Human Heredity and Health in Africa (H3Africa)

NIH Common Fund Program
Overall vision: To enhance capacity for using contemporary research approaches, in Africa by African scientists, to understand the genetic and environmental factors that determine disease susceptibility and drug responses in African populations.

- Increase the number of internationally competitive African scientists in genomics and population-based research
- Establish collaborative networks of African investigators
- Create and expand infrastructure for genomics research
- Support the ongoing policy development for ethical issues in genomics research, particularly in an African context

High-risk/high-reward with long-term goals
Current H3Africa Footprint

- H3ABioNet
  - Nodes (32)
- Biorepositories (3)
- Collaborative Centers (5 NIH)
  - Collection sites
- Independent Research (7)
  - Collection sites
- ELSI Research (6)
  - Interview sites
- Collaborative Centers (3 WT)
  - Collection sites
H3Africa: Major Accomplishments

The epigenome of *Trypanosoma brucei*: A regulatory interface to an unconventional transcriptional machine

Johannes P. Maree, Hugh G. Patterson

A Call for Policy Action in Sub-Saharan Africa to Rethink Diagnostics for Pregnancy Affected by Sickle Cell Disease: Differential Views of Medical Doctors, Parents and Adult Patients Predict Value Conflicts in Cameroon

Wonkam Ambrose and Hurst Samia

OMICS: A Journal of Integrative Biology.

The H3Africa policy framework: negotiating fairness in genomics

Jantina de Vries¹, Paulina Tindana², Katherine Littler³, Michèle Ramsay⁴, Charles Rotimi⁵, Akin Abayomi⁶, Nicola Mulder⁷, and Bongani M. Mayosi⁸

• Collaboration across Africa
  - Working Groups
  - Policy development
  - Coordinated training
  - Scientific collaborations

• Training the next generation; leapfrogging where possible
  - >250 trainees (students, postdocs, jr. investigators, technicians, administrators, etc.)
  - Informatics: 12 courses (>450 attendees); curriculum development
  - Learning lab/analysis methods and skills at Broad, JCVI, Baylor, Sanger, etc.

• Capacity Building in difficult environments
  - Limited resources and connectivity
  - Ebola and Doctor strikes
  - National rules and guidelines for consent

• Science: recruitment and research
  - 90% sites recruiting/>25,000 samples so far
  - >30 publications, many more under review or in press

• Sustainability: leveraging resources and building interest

http://h3africa.org
TrypanoGEN and 1000 genomes SNPs
Enock Matovu - Makarare

TrypanoGEN samples:
CDI Côte d'Ivoire
GUI Guinea
UGB SE Uganda
UGN N Uganda

- TrypanoGEN Bantu samples cluster tightly with 1000 genomes African (quality ✔)
- The Nilo-Saharan (Central Sudanic; Lugbarra) cluster very distinct from other African samples
15 samples per phenotype

Asymptomatic carriers of *T. b. gambiense* have distinct cytokine and transcription profiles (increase in IL-4, decrease in IFNγ.)

QTL: mostly genes of unknown function, 3 SNPs in HLA-A – class 1 MHC

71% prevalence in asymptomatics compared to 29 % in symptomatics, 23% in controls.

B Bucheton, A MacLeod
Christian Happi-Nigeria
Advanced Genomics Training – Summer 2015

- MiSeq installation and operation
- Sample preparation and sequencing
- Sequencing analysis
- Independent research
H3Africa: Projected Resources

- Infrastructure
  - Pan-African Bioinformatics capacity (physical and human resources)
  - Three DNA Biorepositories (East, West, and South)
  - Ethical guidelines; best practices for informed consent and community engagement in an African context
  - A collaborative community and a culture of data and sample sharing

- 70,000 DNA Samples to be collected with:
  - A subset of harmonized phenotypes
  - Broad representation of different ethno-linguistic, environmental, cultural and genetic backgrounds and different disease states
  - ~55,000 samples with H3Africa genotyping array data

- Genomic data (genotyping, whole genome, exome, microbiome)

- H3Africa Pan-African genotyping array

- Guidelines, policies, and SOPs for African genomics research
H3Africa: Looking Forward

You are here

STAGE I: Capacity Building

STAGE II: Capacity Implementation
H3Africa: Looking Forward

STAGE I: Capacity Building

- Sample and data collection
- DNA storage
- Bioinformatics support and training
- ELSI research

You are here

STAGE II: Capacity Implementation

- Analysis, publications, and data sharing
- DNA and other samples stored, samples shared, services offered
- Increased Bioinformatics capacity on the continent: 2nd generation training
- Increase ELSI research and apply best practices

Support for projects of IC interest
The H3Africa Consortium: Stage I

8 Collaborative Centers

6 Ethics Research Projects

3 Biorepositories

H3Africa SC and WGs

7 Biomedical Research Projects

Bioinformatics Network/Coordinating Center
H3Africa: Synergy and Sustainability

- NIH
  - MEPI
  - BRAD
  - FIC training programs
  - IC Global Health Initiatives

- Other Funding Agencies
  - Wellcome Trust
  - GSK
  - Gates Foundation
  - Government Funding Agencies
  - SIDA

- African Organizations
  - AESA
  - AAS
  - AU
  - NEPAD

Challenges => Opportunities
H3Africa NIH Working Group (EC)

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