# Transboundary surveillance of bushmeat and vector-borne pathogens in Kenya and Tanzania

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## INTRODUCTION

We have developed cost-effective high resolution melting (HRM) analysis approaches for identifying diverse bloodmeal host DNA sequences in blood-fed mosquitoes (Omondi *et al.* 2015), arthropod-borne viruses (arboviruses) (Villinger *et al*. in review), and tick-borne pathogens (Mwamuye *et al*. in review; Omondi *et al.* in review) from a variety of sample types. We are adapting this approach to identify vertebrate DNA sequence of suspect illegal wildlife products to accelerate generation of legally admissible forensic sequencing evidence for prosecuting wildlife trade offenders. To better understand the impact of bushmeat trade and wildlife translocations on zoonotic disease transmission, we will also monitor meat samples for infectious disease agents and for changes in vector blood-feeding patterns, before and after wildlife translocations.

## OBJECTIVES

- Validate and standardise HRM for bushmeat surveillance.
- Build capacity and transfer technology to KWS and TANAPA to enhance surveillance of national and transboundary bushmeat trafficking, and wildlife poaching.
- Investigate vertebrate host feeding patterns of arthropod disease vectors for evaluating disease risks of wildlife translocations.
- Identify potential zoonotic disease transmission risks from handling or consuming bushmeat.

## METHODOLOGY

- Work with KWS and TANAPA to survey meat vendors in the transboundary regions of Kenya and Tanzania.
- HRM profiling of suspect samples and voucher specimens to distinguish bushmeat from livestock and domestic species.
- Build capacity of wildlife agencies to perform HRM.
- Integrate approach with forensic pipelines for prosecuting wildlife trade offenders.
- Train wildlife 1st responders and sensitise policy makers and other stakeholders.
- Investigate effect of wildlife translocation on arthropod vector feeding preferences.
- Identify zoonotic diseases in bushmeat and vector samples.

## IMPACT

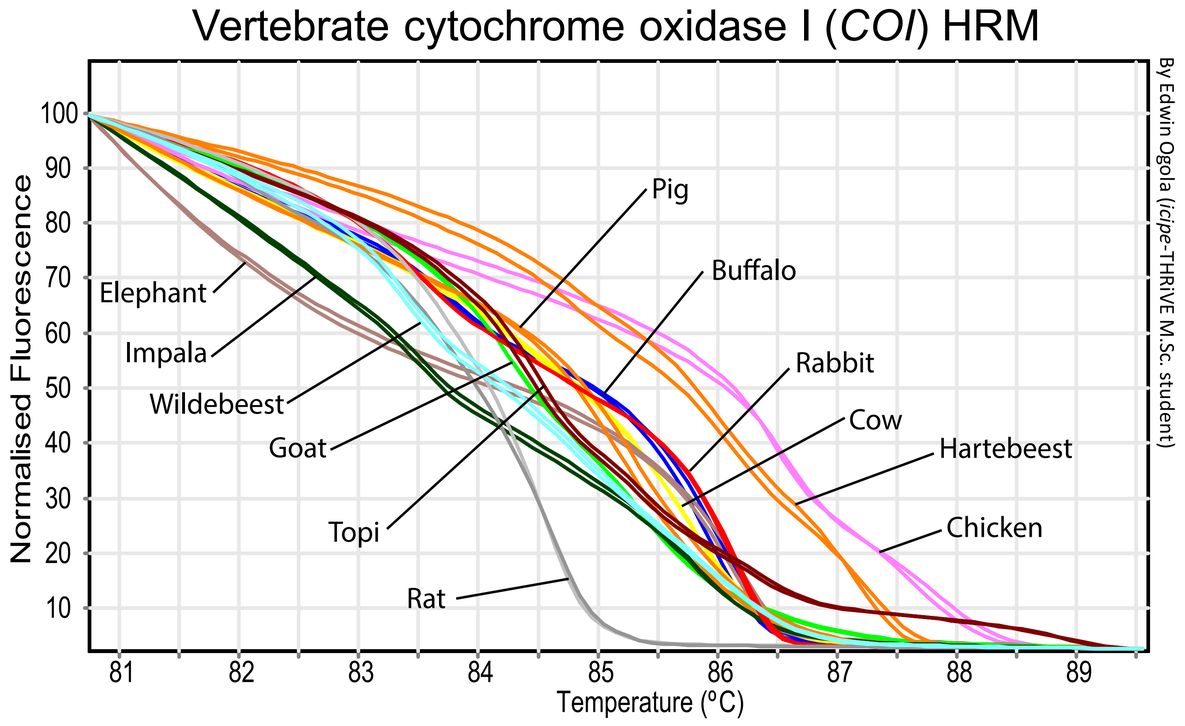

**Outcomes:**

- ✧ Cross-border cooperation, law enforcement, prosecution, and deterrence of illegal wildlife trade will improve.
- ✧ Loss of biodiversity through illegal bushmeat trade will reduce.
- ✧ Disease transmission risks associated with bushmeat handling and consumption will reduce.
- ✧ Better informed wildlife translocation decisions will be made.

**'One Health' impacts**:

- ❖ Economically and ecologically important wildlife diversity in East Africa will be protected.
- ❖ Livestock health will improve, leading to food security.
- ❖ Public health will improve.

## RESULTS




HRM of forensic molecular barcode genes (*COI*) can expand the diversity of species that we can identify. HRM typing of cytochrome oxidase *b* (cytb) and 16S rRNA gene products has been used to identify the different wildlife species (Omondi *et al.* 2015).

## REFERENCES

Mwamuye M.M., Kariuki E., Omondi D., Kabii J., Odongo D., Ouso D., Masiga D. and Villinger J. Novel rickettsia and emergent tick-borne pathogens: A molecular survey of ticks and tick-borne pathogens in Shimba Hills National Reserve, Kenya. (In review @ *Ticks and Tick-Borne Diseases*).

Omondi D., Masiga D.K., Fielding B.C., Kariuki E., Ajamma Y.U., Ouso D. and Villinger J. Molecular detection of tick-borne pathogens along the shores and adjacent islands of Lakes Baringo and Victoria, Kenya. (In review @ *Parasites & Vectors*).

Omondi D., Masiga D.K., Ajamma Y.U., Fielding B.C., Njoroge L. and Villinger J. (2015) Unraveling host–vector–arbovirus interactions by two-gene high resolution melting mosquito bloodmeal analysis in a Kenyan wildlife–livestock interface. *PLoS ONE* 10, e0134375.

Villinger J., Mbaya M.K., Ouso D.O., Kipanga P.N. and Masiga D.K. Discovery of a new clade of *Anopheles* specific flaviviruses and the first Wesselsbron virus in Kenya by novel pan-arbovirus multiplex high resolution melting analysis. (In revision @ *Molecular Ecology Resources*).

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