

**A One Health approach to understanding
Campylobacter and non-typhoidal
Salmonella in the livestock and poultry
meat pathways in Kilimanjaro and Arusha
Regions, Tanzania, 2015-2017**



Kate Thomas, PhD
Centre for International Health,
University of Otago

Outline

- Introduction to *Campylobacter* and *Salmonella*
- Background
- Meat pathways stages
- Field methods and bacteriology
- Results to date
- Remaining research on this project



Campylobacter* and *Salmonella

- **Important causes of diarrhoea - contracted by humans through faecally contaminated food and water**
 - Human: typhoidal *Salmonella*
 - Animal: non-typhoidal *Salmonella*
 - Human and animal: *Campylobacter*
- **Healthy animals are carriers of these pathogens**
- **Annual estimated global burden of human foodborne illness attributed to:**
 - *Campylobacter* = 96M cases and 21,000 deaths
 - Non-typhoidal *Salmonella* = 78M cases and ~60,000 deaths

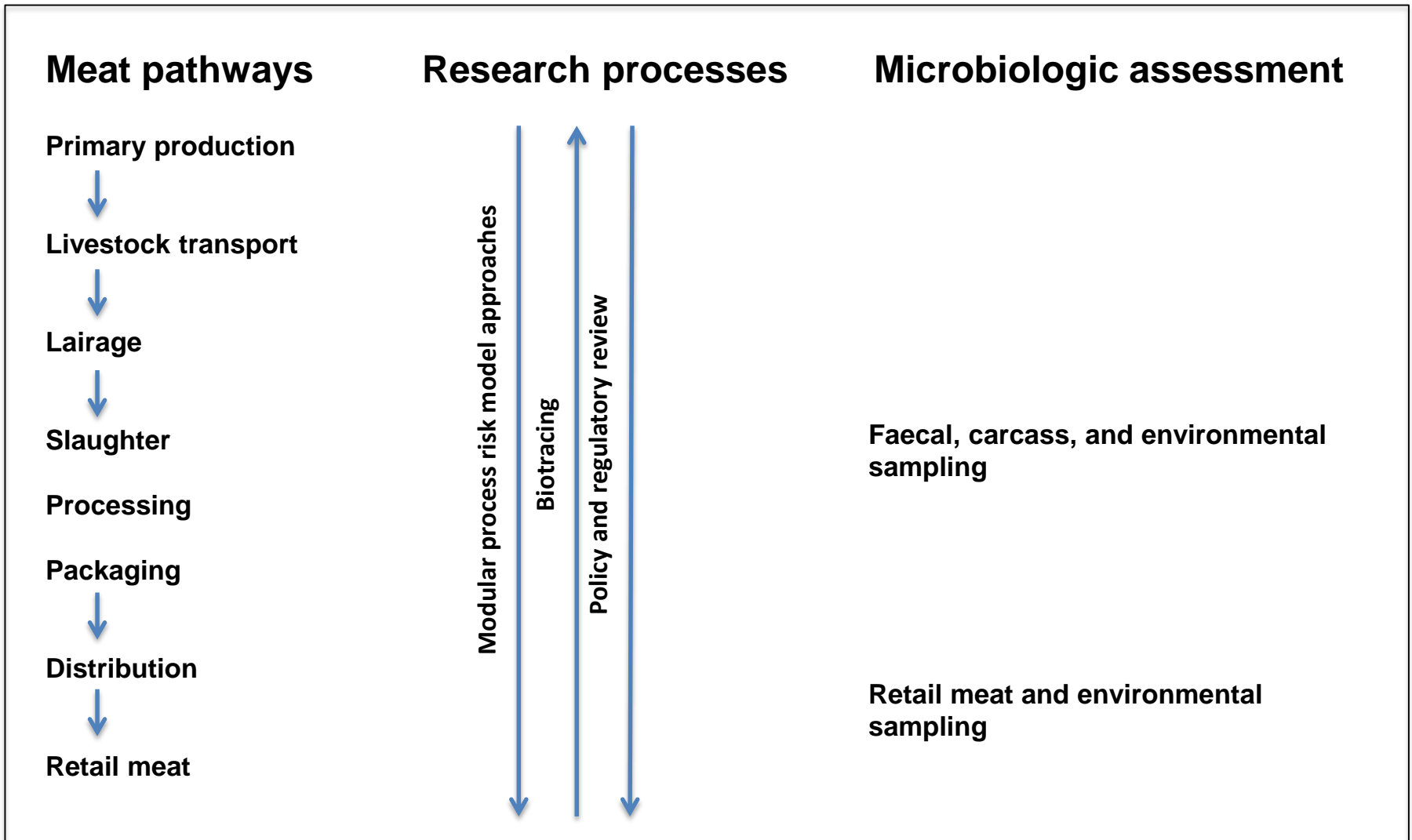
Background

- **WHO has identified northern Tanzania as a high risk area for zoonotic enteric pathogens due to the high density of livestock**
- **Animal carcasses are contaminated with animal faeces during slaughter**
- ***Salmonella enterica* var. Typhimurium ST313 is an important cause of bacteremia in humans**
 - **Endemic to sub-Saharan Africa**
 - **No known reservoir**

Background

- **As the Tanzanian population expands, meat supply chains are adapting**
 - **Movement from rural to urban**
 - **Larger throughput slaughter facilities**
 - **Higher demands on water resources**
- **Our aim is to use a One Health approach to understand emerging livestock and poultry meat pathways in Tanzania**

Meat pathways, Research processes and Microbiologic assessments from Primary Production to Retail Meat for HAZEL project (2015-2017)



Meat pathways

On farm



At slaughter



Retail



Research processes

- **Modular Risk Process Model (MRPM)**
 - Meat pathway steps
 - Transmission
 - Cross contamination
 - Growth or inactivation
- **Biotracing**
 - Investigating a source of contamination
 - Epidemiology
- **Policy and regulatory review**
 - Working with the Tanzanian Ministry of Agriculture Livestock and Fisheries

Modular process risk model approaches

Biotracing

Policy and regulatory review

Field Methods and Bacteriology

- **Sample types collected:**
 - Cloacal swabs from live chickens on farm
 - Faeces and carcass swabs from cattle and goats at slaughter
 - Meat from cattle and goats from butchers
 - Environmental samples (at slaughter, retail, and on farm)
- **Laboratory testing:**
 - Modified Food and Drug Administration – Bacteriological Analytical Manual (FDA-BAM) methods for culture
 - Phenotypic, biochemical, and serologic confirmation

Campylobacter and *Salmonella* prevalence in Cattle, Goat and Poultry samples from Arusha and Kilimanjaro Regions, Tanzania, 2015-2017

	<i>Campylobacter</i> n/n (%)			<i>Salmonella</i> n/n (%)			
	Faeces/ Cloaca	Carcass	Meat	Faeces/ Cloaca	Carcass	Meat	Environ
Cattle	0/65 (0)	0/26 (0)	0/72 (0)	4/335 (1.2)	5/269 (1.9)	50/460 (10.9)	30/226 (13.3)
Goat	0/56 (0)	0/16 (0)	1/36 (2.8)	8/233 (3.4)	6/183 (3.3)	20/207 (9.7)	
Poultry	50/649 (7.7)	n/a	n/a	21/785 (2.7)	n/a	n/a	13/80 (16.3)
TOTAL	50/770 (6.5)	0/42 (0)	1/108 (0.9)	33/1353 (2.7)	11/452 (2.4)	70/667 (10.5)	43/306 (14.1)

Summary of results to date

- ***Salmonella***
 - Low prevalence at slaughter for cattle and goats
 - Low prevalence on farm for poultry
 - Significantly higher in red meat and environmental samples ($p < 0.05$)
- ***Campylobacter***
 - Low prevalence in red meat chain
 - More than twice the prevalence in poultry compared with *Salmonella*
- Our results indicate that the environment on farm, at slaughter, and retail plays an important role in the contamination of meat for sale

Remaining research on this project

- **Further characterisation of *Salmonella* and *Campylobacter* isolates recovered**
 - Typing of isolates
 - Whole Genome Sequencing
- **Provide recommendations for food safety policy and regulations in the meat chain**
- **Ultimately to improve health and wellbeing of Tanzanians**

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Project partners



University of Otago, NZ

John Crump, MB ChB, MD, FRACP, FRCP,
FRCPA, DTM&H



Massey University, NZ

Jackie Benschop, BVSc, MANZCVSc, PhD
Nigel French, BVSc, MSc, PhD, DipECVPH
Gerard Prinsen, MA, PhD
Anne Midwinter, BSc, MSc (Hons), PhD
Matthew Knox, BSc, MSc, PhD

MASSEY
UNIVERSITY



University of Glasgow, UK

Ruth Zadoks, BSc, MVRes, DVM, PhD
Jo Sharp, BA, MA, PhD
Sarah Cleaveland, OBE, BSc, BA, VetMB,
MRCVS, FRSE



Quadram Institute, UK

Gary Barker, BSc, PhD



Kilimanjaro Clinical
Research Institute, TZ

Blandina Mmbaga, MD, MMed, PhD



Nelson Mandela African Institute
of Science and Technology, TZ

Joram Buza, DVM, PhD



Sokoine University of Agriculture,
TZ

Rudovick Kazwala, BVSc, MVM, PhD



Tanzanian Ministry of Agriculture,
Livestock & Fisheries, TZ

Niwael Mtui, BVSc, MVSc, PhD
Emmanuel Swai, BVM, PhD



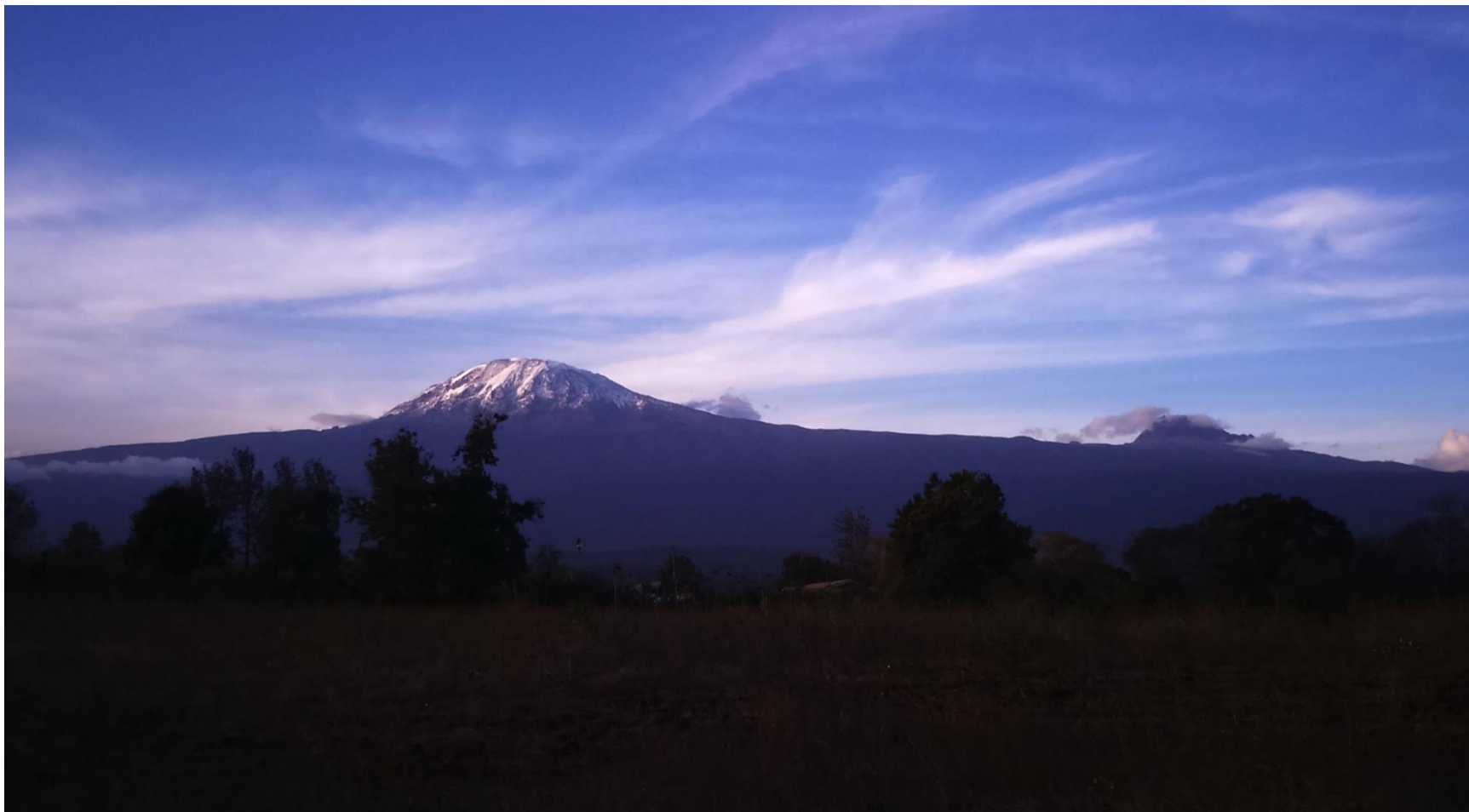
Washington State University, USA

Margaret Davis, BSc, DVM, MPH, PhD

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Karibuni sana Tanzania!

<http://livestocklivelihoodsandhealth.org>

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