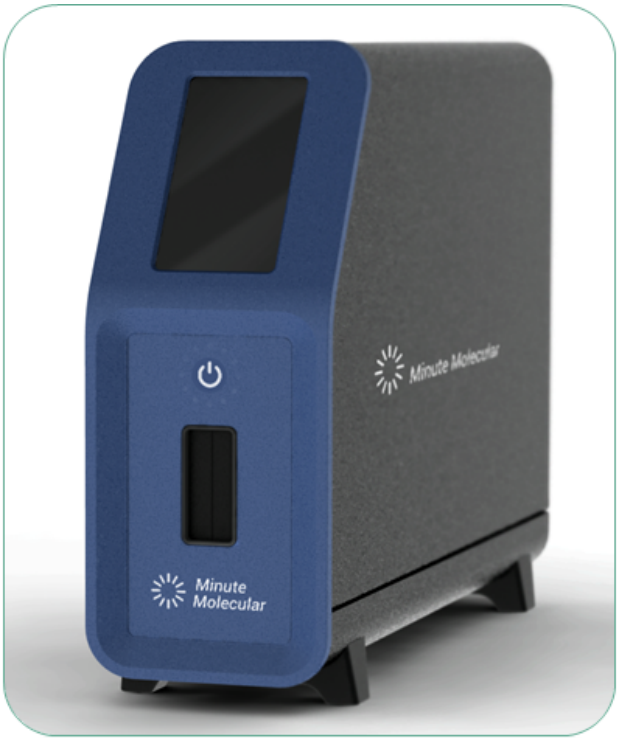
The development of the Sinapi Sputum Container has been completed, with collating of clinical evidence the next step to substantiate a reduction in rejections rates compared to standard of care sputum cups. Sinapi is proposing multiple clinical trials locally and abroad in partnership with the South African National Health Laboratory Service (NHLS), Stellenbosch University, University of STT in Mali and other institutions to support the clinical benefit of using the Sinapi Sputum Container.

C-THAN Pilot Project Images

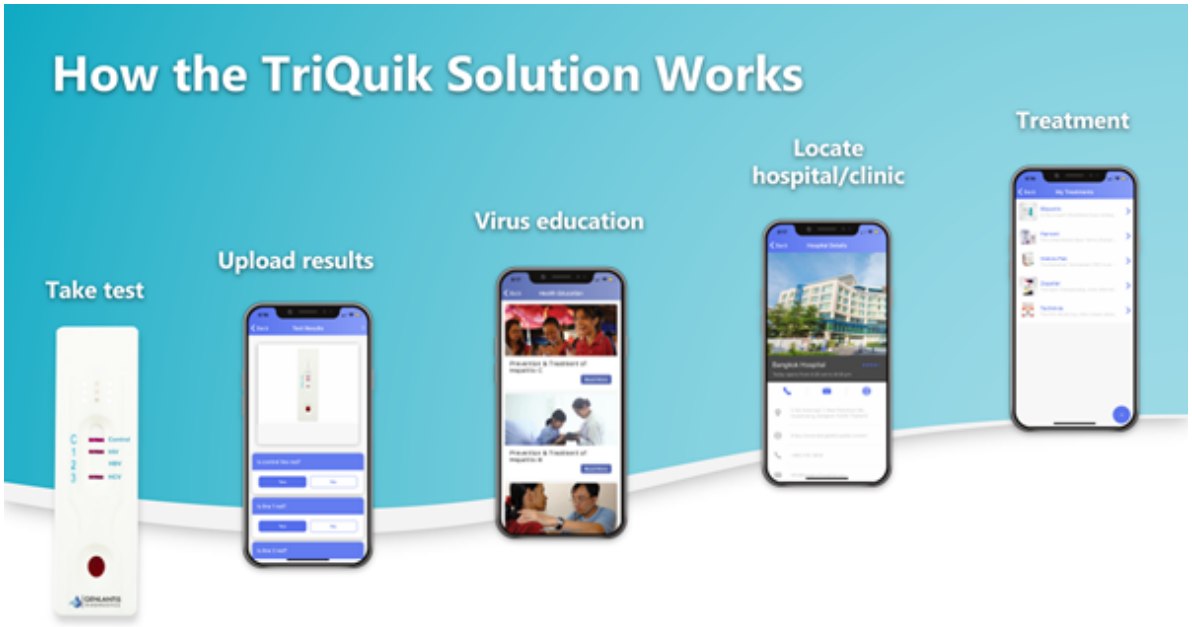








C-THAN Pilot Project Images



C-THAN Third Annual Symposium
Review of Publications (16 total)

YEAR 1 (5)

1. Sarro YD, Kone B, Diarra B, Kumar A, Kodio O, Fofana DB, Achenbach CJ, Beavogui AH, Seydi M, Holl JL, Taiwo B, Diallo S, Doumbia S, Murphy RL, McFall SM, Maiga M. Simultaneous diagnosis of tuberculous and non-tuberculous mycobacterial diseases: Time for a better patient management. Clin Microbiol Infect Dis. 2018 Dec; 3(3). doi: 10.15761/CMID.1000144. Epub 2018 Nov 30. PubMed PMID: 30613797; PubMed Central PMCID: PMC6319944.

2. Oumar AA, Cissoko Y, Konaté I, Kane A, Dembélé JP, Cissé M, Murphy RL, Yombi JC, Seydi M, Dao S, Maiga M. Comparing Treatment Outcomes of Antiretroviral Therapy in HIV-1 and HIV-2 Infected Patients, in Bamako, Mali. Curr Find Infect Dis. 2018;2018(1):RD-INF-10003. Epub 2018 Nov 26. PMID: 30627708; PMCID: PMC6322838.

3. Togo J, Maiga AI, Sylla M, Kone B, Dolo O, Traore FT, Sangare SA, Maiga M, Diallo S, Murphy R, Calvez V, Marcelin AG. Evaluation of Two HIV Rapid Diagnostic Tests in a Context of Strains' Genetic Diversity in Mali. AIDS Res Hum Retroviruses. 2019 Feb; 35(2):145-149. Epub 2019 Jan22. PubMed PMID: 30560678.

4. Oumar AA, Dakouo M, Tchibozo A, Maiga M, Landouré G, Abdi-Bogoreh R, Tulkens PM, Dao S, Yombi JC. Antiretroviral-induced adverse drug reactions in HIV-infected patients in Mali: a resource-limited setting experience. Int J Basic Clin Pharmacol. 2019 May;8(5):831-836. doi: 10.18203/2319-2003.ijbcp20191565. PMID: 31879663; PMCID: PMC6931397.

5. McFall SM, Maiga M, Glucksberg M, Palamountain KL, Achenbach CJ, Povlich LK, Lash TB, Murphy RL. C-THAN: A new research center for the development of point-of-care technology for HIV/AIDS. Global Health Innovation, 2019, 2(2), article # 1. DOI 10.15641/ghi.v2i2.822

YEAR 2 (6)

6. McFall SM, Maiga M, Glucksberg M, Achenbach CJ, Palamountain KL, Murphy RL. Supporting Diagnosis and Management of HIV/AIDS Patients Through Point-of-Care Technology Development. Curr Opin Biomed Eng. 2019 Sep;11:9-15. doi: 10.1016/j.cobme.2019.08.009. Epub 2019 Sep 14. PMID: 32864521; PMCID: PMC7448583.

7. Carleton PF, Schachter S, Lash TB, Chen J, Merchak T, Brand O, Buchholz B, Gaydos C, Lam W, Manabe Y, Martin G, McFall S, McManus D, Murphy R, Parrish J. Point-of-Care Technology Research Network: An evolving model for collaborative translational research in biomedical engineering. Curr Opin Biomed Eng. 2019 Sep;11:145-148. doi 10.1016/j.cobme.2019.10.011. Epub 2019 Nov 13. PMID: 33178901; PMCID: PMC7654972.

8. Sarro YDS, Kodio O, Kumar A, Diarra B, Baya B, Diabate S, Kone B, Sanogo F, Tolofoudie M, Somboro A, Coulibaly G, Degoga B, Kone M, Dembele BP, Camara I, Sanogo M, Togo AC, Coulibaly N, Diallo F, Dembele E, Diakite B, Doumbia S, Popoola OP, Diallo S, Holl J, Achenbach CJ, Murphy RL, McFall S, Maiga M. Use of sodium dodecyl sulfate to improve tuberculosis sputum smear microscopy. Glob Health Innov. 2019 Nov 27;2(2). pii: 3. doi: 10.15641/ghi.v2i2.824. Epub 2019 Nov 26. PubMed PMID: 31853521; PubMed Central PMCID: PMC6919652.

9. Diarra B, Tolofoudie M, Sarro YS, Togo ACG, Bane S, Nientao I, Cisse AB, Kone M, Somboro A, Degoga B, Diallo F, Coulibaly G, Kodio O, Sanogo M, Kone B, Diabate S, Baya B, Kone A, Dabitao D, Maiga M, Belson M, Dao S, Maiga II, Murphy RL, Siddiqui S, Toloba Y, Konate B, Doumbia S, de Jong BC, Diallo S. Diabetes Mellitus among new tuberculosis patients in Bamako, Mali. J Clin Tuberc Other Mycobact Dis. 2019 Nov 1;17:100128. doi: 10.1016/j.jctube.2019.100128. PMID: 31788570; PMCID: PMC6879999.

10. B Kone, YS Sarro, B Baya, D Dabitao, N Coulibaly, M Wague, B Diarra, O Guindo, M Sanogo, ACG Togo, A Kone, D Goita, S Diabate, O Kodio, M Belson, S Dao, S Orsega, RL Murphy, S Diallo, S Doumbia, SSiddiqui, M Maiga. Diagnostic Performances of Three Rapid Diagnostic Tests for Detecting HIV Infections in Mali. Infect Dis Diag Treat 3: 134. 2020. DOI:10.29011/2577-1515.100134.

11. Coulibaly N, Kone B, Sanogo M, G Togo AC, Diarra B, Sarro YS, Cisse AB, Kodio O, Coulibaly G, Kone M, Baya B, Maiga M, Dabitao D, Belson M, Dao S, Diallo S, Diakite M, Babana AH, Doumbia S. Performance of Mali's biosafety level 3 laboratory in the external quality assessment in preparedness of laboratory accreditation and support to clinical trials. Int J Mycobacteriol. 2020 Jan-Mar;9(1):29-33. doi: 10.4103/ijmy.ijmy_5_20. PMID: 32474485.

YEAR 3 (5)

12. Farao J, Malila B, Conrad N, Mutsvangwa T, Rangaka MX, Douglas TS. A user-centred design framework for mHealth. PLoS One. 2020 Aug 19;15(8):e0237910. doi: 10.1371/journal.pone.0237910. PMID: 32813711; PMCID: PMC7444488.

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14. Musa J, Mehta SD, Achenbach CJ, Evans CT, Jordan N, Magaji FA, Pam VC, Daru PH, Silas OA, Sagay AS, Anorlu R, Zheng Y, Maiga M, Adewole IF, Murphy RL, Hou L, Simon MA. HIV and development of epithelial cell abnormalities in women with prior normal cervical cytology in Nigeria. Infect Agent Cancer. 2020 Jul 29;15:50. doi: 10.1186/s13027-020-00316-5. PMID: 32760435; PMCID: PMC7392708.

15. Combo Georges TA, Aissata T, Fatimata D, Abou CC, Gagni C, Moise SA, Boureima D, Amadou S, Baye DH, Price Polycarpe DB, Bourahima K, Moumine S, Dit Sadio SY, Ousmane K, Bocar B, Mohamed T, Boubakar TA, Sidy B, Mamoudou M, Michael B, Seydou D, Bassirou D, Ibrahima IM, Souleymane D. Performance of Xpert MTB/RIF in comparison with light-emitting diode-fluorescence microscopy and culture for detecting tuberculosis in pulmonary and extrapulmonary specimens in Bamako, Mali. Int J Mycobacteriol. 2020 Oct-Dec;9(4):397-404. doi: 10.4103/ijmy.ijmy_171_20. PMID: 33323655.

16. Hou L, Mehta SD, Christian E, Joyce B, Lesi O, Anorlu R, Akanmu AS, Imade G, Okeke E, Musah J, Wehbe F, Wei JJ, Gursel D, Klein K, Achenbach CJ, Doobay-Persaud A, Holl J, Maiga M, Traore C, Sagay A, Ogunsola F, Murphy R. Impact of the COVID-19 pandemic on global health research training and education. J Glob Health. 2020 Dec;10(2):020366. doi: 10.7189/jogh.10.020366. PMID: 33214886; PMCID: PMC7648891.

C-THAN Year Four Pilot Projects Solicitation

2021 Award Competition: Development of Point-Of-Care Testing for HIV and Co-Morbidities for Use in Low and Middle Income Countries

Applications accepted through 15 March, 2021

C-THAN Contact: Sally McFall, Ph.D., Director of Technology Development/Refinement Core
Email: s-mcfall@northwestern.edu

CHICAGO, IL – The Center for Innovation in Point-of-Care Technologies for HIV/AIDS at Northwestern University (C-THAN) seeks collaborative research projects to develop novel point-of-care technologies (POCT) aimed at improving diagnosis and treatment monitoring of HIV/AIDS in low- and middle-income countries (LMIC). If successful, projects should be viable candidates for commercial development.

About C-THAN

C-THAN was funded in 2018 for a five-year period by the National Institute of Biomedical Imaging and Bioengineering (NIBIB) Point-of-Care Technologies Research Network (POCTRN), Fogarty International Center (FIC) and the Office of AIDS Research. C-THAN's mission is to support the development and facilitate commercialization of a pipeline of POCT designed to meet the clinical needs of people who live with HIV/AIDS in LMIC.

Background

HIV disproportionately impacts low- and middle-income countries (LMICs) with the heaviest burden in sub-Saharan Africa. In 2019, 67% of people living with HIV/AIDS (PLWHA), 57% of new HIV infections and 64% of HIV-related deaths were from this region of the world. The Center for Innovation in Point-of-Care Technologies for HIV/AIDS at Northwestern University (C-THAN) was founded to support the development of vital point-of-care technologies (POCT) specifically designed for patient management of PLWHA in LMICs with emphasis on the diagnostic needs of sub-Saharan Africa. We seek to support projects designed for settings with limited medical infrastructure including restricted access to electricity, refrigeration and/or central water supply. Relevant projects considered for funding include, but are not limited to, diagnostic assays or technologies for HIV/AIDS disease and its comorbidities (e.g., tuberculosis, viral hepatitis, related cancers, related cardiovascular diseases), treatment-related diagnostics, technologies that can be self-administered for either diagnosis or treatment monitoring, and/or technologies that improve or enable POC test performance. The focus of this solicitation is to develop POCTs that address one or more of the AIDS Office of Research High Priority Research Areas. The requirements for the test are summarized in the table below:

HIV/AIDS Clinical Priorities	POCT Priority Features	LMIC Environmental Factors
a) Reduce HIV incidence b) Diagnose HIV-associated comorbidities c) Reduce health disparities d) Train the workforce	a) User friendly b) Low manufacturing cost c) Rapid results d) Minimal invasiveness e) Durable f) Internal performance checks g) Self calibration	a) Low resource setting b) Dust c) Humidity d) High temperature e) User education and skills f) Variations in power supply

Design Requirements for POCTs

The proposed project must focus on a specific need related to HIV prevention, treatment, or management in an LMIC setting and must show promise for improved health outcomes for those at high risk or living with HIV. The proposed project may consist of one or more product development activities including: developing and/or refining technology, clinical field testing, establishing test characteristics, obtaining feedback on user steps from end users, obtaining end user assessments, conducting market research on product concepts or working prototypes with distributors, implementers, procurement agencies, policy makers, or other relevant stakeholders, evaluating test implementation, and assessing feasibility. Relevant technologies that will be considered for funding include, but are not limited to, in vitro diagnostic assays or technologies, treatment-related diagnostic technologies, technologies that can be self-administered, and/or technologies that improve or enable POC test performance. Microfluidic and nanotechnology platforms that are capable of multiplex testing to measure multiple analytes are welcomed.

Maturity

Applicants with a working prototype or an existing assay/device (not necessarily used for the proposed application) and preliminary data to demonstrate its potential for detection, diagnosis, or treatment guidance for HIV and/or its co-morbidities in LMICs will have priority. Minimum preferred maturity levels in the four product development cycle domains:
Maturity: proof of concept (3) or preferably proof of feasibility (4)
Regulatory: proof of concept (3) or preferably proof of feasibility (4)
Marketing/Business: proof of concept (3) or preferably proof of feasibility (4)
Clinical: proof of concept (3) or preferably proof of feasibility (4)

Applicant Eligibility

Applications from all sources will be considered including domestic or foreign, public or private, or non-profit or for-profit. Applicants from low- and middle-income countries either independently or in collaboration with developers in high resource countries are encouraged to apply. Teams consisting solely of applicants from low- and middle-income countries will be given special consideration.

Justification

Our mission is to support the development and facilitate commercialization of a pipeline of POCT designed to meet the clinical needs of PLWHA in LMICs. In order to achieve our goals, we will support projects from both US and foreign institutions with preference for those with collaborations/connections that could facilitate eventual field testing, implementation evaluations, and manufacturing within LMICs.

Applicants are encouraged to contact C-THAN to discuss potential collaborations within the network. Preferred applications will:

- Be based upon a working prototype (for new technologies) or an existing device (which will serve as the base for adaptation)
- Generate preliminary data to demonstrate its potential for detection, diagnosis, or treatment guidance for HIV and/or its co-morbidities in LMICs
- Demonstrate test characteristics such as clinical sensitivity and specificity, feasibility or usability for a chosen clinical need comparable to an existing technology, device, or assay in clinical practice.

C-THAN Year Four Pilot Projects Solicitation

General Characteristics

Usable for patient management in LMIC clinic conditions, non- to minimally-invasive, low cost (the cost of test should be comparable to or lower than the local median daily income, the local cost of HIV medication dose, etc.) user friendly (can be operated by health care workers that receive local training in its operation and maintenance)

Specific Attributes

Portability, operable in locations with limited or no medical infrastructure (limited access to electricity, land-line communication, refrigeration or central water supply)

C-THAN is also receptive to proposals from industry with commercially available testing devices that have not been optimized to address the requirements listed above. The application must detail the limitations of the currently available system relative to use in LMIC or in HIV/AIDS priority topics and describe the proposed approach to resolution of these limitations.

Applications accepted through 15 March, 2021

Apply Now

Instructions

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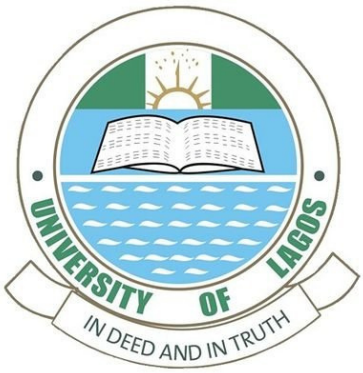
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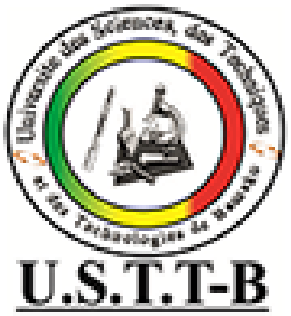
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