Sanjay Curtis Nagi

MRC CASE PhD student

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About

I am a first-year PhD student at the Liverpool School of Tropical Medicine, having recently completed an MRes in quantitative skills at Lancaster University. My research sits at the interface of population genomics, bioinformatics and molecular biology, and the rapid evolution and spread of insecticide resistance is of major interest. The main project of my PhD will focus on demographic inference from whole genomes of a Ugandan *An. gambiae* population, in the context of a large-scale vector control trial. I am a highly motivated, enthusiastic and independent learner. I feel strongly about reproducibility in computational research, and as such, use the workflow manager snakemake for computational analyses.

Education

PhD. Vector biology

Liverpool School of Tropical Medicine

Oct 2019 – Present

- Population genomics and mechanisms of insecticide resistance of *Anopheles gambiae*

MRes. Quantitative skills in Global Health

Lancaster University

Sept 2018 – Sept 2019   Distinction | 74%

- Studied statistics and statistical genetics
- Built gene regulatory networks (GRNs) from transcriptomic data in *Anopheles gambiae s.l*
- Applied machine learning algorithms to genomic data to uncover genotype-phenotype associations
- Performed fieldwork in Chikwawa, Malawi, investigating patterns of insecticide resistance

MSc. Molecular Biology of Parasites & Disease Vectors

Liverpool School of Tropical Medicine

Sept 2016 – Sept 2017   Distinction | 77%

- Mechanisms of resistance to the volatile pyrethroid, transfluthrin, in mosquitoes

Experience

Molecular biology research technician

Liverpool School of Tropical Medicine

Oct 2017 – Sept 2018

- Running molecular diagnostics on mosquito samples, investigating insecticide resistance
- *In silico* work on the role of small RNAs in resistance in *Anopheles gambiae*

Selected Awards

MRC CASE studentship
£125,000

InfraVec
Investigating the role of small RNAs in insecticide resistance in *Anopheles gambiae* | £11000

RNA transcriptomics 2019
MRC funding to attend training | £1220

Evomics Pop Gen
MRC funding to attend training | £2000

Skills

Programming

Unix & **Bash**
Snakemake
Python & Jupyter
R & RStudio

Software Tools

LaTeX, MS Office
Git, Github

Scikit-allel, Numpy, Pandas, Scikit-learn
SLiM, msprime
Matplotlib, Seaborn, Bokeh
Tidyverse

BWA, HISAT2, Samtools
GATK, freebayes, snpEff
Kallisto, DESeq2, Sleuth
IQTree, mafft
PyMol, Autodock Vina

Molecular biology

Illumina sequencing (MiSeq)
Amplicon sequencing panel design
qPCR & LNA probe qPCR assay design
Metabolism assays & HPLC
Cloning & Sequencing

Publications

High concentrations of membrane fed ivermectin are required for substantial lethal and sublethal impacts on Aedes aegypti

Max Hadlett, Sanjay C Nagi, Manas Sarkar, Mark JI Paine, David Weetman

📅 January 2021　　　　📄 Parasites & Vectors

Capturing the transcription factor interactome in response to sub-lethal insecticide exposure

Victoria A Ingham, Sara Elg, Sanjay C Nagi, Frank Dondelinger

📅 Dec 2020　　　　📄 BioRxiv

PhD Projects

Snakemake RNA-Seq workflow

Building an **RNA-Seq analysis workflow** and its application to multiple strains of insecticide resistant *An. gambiae s.l* and *Ae. aegypti* from sub-Saharan Africa.

Identification and validation of a selective sweep

In-silico and functional validation of a swept haplotype containing two alpha-esterases which is rapidly spreading throughout West Africa in *An. gambiae s.s*.

Amplicon sequencing panel and analysis workflow

Designing an amplicon sequencing panel based on insecticide resistance mutations and selective sweeps in the Ag1000g data. In parallel I will develop a snakemake workflow to analyse the data, in collaboration with partners at MalariaGEN, Sanger institute.

Population genomics of the LLINEUP trial

Population genomic analysis of spatio-temporal sampled *An. gambiae* collected at baseline, 12 and 24 months into a large-scale PBO bed-net trial in Uganda. The aim is to detect the impact of vector control via genomic approaches, with accompanying forward simulations in SLiM.

Training

Snakemake
University of Cambridge

📅 2 days, Jan 2020

Snakemake workshop for reproducible data analysis, ran by Johannes Koester

RNA transcriptomics
Wellcome Genome Campus

📅 10 days, June 2019

Hands-on training in the latest laboratory and computational methods for transcriptomic analysis

Amplicon Sequencing
MalariaGEN, Sanger Institute

📅 7 days, Dec 2019

Hands-on lab workshop - "Genomic Surveillance of Malaria"

Referees

Prof. Martin J Donnelly
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Prof. Hilary Ranson
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