



BIONTECH



IMMUNO-ZAMBIA WORKSHOP REPORT

**New advances in the immunology of the “BIG FOUR”
(COVID-19, HIV, TB and Malaria) infectious diseases
in sub-Saharan Africa**

5 – 9 December 2022
M’kango Golf View Hotel
Lusaka, Zambia

Introduction

The International Union of Immunological Societies (IUIS) and Immunopaedia in collaboration with national immunological societies regularly hold immunology training workshops aimed at training early career investigators on a variety of immunology related topics.

In December 2022, the course called “Immuno-Zambia” was held at M’kango Golf View Hotel in Lusaka, Zambia from 5 – 9 December 2022. It was organized by a recently established, Immunological Society of Zambia (ISZ), with funding support from: IUIS, IUIS Education Committee, BioNTech, the Clinical Immunology Committee (CIC), the Federation of African Immunological Societies (FAIS), IAVI and Sub-Sahara African Network for TB/HIV Research Excellence (SANTHE).

The theme of the work shop was “*New advances in the immunology of the “BIG FOUR” (COVID-19, HIV, TB and Malaria) infectious diseases in sub-Saharan Africa*”. The focus was on advanced immunology of these four prominent infections in sub-Saharan Africa with sessions on immunology of neglected tropical diseases and immunology of infants. Notable at this workshop was a session on Equity Diversity and Inclusion (EDI) in academia. EDI principles in Africa like some other parts of the world remain relatively underdeveloped with limited discussion among stakeholders; however, the principles are increasingly recognized as critical to achieve greater scientific productivity and impact. A highlight of the course was a grant writing exercise that allowed the trainees to work in groups to identify important and relevant immunology research question and develop a grant proposals.

Organizing Committee

Local Organizers

- **Zaza Ndhlovu:** African Health Research Institute (AHRI), South Africa (RSA)
- **William Kilembe:** Center for Family Health Research in Zambia (CFHRZ), Lusaka, Zambia
- **Sody Munsaka:** University of Zambia,

Faculty

- **Azza Idris Hussein,** Vaccine Research Center/NIH Ragon Institute, USA
- **Clive Gray,** Stellenbosch University, RSA
- **Dieter Kabelitz,** University of Kiel, Germany
- **Eunice Nduati,** KEMRI Wellcome Trust, Kenya
- **Jackson Marakalala,** AHRI, RSA
- **Kelly McNagny,** University of British Columbia, Canada
- **Kondwani Jambo,** Malawi Clinical Research Programme
- **Lishomwa Ndhlovu,** Cornell Medical School, USA
- **Manuel Ritter,** IMMIP, University Hospital Bonn, Germany
- **Michelle Letarte,** SickKids & University of Toronto, Canada

International Organizers

- **Dieter Kabelitz:** University of Kiel, Germany
- **Michelle Letarte:** University of Toronto, Canada
- **Clive Gray:** Stellenbosch University, RSA
- **Rosana Pelayo:** Mexican Institute for Social Security (MISS), Delegacion, Mexico
- **Izukanji Sikazwe,** CIDRZ, Zambia
- **Monde Muyoyeta,** CIDRZ, Zambia
- **Rosanna Pelayo,** Mexican Institute for Social Security (MISS), Delegacion, Mexico
- **Sam Kinyanjui,** IDEAL and KEMRI, Kenya
- **Thandeka Moyo,** National Institute of Communicable Diseases, RSA
- **Thumbi Ndung’u** AHRI, RSA
- **Pierre Miossec,** University Claude Bernard, France
- **Wendy Burgers,** University of Cape town, RSA
- **William Horsnell,** University of Cape town, RSA
- **William Kilembe,** CFHRZ, Lusaka, Zambia
- **Yanet Valdez,** University of British Columbia, Canada
- **Zaza Ndhlovu,** AHRI, RSA

Trainees

Call for applications for Immuno-Zambia opened on 15 June 2022 and invited applications from graduate students, Masters, PhD and Post-doctoral fellows who were involved in immunology research. Target number of trainees was 50 with up to 20 slots reserved for Zambian applicants and female students were encouraged to apply. Criteria for selection weighed heavily on quality of trainee’s submitted abstract, track record of research output and academic excellence.

Application period closed on 22 August 2022 and 90 applications were received from individuals from 21 countries including Zambia. Fifty trainees were selected to participate in the course (Fig1). Just over 2/3 of the successful applicants were female and almost half the participants were PhD students. Female to male ratio was 2:1 for Post doc and PhD trainees and 3:1 for Masters and other career level (Fig 2). Only one trainee was below 25 years and 3 trainees were above 40 years.

Fig 1: Proportions of Applicants and Selection by Country

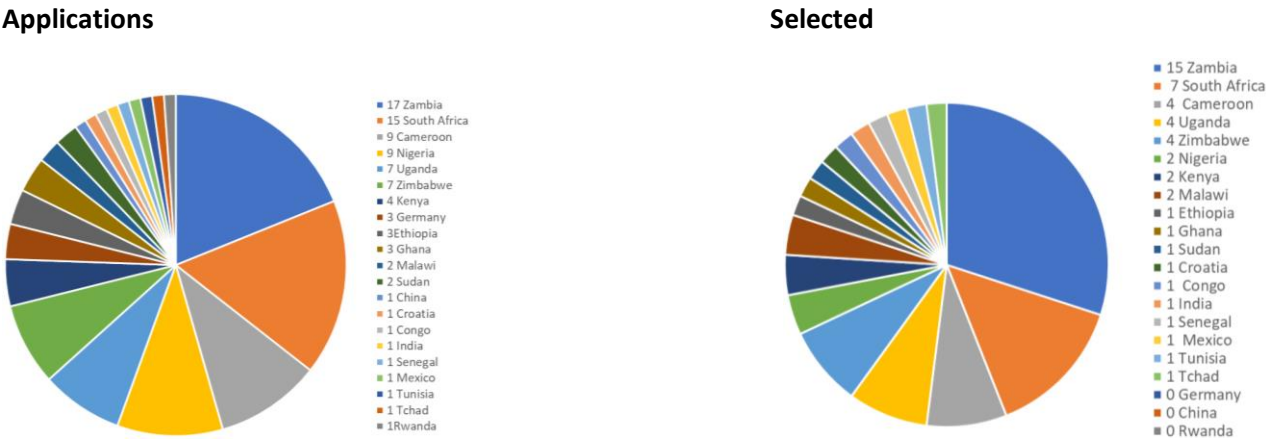


Fig 2: Distribution of trainees by Gender and Career level

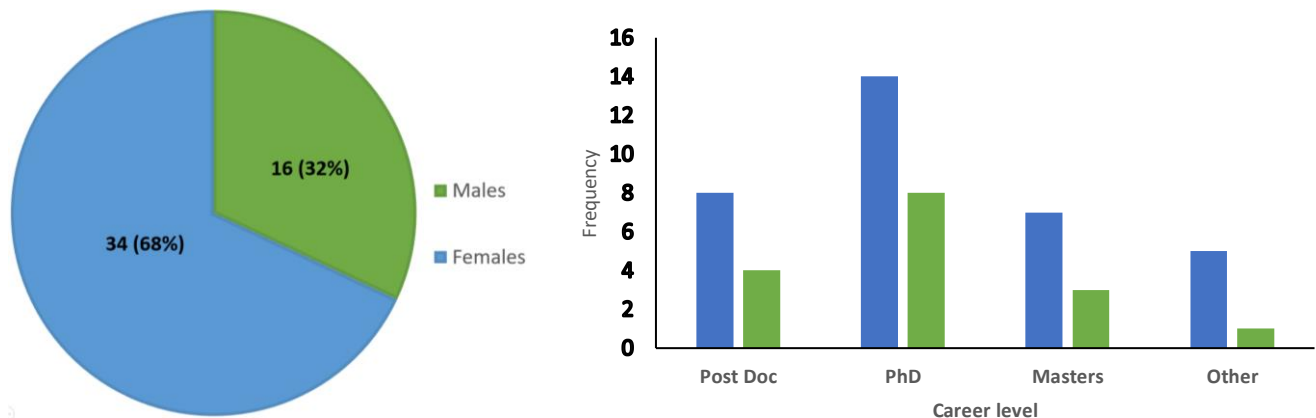
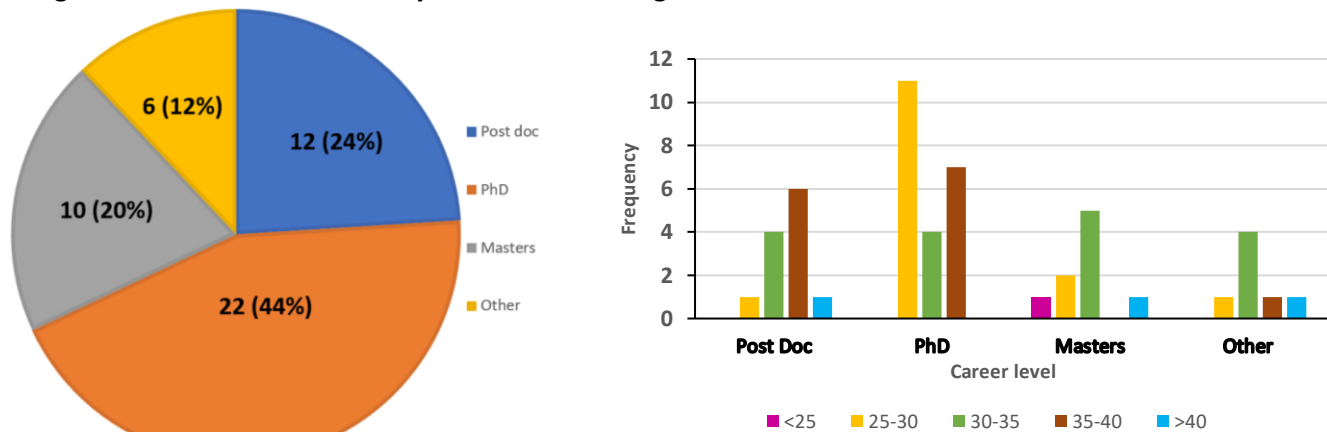


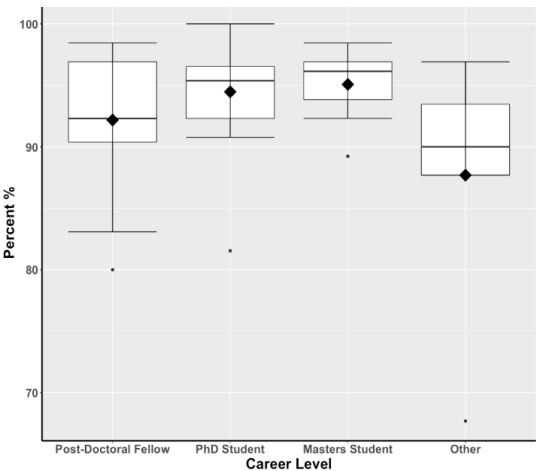
Fig 3: Distribution of Trainees by Career level and age



Pre-course

Faculty members submitted materials to the organizing committee for the development of a pre-course training activity for the trainees. The materials summarized the topics they planned to teach at the in-person course. Each presenting faculty member submitted 2-3 publications related to their topic plus 3 questions for assessment of the trainees. The pre-course was managed by Immunopaedia on their learning platform <https://www.immunopaedia.org.za> and all students were required to complete the pre-course work and assessments before the in person workshop. In the assessment, most trainees (84%) had a score equal to 90% or higher. The means of the scores by career type did not differ significantly; however, there were outliers in each career type and one participant scored 68% (Fig 4).

Fig 4: Trainee Performance in pre-course assessment



In-person workshop 5-9 Dec 2022

Of the 50 trainees whose applications were successful, 46 trainees attended the entire course and the other 4 did not attend due to extenuating circumstances.

Day 1: 5 December 2022

- Session 1: Immunology of infectious diseases and SARS-CoV-2 (Chairs: Rosana Pelayo and Pierre Miossec): Presentations on innate immunity (Dieter Kabelitz) and adaptive immunity (Kelly McNagny) to viral infections gave an excellent introduction to Wendy Burgers and Thandeka Moyo's presentations on Cellular and Humoral immunity to SARS-CoV-2 respectively. Key highlight was that an understanding of the immunology to infections is critical for designing effective vaccines.
- Session 2: Equity, Diversity and Inclusion (EDI) in Academia was led by Yanet Valdez, Eunice Nduati and Monde Muyoyeta. The aim of this session was to introduce trainees to principles of EDI and to make them aware of why ensuring EDI principles are upheld in academia and in any work setting is important. Key highlights: Definitions of equity, diversity and inclusion and illustrations of examples of how lack of EDI in a setting leads to inequality. The session focused on gender inequalities and proposed ways to strengthen EDI in academia by increasing awareness of EDI in the work environment, women empowerment from an early age, sponsors and funders making it a requirement that EDI plans are in place etc.
- Session 3: Introduction to Grant writing and group assignment – led by Michelle Letarte and Clive Gray.
- Session 4: Meeting Opening Ceremony:
 - This session was led by the executive committee of the Immunological Society of Zambia (ISZ) and officiated by the Ministry of Health (MoH). The Acting president of ISZ, Zaza Ndhlovu, gave a speech that described the vision and objectives of the recently formed society and implored the MoH to support the efforts of ISZ in immunology research and capacity building in Zambia. The guest of honor, Permanent Secretary technical services MoH, Prof. Lackson Kasonka welcomed the international workshop attendees to Zambia and expressed gratitude to the organizing committee for putting up such a workshop that aimed to train early career investigators/scientists in immunology research. He also assured the ISZ and its collaborating partners of MoH full support.
 - The opening ceremony was followed by a presentation by Lloyd Mulenga on the Epidemiology of the BIG four infectious diseases in Zambia and a round table discussion moderated by William Kilembe on Pandemic Preparedness in Africa; lessons learnt from COVID-19. Participants in the round table discussion were Nathan Kapata from the Zambia national Public Health Institute (ZNPHI) and faculty members Wendy Burgers, Thumbi Ndung'u and Kelly McNagny. Key highlights from the round table discussions were that there were major inequities in COVID-19 vaccine scale up early in the pandemic globally and developing countries consistently lagged behind in rates of vaccination for the disease. The session also highlighted weak surveillance and health systems in developing countries and this contributed significantly to the slow response to the pandemic. Discussants agreed that lessons learnt from the COVID-19 pandemic should help sub-Saharan African countries prepare better for future pandemics and that there should be investment in increasing capacity for vaccine research and development through creation of regional vaccine manufacturing hubs.

Day 2: 6 December 2022

- Session 1: Recent Advances in HIV Research (Chairs: Clive Gray and Monde Muyoyeta)
 - Kondwani Jambo illustrated that sub-Saharan Africa has the greatest burden of HIV and the extreme evolutionary nature of HIV, reservoirs and the lack of natural protective immunity in humans present the greatest challenges to combating the HIV pandemic. Even though chronic HIV infection may result in development of broadly neutralizing antibodies (bnAbs), these antibodies do not benefit the individual with chronic HIV. The current focus of Humoral immunology research in HIV is to develop immunogens that will elicit bnAb production. Zaza Ndhlovu described the role of tissue resident T-cells in HIV elimination. He illustrated how the use of spatial omics analyses in translational HIV studies and tissue compartments beyond blood will be critical to advancing our understanding of viral establishment, persistence, and eradication. Thumbi Ndung'u's presentation summarized the current HIV vaccine landscape and his presentation highlighted ongoing vaccine design that focuses on conserved epitopes as T-cell immunogens, use of the mRNA platform for rapid development of vaccines for clinical trials and germline targeting for induction of bnAbs. Eunice Nduati's talk on antibody based HIV vaccines described strategies under study that aim to guide humoral immunity to produce protective bnAbs against HIV and highlighted the progress in germline targeting immunogen in the IAVIG003 trial.
- Session 2: Variety of short talks selected from the abstracts from the trainees
- Session 3: Grant writing activity
- Poster Session 2 (Posters 13 – 25)

Day 3: 7 December 2022

- Session 1: Recent Advances in TB immunology and Vaccines (Chairs Wendy Burgers and Kondwani Jambo)
 - Jackson Marakala's talk was on the basics of immunology in TB which highlighted infection of the macrophages and factors that support healing vs those that lead to granuloma formation or Tuberculosis. He also explained the role of neutrophils i.e. Neutrophil Extracellular traps (NETS) in TB pathology and how they contribute to tissue destruction. Monde Muyoyeta described how immune responses to TB are dampened in advanced HIV diseases and how HIV predisposes to TB disease. Pierre Miossec presented on how chronic inflammation increases risk of TB using inflammation in Rheumatoid arthritis as an example. Inhibition of TNF- α as seen in Rheumatoid arthritis predisposes to TB and that TNF- α , IL-12 and IFN γ are required for efficient host defense against TB. As an illustration of TNF α inhibition, Pierre described impact of cytokine production from a naïve CD4 T-cell in the presence of TNF α inhibitor Infliximab.
- Session 2: Variety of short talks selected from the abstracts from the trainees
- Game Drive: Chaminuka Resort
- Poster session 3

Day 4: 8 December 2022

- Session 1: Advances in Malaria Research and vaccines (Jackson Marakala)
 - Sam Kinyanjui and Azza Idris presented on cellular and humoral aspects of immunity to Malaria respectively.
- Session 2: Infant Immunity (Chairs Michelle Letarte and Kelly McNaghy)

- Presentations by Clive Gray highlighted the great difference between adult and infant immunities shown by CYTOF in HIV exposed infants. Future implications reflections: There is need for a lot more work in infants as they present a very unique and diverse range of immune responses from adults. Rosana Pelayo presented on Emergency hematopoiesis – a seminal innate mechanism to fight inflammatory infectious diseases.
- Grant writing
- Poster Session 4 (Posters 39 -51)

Day 5: 9 December 2022

- Session 1: Worm Infections: Major Drivers of Direct and indirect effects on health and HIV complications and Cure (Session Chair: Azza Idris)
 - Presentations by William Horsnell on parasitic nematodes and Manuel Ritter on schistosomiasis. Key highlights from session: Worm infestations though generally do not lead to mortality have severe implications in vaccine responses and other health areas including fertility. There are great challenges to management of infections as the improvement of water sources and sanitation is key but challenging in most LMICs. Parasitic infections may affect responses to vaccines and may lead to vaccine failure. Nevertheless, these infections have inexpensive treatments but the challenge is treatment at community level is sub-optimal. It will require a holistic approach with multiple intervention points as the life cycle of the parasites is diverse.
 - Lishomwa Ndhlovu gave an account of HIV complications from an immunology perspective and illustrated promising HIV cure strategies in research.
- Session 2: Grant proposal presentation and review
- Session 3: Concluding session (Dieter Kabelitz and Michelle Letarte)
 - Yanet Valdez, Eunice Nduati and Monde Muyoyeta led a session to guide the trainees to develop an action plan for Equity, Diversity and Inclusion in Academia
 - Thumbi Ndung'u presented on funding opportunities for young African scientists and focused on opportunities available in the SANTHE network.
- Closing Ceremony and award for best grant proposals

Trainee Course Evaluation Summary

Trainees were asked to complete a post course evaluation form to communicate their experience at the Immuno-Zambia and to provide feedback to the organizing committee and faculty on ways to improve future courses.

The post course evaluation was answered by 42/46 (91%) of the trainees. Overall, the trainees responded that the course adequately covered advance immunology of the “BIG FOUR” (COVID-19, HIV, TB and Malaria) and that the themes of the course were sufficiently addressed i.e. mean score of 8.7/10. The trainees also rated the appropriateness of faculty and their presentations very highly i.e. mean score of 9/10 and for almost all (41/42), the course met or exceeded their expectations.

About a quarter of respondents thought that the course should have been planned for a longer period to allow for more time allocated to presenters, for the grant writing exercise and also for more interaction between trainees and faculty and among peers. A few trainees gave the following suggestions for improvement to future immunology courses:

1. Inclusion of practical sessions on immunology principles e.g. Flow cytometry, RNAseq, RT-qPCR and CYTOF

2. Inclusion in the agenda on topics addressing immunology of other infections i.e. fungal infections and diarrhoeal diseases which are of high prevalence in sub-Saharan Africa.
3. Presentations to focus more on research conducted by faculty members.

The poster presentations were rated a mean score 8/10 by the trainees and all except one trainee found the presentations to be an effective exercise. The trainees generally found the grant writing exercise effective and educative (mean score 8.6/10); those that did not find the exercise effective, cited inadequate time as the main reason.

Regarding travel logistics and organization of the workshop 6/42 trainees reported that they had encountered a problem and for 3 of them, this was related to travel to Zambia and transport logistics between the airport and hotel.

Funding Support and Expenditure

	<u>Sponsors</u>	<u>USD Amount</u>
1	IAVI	\$ 9,036.68
2	BioNTech donation Inv # 32	\$ 20,000.00
3	Int.Union Imm. Ges. IUIS- Inv #34 (FAIS)	\$ 9,979.99
4	IUIS Education Committee - Inv #40	\$ 12,000.00
5	AHRI (Inv 33)	\$ 8,308.62
6	IUIS Education Committee	\$ 2,468.27
7	IUIS Education Committee (Eur 8,831)*	\$ 8,491.35*
8	IUIS Clinical Immunology Committee (inv #41)	\$ 10,315.00
9	Tiza Nguni refund for accommodation and registration (Inv #43)	\$ 400.00
10	Moses Okee refund for air ticket	\$ 753.55
11	Salhami Travel and Tours- air ticket for Dalilo Mamadou ticket (70% on 1st ticket)	\$ 834.40
12	IUIS Education Committee #45 (EUR 5,300)*	\$ 5,508.24*
13	Refund from Sepiso Masenga- to be paid in Jan 2023	\$ 309.00
TOTAL		\$ 88,405.10

*1 Euro = \$ 1.04

	<u>Payments</u>	<u>USD Amount</u>
1	M`kango golf view down payment(Conferencing and Accommodation)	\$ 20,000.00
2	Flight Kelly McNaghy (Eur1,731)	\$ 1,664.42
3	Flight Jackson Marakala (Eur616)	\$ 592.30
4	Bank fees (Eur 220)	\$ 213.59
5	Flight Michelle Letarte (Eur1,642)	\$ 1,578.84
6	Flight Rosana Pelayo (Eur2,560)	\$ 2,461.54
7	Flight Gabriela Herrera (Eur2,560)	\$ 2,461.54
8	Flight Dieter Kabelitz (Eur2,069)	\$ 1,989.42
9	Salhami Travel and Tours- air tickets	\$ 40,807.21
10	Kumudzi Kwathu-Dance Troup	\$ 529.41
11	Benmark- hire of Bus to Chaminuka	\$ 142.29
12	Chaminuka-Game viewing	\$ 732.50
13	Fuel (Chaminuka trip)	\$ 34.15
14	Taxi- (transport to Chaminuka for Eunice Nduati)	\$ 105.29
15	Taxi from airport Sam Kinyanjui	\$ 31.02
16	Group Photos	\$ 59.76
17	Transport for Media officials	\$ 102.45
18	Admin fees- CIDRZ staff	\$ 300.00
19	Stationery Supplies	\$ 24.42
20	M`kango golf view final payment (Conferencing and Accommodation)	\$ 9,036.68
21	Bank Charges	\$ 40.00
Total Payments		\$ 82,906.82

<i>Cash Balance on hand</i>	\$ 5,498.28
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Acknowledgments

The Immunological Society of Zambia (ISZ) would like to thank IUIS, IUIS Education Committee, BioNTech, FAIS, the IUIS Clinical Immunology Committee, IAVI and SANTHE for the generous funding support towards the Immuno-Zambia workshop. The society is grateful for the commitment from the organizing committee that led to such a wonderful workshop. Special thanks to Immunopaedia for providing a learning platform for the pre-course training and in particular to Bon Holtak for coordinating meetings for the organizing committee, faculty and also organizing the pre-course training materials for the trainees. We also thank the faculty members who took time from their busy scheduled and most of whom travelled from far off countries to attend this in person work shop and teach immunology. Lastly, thanks go to the trainees who worked very hard during the 5 day training and were very active in asking intriguing questions during discussion time after sessions.



Photos from the work shop



