Personalized Medicine as a Catalyst to a New Health Future for Ethiopia

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We are committed to a partnership with local Addis Ababa and national Ethiopian health, academic and and life-science research decision-makers that aids them in their current efforts to create a more effective, more sustainable, and more community-responsive health care ecosystem in Ethiopia.

At the specific request of Addis Ababa University leadership working with the Ethiopian Ministry of Health and key stakeholders, we have committed to help develop a competent genomics and personalized medicine capability, from the ground up, that will serve as THE catalyst for a New Health Future for Ethiopia: combining education, training, technology acquisition and sustainability to empower patient and family-centered continum of care and parallel economic development.

This partnership will be built on a foundation of collaboration and innovation. The guiding principles to this effort are:

Autonomy
Beneficence
Respect

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We will use real-word evidence and great science, combined with knowledge translation, training and education as the “drivers” to build this new ecosystem and foster true community-responsive innovation. Patients, their families and their communities will be active in all elements of this endeavor and new knowledge will be an integral by-product of every care experience.

We will position evidence development and its application in the Ethiopian context to foster health care that continually improves to meet the needs of Ethiopians.

Health care can be costly and challenging, yet an effective health care ecosystem Is a critical quality of life factor for all society including productive workers. Successful economies require a high quality, sustainable, and responsive health care ecosystem.

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Catalyst to a
New Health Future for Ethiopia

Motivation

The Human Genome Project (HGP) fundamentally changed how we approach science and medicine. The HGP's health benefits are beginning to bear fruit with personalized treatments tailored to an individual's genetic profile. It has also been a financial success, delivering an economic dividend of $178 for every dollar invested. Yet, despite the promise for improving health and wellness, there is a profound inequality in the potential of genomic sciences – 90% of all genome sequences are derived from white European populations. Missing from this picture are genomes derived from any of the hundreds of diverse African populations.

The goal of the **Ethiopian Translational Health Innovation (ETH-I)** is to develop a local, stakeholder driven effort that uses genomics and data to empower innovation in healthcare and wellness in Ethiopian Universities and communities.

In biological research, genomic diversity is a foundational principle. Now it is time to increase diversity in genomics.

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Catalyst to a
New Health Future for Ethiopia

The benefits of this innovative project are manifold and include-

- Ethiopia will become a go-to resource for Pharmaceutical Companies and Drug Developers seeking to access this rich genomic dataset.
- Data will be owned by the individuals and will be a national resource to incentivize local investment and entrepreneurship.
- The project will train front-line health care workers in genomic sample collection, informed consent and in teaching the fundamentals of genomics.
- Data generated from this project will inspire training of a variety of Ethiopian Data Scientists; storage, application and software development, and informatics.
- The first Ethiopian genomic pioneers to participate will inspire the next wave of participants, innovators and educators.

Personalized Medicine as a
Catalyst to a
New Health Future for Ethiopia

Continuing the conversation: Why ETH-I, How and When?
Genomics is dominated by the 'Global North data' this fundamentally undermines the goals of personalized, precision medicine.

Why: As demonstrated in nature genetics (January 2019: 30–35) geographically appropriate datasets are needed. We further submit that local researchers need to be the driving stakeholders, "300million bp (~10%) of the genome of populations of African descent is missing from the reference genome"

How: By empowering AAU and affiliated scientists to apply genomic technologies…..

When: First step are two workshops in April/May 2019

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Catalyst to a
New Health Future for Ethiopia

April 2019, on the ground, training the trainers.

Workshop 1. Pharmacogenomics and plant genomics

Day 1	Day 2	Day 3
10am-11am: Introductory Lecture 1h Goals for the workshop	10am-11am: Review of Day 1	10am-11am: Review of Day 2
11am-1pm: Review of molecular techniques Pipetting Good laboratory practices Documentation	11am-12noon: Saliva and plant DNA extraction Pt2	11am-12noon: Gel electrophoresis of P reactions
	12noon-1pm: Description of Oxford Minion	12noon-1pm: Data Documentation best practices
1-2pm: Break	1-2pm: Break	1-2pm: Break
2:00-3pm: Saliva collection and plant sample processing	2-3pm: Gel electrophoresis of PCR reactions	2-3pm: End-point PCR analysis
3-4pm: Saliva and plant DNA extraction Pt1	3-4pm: Load Minion	3-4pm: Minion analysis
4-5pm: End-point PCR set-up 1	4-5pm: End-point PCR set-up 2	4-5pm: Summary discussion

Workshop 2. Small genomes and microbiome

Day 1	Day 2	Day 3
10am-11am: Introductory Lecture 1h Goals for the workshop	10am-11am: Review of Day 1	10am-11am: Review of Day 2
11am-1pm: Review of molecular techniques Pipetting Good laboratory practices Documentation	11am-12noon: Microbe and microbiome DNA extraction Pt2	11am-12noon: Gel electrophoresis of P reactions
	12noon-1pm: Description of Oxford Minion	12noon-1pm: Data Documentation best practices
1-2pm: Break	1-2pm: Break	1-2pm: Break
2:00-3pm: Microbe and microbiome collection and	2-3pm: Gel electrophoresis of PCR reactions	2-3pm: End-point PCR analysis
3-4pm: Microbe and microbiome DNA extraction Pt1	3-4pm: Load Minion	3-4pm: Minion analysis
4-5pm: End-point PCR set-up 1	4-5pm: End-point PCR set-up 2	4-5pm: Summary discussion

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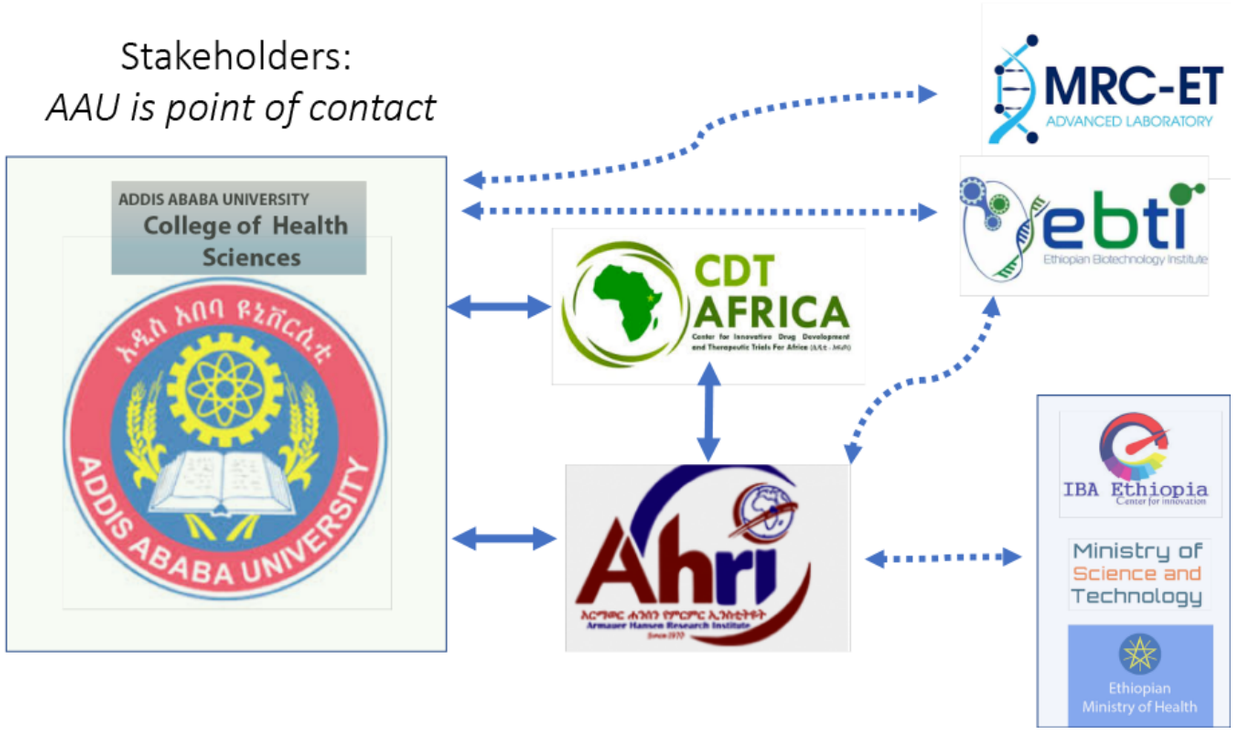
Stakeholder Institutions

- **University of Addis Ababa**
- **The Center for innovative Drug Development** and Therapeutic Trials for Africa (CDT-Africa) is a semi-autonomous, World Bank supported center of excellence for education and research. http://cdt-africa.org/
- **Armauer Hansen Research Institute (AHRI)** founded in 1970 through the initiative of the Norwegian and Swedish Save the Children organizations. AHRI is a biomedical research institute and joined the Ethiopian Ministry of Health in 2004. https://ahri.gov.et/about-ahri
- **Ethiopian Biotechnology Institute (EBTI):** Mission is to provide world class research, innovation and community service to improve citizens' quality of life and to significantly contribute for the national economic development via the synergetic endeavor of biotechnology and emerging technologies http://www.ebti.gov.et/
- **MRC-ET**: An affiliate of MRC-Holland; MRC-ET provide a much-needed service to the community by providing genetic diagnostics services and state of the art genetic screening techniques to medical institutes.



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Catalyst to a
New Health Future for Ethiopia

Stakeholder Contacts

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Dr. Abebaw Fekadu, MD, Ph.D., MRCPsych Lead, and Faculty Director CDT
Abebe Genetu Bayih - Director General, Armauer Hansen Research Institute (AHRI) Addis Ababa, Ethiopia
Kassahun Tesfaye (Ph.D.) Director General, Ethiopian Biotechnology Institute, Ministry of Science and Technology, Ethiopia

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Dr. Ephrem Engidawork - Addis Ababa University Department of Pharmacology (ex-dean of School of Pharmacy)

Teshome Nedi (BPharm, MSc, Ph.D.) --- Associate Professor of Pharmacology, Head, Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, College of Health Science
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Dr. Zewdu Terefework -- MRC-ET Advanced Laboratory · Genetics
Haile Gebrselassie is a retired Ethiopian long-distance track and road running athlete
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