# AIBBC 2020 ONLINE CONFERENCE & TRAINING in the COVID-19 ERA

## Workshop Courses

## Thur, Nov. 5th, 2020

| Instructors | Session | Session title | Instructor (s) in charge | Contents |
|---|---|---|---|---|
| **COURSE 1 DIAGNOSTIC CYTOMETRY** | | | | |
| **Instructors** | **Prof. J. Paul Robinson** *(Purdue University, USA),* **Dr. Heather Paich** *(Agilent Technologies, Inc. USA),* **Dr. El-ad David Amir** *(Astrolabe Diagnostics, USA)* | | | |
| **14:00~14:30** | **Session C1-1** | **Introduction to Flow cytometry (25 Min)** | **Heather** | This is a general introduction to the field of flow cytometry. It will outline what it achieves, the broad features and value of single cell analysis. We will mention the variety of instruments covering basic analysis, image-flow and cell sorting. The goal is to introduce the technology as a general purpose single cell analysis opportunity. |
| **14:30~15:00** | **Session C1-2** | **Principles of technology (25 min)** | **J. Paul** | This lecture will focus on the core components providing details of how flow cytometry works starting from requiring samples to be in single cell suspension (fluidics), to light sources (Excitation), capturing signals and outputting data (electronics). This lecture will provide listener with an overview of what technology is generally involved. |
| **15:00~15:30** | **Session C1-3** | **Fluorescence & Sample prep including antibody staining (25 min)** | **Part 1 (10 min)** **J. Paul** | Expanding on the previous lecture, a more detailed overview of the principles of what is fluorescence and how it provides advantages in terms of sensitivity, background and signal intensity and wavelength separation |
| | | | **Part 2 (15 min)** **Heather** | Now we have some background in fluorescence, how is it used? This component will explain how antibodies are conjugated with fluors or how secondary antibodies can be used. Additionally, we can attach antibodies to beads and then use fluorescently labeled antibodies to measure molecules like cytokines, or hormones etc in sera. |
| **15:30~16:00** | **Session C1-4** | **Basic Data analysis & Typical Sample analysis (25 min)** | **Part 1 (10 min)** **J. Paul** | In this introduction we will discuss how a flow cytometer creates a data set called a listmode file and what that means. We will outline how a flow cytometer collects and saves these data sets so complex analysis can be performed. |
| | | | **Part 2 (15 min)** **Heather** | Gating your data. Here we provide examples of typical data processing and analysis showing how we go from collecting data and providing some meaningful results in the laboratory. |
| **16:30~17:00** | **Session C1-5** | **Compensation (25 min)** | **Paul** | Multiple fluorescence bands brings a significant problem that has to be solved in flow cytometry and that is spectral overlap from one band to another. A process of compensating each overlapping band is used and this section will explain how this works and why it is critical to obtain accurate results. |
| **17:00~17:30** | **Session C1-6** | **High Parameter and Spectral flow (30 min)** | **Paul** | This section will outline the difference between polychromatic and spectral data and show how very high content data can be produced requiring very advanced analytical approaches. |
| **17:30~18:00** | **Session C1-7** | **Really complex data (30 min)** | **El-ad David** | In this session, opportunities to manage and manipulate very high content data will be presented to demonstrate to participants some of the options for extracting valuable data from condensed datasets. |
| **18:00-18:15** | **CLOSING CEREMONY** | | **USE THE ZOOM LINK FOR OPENING AND CLOSING CEREMONY** | |
| **COURSE 2 IMMUNOLOGY AND VIRAL INFECTION** | | | | |
| **Instructors** | **Prof. Cristina Mussini** *(Univ. of Modena and Reggio Emilia, ITALY),* **Prof. Andrea Cossarizza** (*Univ. of Modena and Reggio Emilia, ITALY*), **Dr.Lucy Ochola** *(Institute of Primate Research, KENYA),* **Ms. Isabel Pagani** *(Vita-Salute San Raffaele University, ITALY),* **Dr.Paul Ogongo** *(University of Carlifornia, San Franscisco, USA)* | | | |
| **14:00~14:30** | **Session C2-1** | **Impact of Covid-19 on HIV patients (30 min)** | **Cristina** | While COVID-19 has been in the spotlight, there is concern that other equal important viral infections may be relegated, t is important to understand the impact on other viral infections, in particular HIV.Impact of Covid-19 on HIV patients |
| **14:30~15:00** | **Session C2-2** | **Issues related to methods of SARS-CoV-2 isolation and titration of viral stocks (30 min)** | **Isabel** | The talk will address issues related to methods of SARS-CoV-2 isolation and titration of viral stocks. Methods to study SARS-CoV-2 replication in susceptible cells will be addressed as well as techniques for quantification of SARS-CoV-2 nucleic acids. Inhibition of viral replication by repurposing drugs will be discussed. |
| **15:00~15:30** | **Session C2-3** | **Flow cytometry for immunology in the covid era (30 min)** | **Lucy & P. Ogongo** | This sesssion will cover flow cytometry for immunology in the covid era including practical analysis of cells usnig a flow cytometer. |
| **15:30~16:00** | **Session C2-4** | **Part 1: Immune response to SARS-CoV-2 (30 min)** | **Andrea** | This program will look into the mechanisms of immune response to SARS-CoV-2. |
| **16:30~17:00** | **Session C2-5** | **Mycobacterium tuberculosis (30 min)** | **Lucy & P. Ogongo** | This session will discuss one of the most important infectious diseases affecting millions of people in Africa, i.e. TB and its causative agent mycobacterium tuberculosis (m.tb). |
| **17:00~17:30** | **Session C2-6** | **Part 2: Immune response to SARS-CoV-2 (30 min)** | **Andrea** | This program will continue discussions into the into the mechanisms of immune response to SARS-CoV-2. |
| **17:30~18:00** | **Session C2-7** | **HIV and SARS-CoV-2 (30 min)** | **Lucy & P. Ogongo** | In this session, practical applications of flow cytometry for immunology in the covid era will be presented and discussed. |
| **18:00~18:15** | **CLOSING CEREMONY** | | **USE THE ZOOM LINK FOR OPENING AND CLOSING CEREMONY** | |
| **COURSE 3 MOLECULAR DIAGNOSTICS** | | | | |
| **Instructors** | **Prof. Masood Kamali-Moghaddam** *(Uppsala University, SWEDEN),* **Prof. Collins Ouma** (Maseno University, KENYA), **Dr. Radiosa Gallini** (*Uppsala University, SWEDEN*), **Mr. Martin Sifuna** (*Chiba University, JAPAN*) | | | |
| **14:00~14:30** | **Session C3-1** | **Molecular Diagnostics in Infectious and Non-Infectious Diseases (30 min)** | **Collins** | This trainings will focus on the current molecular diagnostics in infectious and non-infectious diseases. The training will unravel molecular techniques most appropriate for infectious and non-infectious agents that are difficult to detect, identify or test for susceptibility in a timely fashion.Focus will be on the current molecular diagnostics in infectious and non-infectious diseases. The training will unravel molecular techniques most appropriate for infectious and non-infectious agents that are difficult to detect, identify or test for susceptibility in a timely fashion. |
| **14:30~15:00** | **Session C3-2** | **Topic 1: Power of immuno-assays and Proximity Ligation Assays" (10 min)** | **Masood & Radiosa** | "Power of Immunoassays and Proximity Ligation Assays"<br>A short presentation on the basics of immunoassays and how specificity can be an issue. How can it be solved? This session will focus on the advantage of combining multiple binders. |
| | | **Topic 2: Proximity Ligation as Diagnostic Tool (10min)** | | "Proximity Ligation as Diagnostic Tool"<br>A short overview on in-solution assays and the quest to increase sensitivity. The presentation will illustrate the amplification-of-signals obtained by combining affinity binders with oligonucleotide sequences amplification. |
| **15:00~15:30** | **Session C3-3** | **Molecular and genomic surveillance during COVID-19 pandemic (30 min)** | **Steven** | The presentation will focus on techniques used to generate molecular and genomic data and how the data has been used during COVID-19 pandemic to inform transmission dynamics and understand spread of SARS-CoV-2 nationally, regionally and globally. |
| **15:30~16:00** | **Session C3-4** | **Proximity Ligation on liquid samples - practical tutorial (30 min)** | **Masood & Radiosa** | This session will go into the details of a Proximity Ligation Assay on solution samples. The practical protocol will be covered and explained, step-by-step. |
| **16:30~17:00** | **Session C3-5** | **Topic 1: How to be Quantitative with Quantitative PCR (20 min)** | | What is the difference between PCR, qPCR, and dPCR? For anyone that feels confused, or wants to refresh those blurry memories, this section will provide a short overview of the different PCR methods. The focus then will be on the analysis of qPCR results from a Proximity Ligation Assay, with a practical tutorial. |
| | | **Topic 2: Topology of molecules: how to detect colocalization? (10 min)** | | A brief summary of advantages and disadvantages of colocalization imaging methods, and how Proximity Ligation can be used as in situ detection assay. |
| **17:00~17:30** | **Session C3-6** | **Topic 1: In Situ Proximity Ligation Assay - practical tutorial (20 min)** | | This session will go into the details of a Proximity Ligation Assay in situ. The practical protocol will be covered and explained, step-by-step. |
| | | **Topic 2: The hurdles of experimental design (10 min)** | | The previous sessions have focused on Proximity Ligation Assays, where the combination of affinity binders and oligonucleotide sequences amplification introduces additional variables to the experimental protocols. This brief presentation will address the importance of choosing the right controls to include in a Proximity Assay experiment. |
| **17:30~18:00** | **Session C3-7** | **Practical application of label free diagnostics (30 min)** | **Martin** | Extracorporeal circulation is vital in the management of cardiovascular diseases but risks of thrombus formation is a major concern. Current thrombogenesis monitoring procedures include activated clotting time (ACT) that enables rapid alteration in heparin infusion to maintain a constant anticoagulation prothrombin time (PT) and activated partial prothrombin time (aPTT) done at intervals during and after surgery as point of care thrombus monitoring procedures. Interval based measures thus are unreliable for real-time monitoring of thrombogenesis. This presentation introduces a practical application of electrical impedance spectroscopy as a label free approach to monitor and prevent thrombogenesis. |
| **18:00~18:15** | **CLOSING CEREMONY** | | **USE THE ZOOM LINK FOR OPENING AND CLOSING CEREMONY** | |

## COURSE 4 POINT OF CARE DIAGNOSTICS

**Instructors** — **Prof. Aman Rusom** (*KTH Royal Institute of Technology, SWEDEN*), **Prof. Tamara Kinzer-Ursem** (*Purdue University, USA*), **Prof. Jacqueline C. Linnes** (*Purdue University, USA*), **Dr. Melinda Lake** (*Purdue University, USA*), **Dr. Eddy Odari** (*Jomo Kenyatta University of Agriculture and Technology, KENYA*)

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| **14:00~14:30** | **Session C4-1** | **Introduction to point-of-care diagnostics (30 min)** | **Tamara/Jackie/ Melinda** | COVID-19 has brought much attention to diagnostics generally and the need for rapid point-of-care diagnostics. This session will provide an overview of various types of point-of-care diagnostics that are available, the types of analytes that they detect, and the advantages and constraints posed by various testing methods. |
| **14:30~15:00** | **Session C4-2** | **Part 1: Developing design specifications and designing for the end-user (30 min)** | | This session will describe how to determine criteria from both top-down and bottom-up approaches. From there, considerations of how the diagnostic technology has to function, the user, the environment, what potential failure modes might be encountered, and how to test for these will help determine design specifications that ensure robust, user-friendly assays with the necessary sensitivity and specificity. |
| **15:00~15:30** | **Session C4-3** | **Emerging technologies (30 min)** | | The diagnostic landscape is changing quickly and we will describe new techniques, assays, applications, and technologies that are emerging. |
| **15:30~16:00** | **Session C4-4** | **Part 2: Developing design specifications and designing for the end-user (30 min)** | | Developing good design input is critical to generating functioning and usable technologies including diagnostics. We will discuss various methods to uncover critical user needs and barriers to adoption and update. |
| **16:30~17:00** | **Session C4-5** | **Part 1: CD Microfluidics for point-of-care diagnostics (30 min)** | **Aman** | We will demonstrate how mobile devices can be designed to specifically meet diagnostic needs at resource-limited settings. |
| **17:00~17:30** | **Session C4-6** | **Part 2: POC covid test on platform specifically designed to meet the needs at resource limited settings (30 min)** | | At resource limited settings, point of care devices require a very low-cost, robust and easy to use platform that is preferably capable of automating and multiplexing intricate bioassays. This session will demonstrate a POC covid test on platform specifically designed to meet the needs at resource limited settings. |
| **17:30~18:00** | **Session C4-7** | **Part 1: "Valley of Death" in the development of diagnostic tools (30 min)** | **Eddy** | Taking an innovation from the lab to the market is hard in any discipline - for this reason a lot of innovative ideas have remained on shelves in the labs or as publications in high end journals. In this era of COVID-19 pandemic the big question remains - how do we ensure timely transition of ideas from the labs to those who urgently need them? This interactive session will explore the challenges faced by researchers and innovators mainly from LMIC and offer practical solutions of how to navigate such challenges in the field of medical diagnostics. |
| **18:00~18:15** | **CLOSING CEREMONY** | | **USE THE ZOOM LINK FOR OPENING AND CLOSING CEREMONY** | |