

# NEWSLETTER

Issue No. 5/2017



# B<sup>3</sup> Africa

BRIDGING BIOBANKING AND BIOMEDICAL RESEARCH  
ACROSS EUROPE AND AFRICA

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## IN THIS ISSUE

Editorials.....	2
Updates on B3Africa Activities, Part 1.....	4
Testing the eB3Kit in Real-Life Settings.....	8
Updates on B3Africa Activities, Part 2.....	12
Announcements.....	16
B3Africa Partners.....	16
Contact Information.....	16

# Editorial

## by the Project Coordinator



### On behalf of the B3Africa consortium,

Professor Erik Bongcam-Rudloff,  
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A biobank is a repository of biological samples (usually human or animal) to be used in research and/or development. Since the late 1990s, biobanks have become the backbone of biomedical research; they are a fundamental resource in the genomic era. Advances in translational and personalized medicine have been possible thanks to the contributions of biobanking. Building biobanks in developing and developed countries requires strengthening the research capacity of each country so that they can benefit from the new biotechnologies that have revolutionized the life sciences over the past 10 years. This is where B3Africa plays an important role.

Over the course of the first 2 years of the B3Africa project, the consortium members have dealt with two major areas that concern biobanks: ethics and technology.

On the ethics front, B3Africa, together with leading experts in ethics and law from several organizations, has delivered a first draft of the ethical and regulatory framework of the project. In a joint collaboration, guidelines are being developed on issues that arise when managing biobanks, including research participants' privacy rights, ownership of the specimens and their derived data, the extent to which a donor can share in the return of the research results, and the extent to which a donor can consent to be included in a research study.

On the technical side of the project, B3Africa partners have identified issues pertaining to the technical and informatics solutions needed to create and maintain an efficient biobank in low- and high-technology settings. To accomplish this goal, the B3Africa partners have created a unique platform based on open-source software that guarantees a long technical life for the B3Africa products. This platform, called the eB3Kit, is designed to function as a stand-alone instance, as part of a network, and/or integrated with e-infrastructure for big data storage and analysis. Once installed, its tools can operate with or without an internet connection. Each eB3Kit system is an instance of BiBBoX, a software framework that allows for the easy deployment, management, and integration of software tools. Workflows can be created to integrate sample collection in the field, a laboratory information management system (LIMS), experiment management, bioinformatics analyses, etc. The implementation of the ethical framework is also facilitated within the platform, and training and educational materials are available. An important software package included in the eB3Kit is Baobab LIMS, developed by one of the B3Africa partner institutions.

After 2 years of hard work, B3Africa is proud to initiate the final phase of the project: the deployment and testing of the eB3Kit platform. This deployment will allow us to test all components of the platform in various environments and will facilitate the sharing of data, knowledge, and education between Africa and Europe.

# Editorial

## by the WP 6 Leader: A Pivotal Year Ahead for the Dissemination Work Package



Dr Maimuna Mendy,  
Leader, Work Package 6  
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It is a pleasure to introduce the latest edition of the B3Africa newsletter. We are now entering the final year of the B3Africa project, and so much has been achieved so far. This issue of the newsletter includes valuable insights from partners into the development of the technical component of the eB3Kit, including the users' perspectives following the installation of BiBBoX and the Baobab Laboratory Information Management System (LIMS).

During the second year of the project, we held a variety of webinars covering IT questions, ethics, legal and social issues, the MIABIS minimum dataset, material and data transfer agreements, and bioinformatics. More than 60 professionals from biobanks and research institutions have participated in the B3Africa webinar series. A 3-day in-person training course was also held, in South Africa; its 26 participants included B3Africa developers/trainers, representatives from five use case institutions, and training organizers.

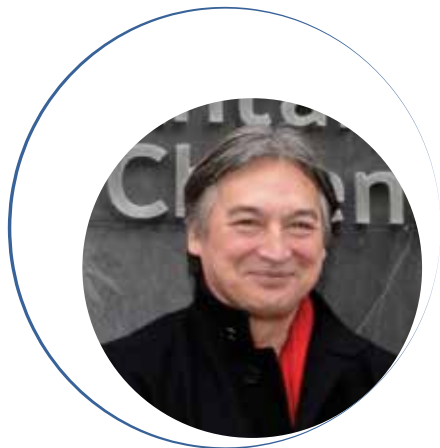
In the final year of the project, the Dissemination Work Package (WP 6) will include an important deliverable: an evaluation and sustainability plan to be submitted to the EU by January 2018. Sustaining and maintaining platforms and infrastructure beyond the end of a funding cycle is always challenging. The B3Africa sustainability plan will aim to provide strategies for the continuity of the integrated platform (the eB3Kit) and the training resources. To this end, partners are actively engaging and sensitizing relevant stakeholders, policy-makers, funding agencies, researchers, and potential users, through high-level meetings, conferences, and training events to present the eB3Kit and its components.

Several specific strategies will be presented in the plan, and international and regional organizations and subject matter experts will be identified to partner with B3Africa to provide fit-for-purpose biobanking and bioinformatics research infrastructure. The focus will be on economic and operational solutions for the maintenance and promotion of the adoption of the eB3Kit, the legal framework, and the training component after the end of the EU-H2020 project funding.



Partners are actively engaging and sensitizing relevant stakeholders, policy-makers, funding agencies, researchers, and potential users, through high-level meetings, conferences, and training events to present the eB3Kit and its components.

# Updates on B3Africa Activities, Part 1



Professor Erik Bongcam-Rudloff,  
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## News from the Second B3Africa Annual General Meeting

The second B3Africa Annual General Meeting (AGM) was held on 12–13 June 2017 in Uppsala, Sweden. The meeting was well attended and partners that could not be present could follow the discussions and presentations via Skype and a Logitech conference device. The first day was dedicated to Work Package status reports and a presentation by Ethics Committee member Professor Ames Dhai of South Africa on legal and ethical pitfalls associated with international collaborations with African countries, highlighting questions that need to be resolved within the project. The second day was devoted to coordinating the work ahead, including future tasks from the Work Packages and the development of a strategic

plan to sustain B3Africa beyond the current project's lifetime. Discussions centred on the various possible opportunities to develop the financial capacity to support users of B3Africa solutions and to allow for further development of the eB3Kit platform and its components (Baobab LIMS, Galaksio, BiBBoX, etc.). The discussions were extremely productive, and B3Africa also received valuable advice on various solutions from invited experts. The prevailing mood following the meeting was one of strong optimism and firm dedication to making the third year of the B3Africa project a great one. Next year will be fully dedicated to the deployment, dissemination, and education on the use of the eB3Kit platform at the use case institutions in Africa and Europe.



B3Africa partners at the second AGM, in Uppsala, Sweden



Presentation by the B3Africa Ethics Committee (Professor Ames Dhai) to B3Africa partners



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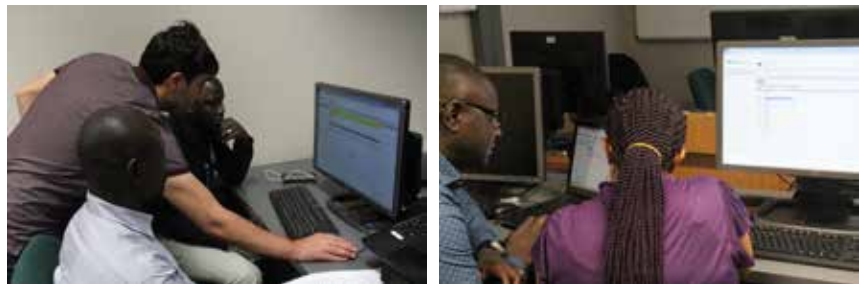
## The B3Africa Training Plan in Action

During the first year of the project, a learning needs assessment was conducted among the B3Africa developers and future pilot users. This led to the development of a tailored training plan including self-study resources and facilitated training events.

The B3Africa learning plan, initiated in July 2016, **has now reached its cruising speed**, with:

- More than **60** professionals from biobanks and research institutions around the world having participated in the B3Africa webinar series, and **50%** of them having attended more than one webinar;
- **46** professionals having created accounts on the B3Africa Learning Space;
- A **3-day** in-person training course held in South Africa, whose **26** participants included B3Africa developers/trainers, representatives from **5** use case institutions, and training organizers;
- **1494** views, by **197** visitors, of an introductory infographic about the eB3Kit posted on the B3Africa website;
- A documentation page created on the use of BiBBoX;
- Documentation drafted on the installation of Baobab LIMS;
- Accelerated development of learning and training resources planned for the final year of the project;
- A second in-person training session planned in parallel with the BCNet Symposium:

**“From Biobank Infrastructure to Research: How BCNet Member Biobanks Are Contributing to Addressing Public Health Concerns”**  
(November 2017 in Lyon, France).



B3Africa training events



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## Configuring and Installing the BiBBoX Environment: A Developer's Perspective

The first practical integration of the BiBBoX system into the existing infrastructures of our use case partners has been an interesting experience and an excellent test for the system itself.

BiBBoX provides a great deal of value and can save users large amounts of time and money in IT maintenance, but it is also quite a complex platform. Its installation requires a certain level of expertise in several software and network-related fields, and in our experience so far, new users definitely require support from experienced developers to get started with the system.

During the integration phase of the first three use cases, some unexpected challenges and findings emerged. The networking component of the BiBBoX system, and how the system can communicate with existing server infrastructure, proved quite difficult for system administrators at the use case partner sites to fully comprehend. This was a valuable insight, because the development process took place within a much more controlled environment, which did not provide such a wide variety of infrastructural needs and conditions. In reality, as we have now learned first-hand, every infrastructure has its own unique hierarchy and software tools. This makes the integration and configuration process for BiBBoX quite distinct and special for every use case.

Another thing we could only have learned from the practical use cases was that we needed to rethink how we distribute the BiBBoX software. Our initial approach was to give the on-site system administrators the opportunity to build their own BiBBoX system from scratch with a minimum of effort. This relatively technologically advanced option offers the benefits of more-controlled configuration and faster upgrades. But in practice, this approach proved to be quite problematic because it was dependent on many environmental factors and external resources; therefore, the process was not consistent across the use cases.

These experiences have been extremely valuable, and they have provided the best kind of feedback we could possibly receive. Since the first integration of the system, we have expanded our distribution repertoire, enhanced our guides and documentation, and made the system even easier to use. For example, it is now possible to try out a local BiBBoX installation with only a single download and no need for expert knowledge during the setup process.

We have learned a lot from these use cases, and we are applying this knowledge to continually improve the BiBBoX software and make it even easier for our partners to get the most out of the platform. The road so far has been an interesting and educational adventure, and we already have plenty of new ideas and features in the pipeline, which we are looking forward to sharing with our partners.



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## The Successful Testing of the Baobab LIMS Open-Source Software in a Use Case Analysis at a Medical School in South Africa

The Baobab Laboratory Information Management System (LIMS) was designed as an open-source alternative for use in resource-limited settings to meet the increasing demands associated with growing biobank collections. The Baobab LIMS also provides the South African National Health Laboratory Service (NHLS) Stellenbosch University Biobank (NSB), a biorepository associated with the Faculty of Medicine and Health Sciences Division of Haematological Pathology, with an open-source software suite for biobanking and biomedical research for longer-term sustainability, given that commercially available LIMS platforms are not a viable option in resource-limited settings.

The first use case testing of the Baobab LIMS software at the NSB was successfully completed in 2017, and the potential extension of its functionality to cater to different research group requirements is a promising avenue for future studies.

Our collaboration with the software developers and IT experts at the South African National Bioinformatics Institute (SANBI – University of the Western Cape) allowed us to exchange viewpoints and adapt workflows to our needs. Within the context of NSB biobanking, the following were identified as the key modules for the extension of the existing Bika LIMS software: biospecimen kit assembly, shipping of biospecimen kits, storage management, analysis requests, reporting, and invoicing. These additions provided the NSB group with crucial functionalities to improve the existing workflows. Further developments are in the pipeline to enhance and expand upon the existing modules in order to improve the end-user experience and increase functionality in the laboratory setting.



The Baobab LIMS testing team from Stellenbosch University and the University of the Western Cape

# Testing the eB3Kit in Real-Life Settings

Institutions participating in the Use Cases Work Package (WP 7)

## National Health Laboratory Service (NHLS) Stellenbosch University Biobank (NSB) SOUTH AFRICA



Public entity



15 000 samples: whole blood, serum, plasma, urine, breast milk, meconium, peripheral blood mononuclear cells



Freezers, liquid nitrogen (LN<sub>2</sub>), ambient



Commercial LIMS, Microsoft Excel, Microsoft Word



16 biobank members and collaborators (from South Africa and Sierra Leone) participating in the B3Africa education and training programme

- **Membership:** B3Africa consortium, BCNet; one of the first pilot centres to test the eB3Kit

- **Interested in:** Baobab LIMS

## International Livestock Research Institute KENYA



International nongovernmental organization, member of the CGIAR Consortium



More than 400 000 animal and human samples stored in vapour phase LN<sub>2</sub>



Freezers, LN<sub>2</sub>



Commercial LIMS with custom modules developed in-house



9 biobank members and collaborators participating in the B3Africa education and training programme

- **Membership:** B3Africa consortium

- **Interested in:** Field sample collection module, test case for the eB3Kit from an animal biobank perspective

Makerere University College of Health Sciences  
**UGANDA**



Public entity



169 500 samples collected for specific research projects



Freezers, LN<sub>2</sub>, ambient



STARLIMS and Freezerworks



8 biobank members and collaborators participating in the B3Africa education and training programme

● **Membership:** B3Africa consortium, BCNet

● **Interested in:** Testing the eB3Kit LIMS component, bioinformatics tools, other components of the eB3Kit

Institute of Human Virology, Nigeria  
**NIGERIA**



Nongovernmental organization



58 919 samples and 99 232 aliquots: DNA, serum, plasma, urine, stool, rectal swab, oropharyngeal swab, mouth wash, red cells, buffy coat



Freezers, LN<sub>2</sub>, ambient



Commercial LIMS, Microsoft Excel, Microsoft Word



7 biobank members and collaborators participating in the B3Africa education and training programme

● **Membership:** B3Africa consortium; operates the regional H3Africa biorepository for West Africa

● **Interested in:** Mainly the eB3Kit LIMS component, bioinformatics for genomics as a test case

# Testing the eB3Kit in Real-Life Settings

Institutions participating in the Use Cases Work Package (WP 7)

Wroclaw Research Centre EIT+Biobank

**POLAND**



Public entity



120 000 samples: some collected specifically for the biobank, others collected for specific research projects



Freezers



Commercial LIMS, Microsoft Word, SQL databases, paper notebooks



5 biobank members and collaborators participating in the B3Africa education and training programme

● **Membership:** BCNet; selected among BCNet members to serve as a B3Africa pilot centre

● **Interested in:** The eB3Kit LIMS component

National Cancer Institute

**LITHUANIA**



Public entity



222 000 samples: specific research projects; clinical samples from clinical trials



Fridges, freezers, LN<sub>2</sub>



In-house data management system, Microsoft Excel, Microsoft Word, databases

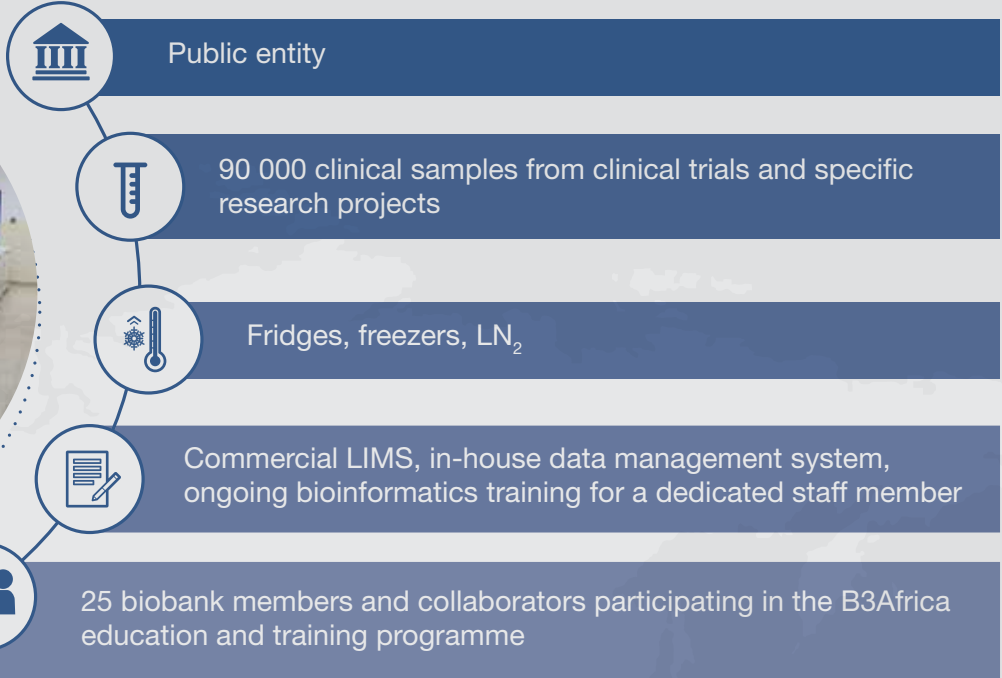


7 biobank members and collaborators participating in the B3Africa education and training programme

● **Membership:** BCNet; selected among BCNet members to serve as a B3Africa pilot centre

● **Interested in:** Field sample collection module, test case for the eB3Kit from an animal biobank perspective

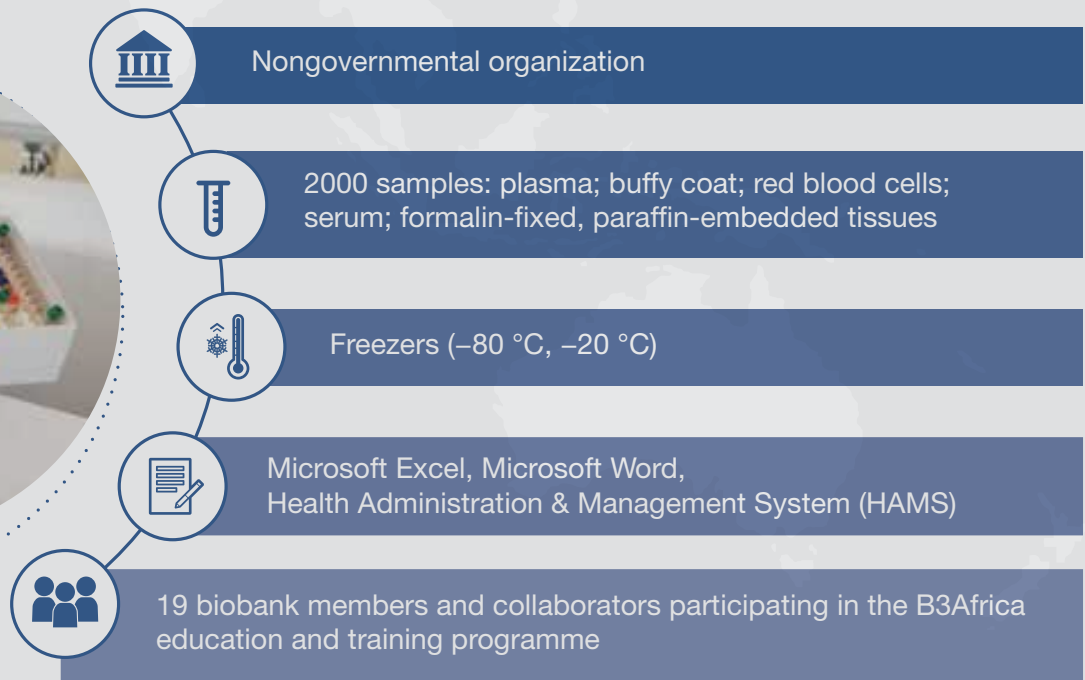
Medical Research Council Unit  
**THE GAMBIA**



● **Membership:** BCNet; selected among BCNet members to serve as a B3Africa pilot centre

● **Interested in:** Testing the eB3Kit LIMS component, tools that can be used offline, building bioinformatics capacities

Breast Care International  
**GHANA**



● **Membership:** BCNet; selected among BCNet members to serve as a B3Africa pilot centre

● **Interested in:** All components of the eB3Kit (LIMS, bioinformatics, experiment management, mobile data collection, and ethical and legal framework)

# Updates on B3Africa Activities, Part 2

## Baobab LIMS:

### An Open-Source LIMS for Biobanking



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The term “biobanking” refers to the collection, processing, and storage of biospecimens and their associated demographic and clinical data for future use. These activities require a reliable informatics infrastructure that includes a laboratory information management system (LIMS). The LIMS development process within the B3Africa consortium culminated in the release of an open-source LIMS called Baobab LIMS in April 2017, announced in a publication in the journal *Biopreservation and Biobanking*.<sup>1</sup>



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*Baobab LIMS gives researchers affordable access to human biobanking activities. Commercial LIMS alternatives are available but do not cater to resource-limited settings where researchers cannot afford licensing fees.*

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With this free software, researchers have the ability to define sample collection kits, track courier shipment of kits, and perform freezer storage management. A payment system for biobank clients is also included. Although initiatives have been established to develop harmonized national and regional governance frameworks for biobanking itself, this has not been the case for the IT infrastructure needed to support biobanking. Baobab LIMS will be an essential part of the governance framework underpinning the IT infrastructure used in human biobanking activities.

#### What's next?

- The exciting extension of Baobab LIMS functionality includes customization to cater to the needs of researchers working with animal and plant biospecimens.
- Extensive user testing is underway to refine the functionality.
- The sustained research and development of Baobab LIMS requires an active community of software developers. Our plan is to expand this community as more researchers adopt this LIMS in their laboratories.
- The integration of Baobab LIMS with other biobanking tools developed by the B3Africa consortium is underway and will ensure seamless installation and implementation in the laboratory setting.

<sup>1</sup>Bendou H, Sizani L, Reid T, Swanepoel C, Ademuyiwa T, Merino-Martinez R, Meuller H, Abayomi A, Christoffels A (2017). Baobab Laboratory Information Management System: development of an open-source laboratory information management system for biobanking. *Biopreserv Biobank*. 15(2):116–20.



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# STATegra EMS: Bridging Biobank Data with Experimental Data and Bioinformatics

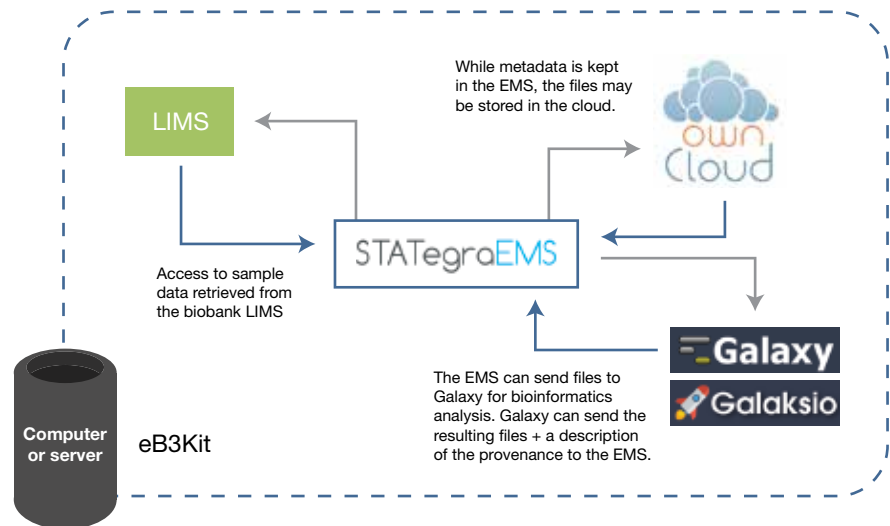
The STATegra Experiment Management System (EMS)<sup>2</sup> is the bridge connecting biobank data with experimental data and bioinformatics in the eB3Kit.

*Big data has become the standard in biomedical research; it is therefore necessary to encapsulate experimental provenance along with sample metadata and storage parameters from the laboratory information management system (LIMS).*

STATegra EMS provides a unique structure to integrate this information for data analysis. The system has been designed to store experimental information for entire integrative-experiment workflows – from biomaterial production to results generation – including the experimental design and protocols for sample measurements and data processing, making it the main point of access for researchers wishing to access all information relevant to their study. STATegra EMS has been designed around the basic concept of a study, and is intended to cover

the entire study workflow; when used within the eB3Kit, the system provides researchers with access to sample data retrieved from the biobank LIMS, data files stored within the ownCloud storage system, and any data generated through data analysis using the bioinformatics component.

As a result, the system provides researchers with a valuable tool for tracking the provenance of their data and ensuring experimental reproducibility, in a collaborative and user-friendly online environment.



The STATegra Experiment Management System (EMS) in the eB3Kit

STATegra EMS was originally developed as a stand-alone tool to integrate omics data, but it is now also available in the eB3Kit and can be downloaded as a tool in BiBBoX, providing research-integrated biobanks with the means to truly integrate experimental factors with pre-analytical variables associated with the collection and storage of samples. For further reading, please refer to the Hernández-de-Diego et al. paper describing the tool.<sup>2</sup>

<sup>2</sup> Hernández-de-Diego R, Boix-Chova N, Gómez-Cabrero D, Tegner J, Abugessaisa I, Conesa A (2014). STATegra EMS: an experiment management system for complex next-generation omics experiments. BMC Syst Biol. 8 Suppl 2:S9.

# Introducing the Galaksio Web Interface

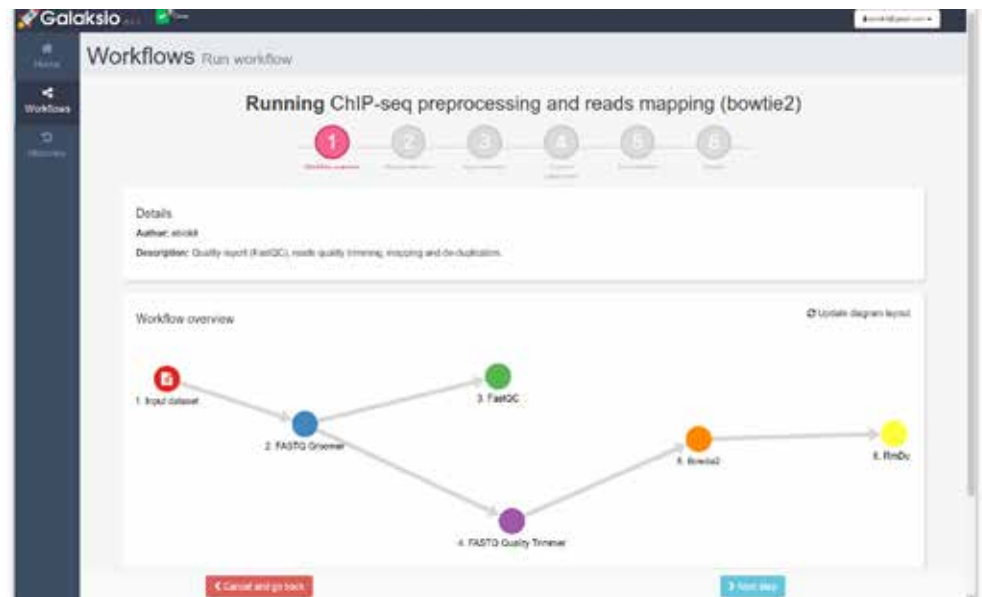
Biobanks are an important strategic investment in the life sciences. However, in order to benefit local research communities, biobanks must be combined with the corresponding capacity to analyse the experimental data generated from samples. Statistics and bioinformatics are significant bottlenecks in life science research; the Galaksio web interface is designed to help research institutions distribute the work load more effectively among staff members by automating routine tasks in a comprehensive manner for researchers with limited training in bioinformatics.

Galaksio does not manage data on its own, but provides a more accessible interface for the Galaxy Workflow Management system, allowing bioinformaticians to continue designing and preparing workflows in Galaxy and allowing research biologists to access those workflows through the Galaksio interface.

When used within the eB3Kit, Galaksio allows researchers to conduct their analyses in an environment closely integrated with the biobank through STATegra EMS, providing analysts with direct access to relevant metadata and potential confounding factors related to the study.

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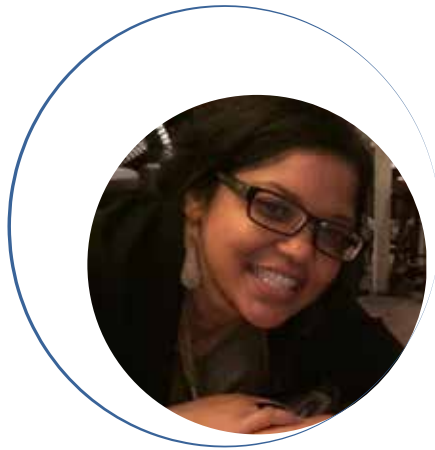
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A simple Galaxy workflow for mapping ChIP-seq data to a reference genome using the Galaksio interface

For more information about the Galaksio interface, keep an eye out for our forthcoming paper in the EMBNet journal.<sup>3</sup>

<sup>3</sup> Klingström T, Hernández-de-Diego R, Bongcam-Rudloff E. Cutadapt removes adapter sequences from high-throughput sequencing reads. EMBnet.journal. (Forthcoming)



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## The B3Africa Project Showcased at the Second Pathology Research and Development Congress (PathReD), in Johannesburg, South Africa

The South African National Health Laboratory Service (NHLS), in association with the Federation of South African Societies of Pathology (FSASP), hosted the Second Pathology Research and Development Congress (PathReD) at the Emperors Palace Convention Centre in Johannesburg, South Africa, on 22–24 June 2017.

The 2017 theme was **“Driving Innovation and Laboratory Excellence”**, and the programme included keynote presentations, satellite sessions, oral and poster presentations, exhibitions, and interactive workshops.

The congress brought together experts from across the full spectrum of diagnostic pathology and public health sciences, including pathologists, technologists, technicians, medical scientists, public health specialists, clinicians, and public health managers.

Sessions on biobanking were an important part of the congress, and included keynote and plenary lectures by Professor Akin Abayomi and Dr Carmen Swanepoel (both B3Africa partners from South Africa), as well as a 2-hour biobanking workshop facilitated by the two of them.

Professor Abayomi’s keynote lecture, titled “Biorepositories and Biosecurity”, focused on biobanking and biosecurity in emerging infectious diseases, as well as on data sharing and protection.

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*Dr Carmen Swanepoel gave a plenary lecture titled “International Genomic and Biobanking Initiatives in Africa”, focusing on initiatives such as B3Africa that have made great strides with regards to work on biobanking, data sharing and protection, and information management systems in Africa and Europe.*

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The biobanking workshop, titled “Biobanking Principles, Science and Practical Issues and Current Developments in Africa”, was interactive and informative. The topics of discussion included biobanking concepts; networks; scientific principles; and practical issues such as transportation logistics, disaster management plans, data/information security, ethical and regulatory issues, harmonization, and biosecurity in resource-limited settings.

The congress also included a presentation by Ms Mantombi Maseme titled “The Biobanking Complexity Matrix, Key Ethical and Governance Considerations for Emerging Biobanks”.



Second Pathology Research and Development Congress (PathReD),  
Johannesburg, South Africa, 22–24 June 2017

# Announcements

- The April 2017 issue of *Biopreservation and Biobanking* contains a special section on the H3Africa biorepositories, including six papers authored by H3Africa biorepositories, with several co-authors also involved in the B3Africa project. The special section also includes a paper on the Baobab Laboratory Information Management System (LIMS), an open-source LIMS for biobanking that has been developed within the framework of the H3Africa and B3Africa initiatives and that will be integrated into the eB3Kit.
- Visit the B3Africa booth at the Global Biobank Week in Stockholm, Sweden, from 13 to 15 September 2017.
- Visit the B3Africa booth at AORTIC 2017 – “Cancer in Africa: Making Strides, Creating Solutions” in Kigali, Rwanda, from 7 to 10 November 2017, and get the latest information about the project!

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## B3Africa Partners

Swedish University of Agricultural Sciences (Sveriges Lantbruksuniversitet, SLU), Sweden; Biobanking and BioMolecular Resources Research Infrastructure – European Research Infrastructure Consortium (BBMRI-ERIC), Austria; Medical University of Graz (Medizinische Universität Graz, MUG), Austria; International Agency for Research on Cancer (IARC), France; International Livestock Research Institute (ILRI), Kenya; Institute of Human Virology, Nigeria (IHVN), Nigeria; Stellenbosch University (SU), South Africa; University of the Western Cape (UWC), South Africa; Centre for Research Ethics & Bioethics (CRB) at Uppsala University, Sweden; Karolinska Institutet (KI), Sweden; Makerere University (MAK), Uganda



BRIDGING BIOBANKING AND BIOMEDICAL RESEARCH  
ACROSS EUROPE AND AFRICA

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