

AMR transmission from the outdoor environment to humans in Bangladesh

An interdisciplinary approach

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- Developing an interdisciplinary proposal
- Learning from the interdisciplinary collaboration
- Future opportunities

Biological anthropology: broad, holistic?

Socio-economic,
environmental, biocultural
influences

Communicable & non-communicable
disease

Evolution

Adaptation

Behaviour



Tackling Antimicrobial Resistance: An Interdisciplinary Approach



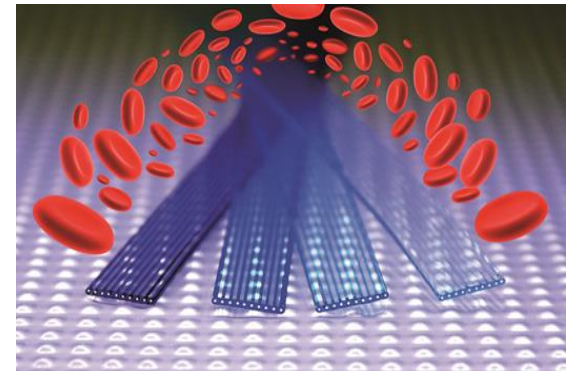
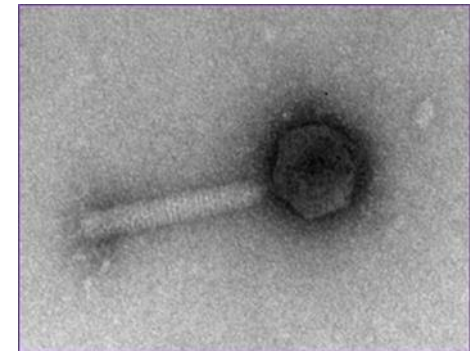
EPSRC Interdisciplinary network grant - Bridging the Gaps in AMR
Loughborough University

Principal investigator: Danish Malik, Chemical Engineering

Co-investigators:

- John Ward, Mathematics
- Marc Kimber, Chemistry
- Sourav Ghosh, Bioengineering
- Emily Rousham, Human Sciences

Clinical and Industrial partners: Smith & Nephew,
ABHI, University Hospitals of Leicester NHS Trust,
The Royal Wolverhampton NHS Trust.

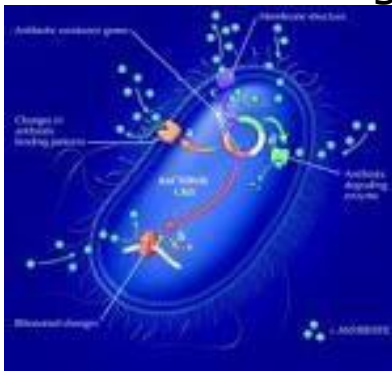


Images: Reis, Malik

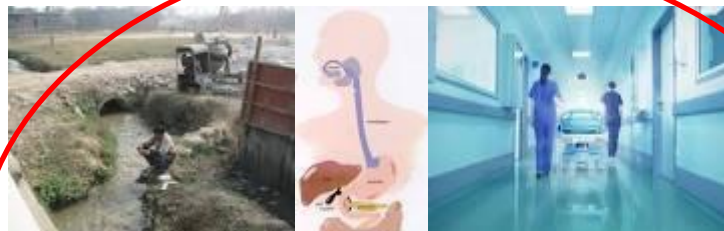
AMR Cross Council Initiative

a thematic approach to funding calls

Theme 1: Understanding resistant bacteria



Theme 2: Accelerating therapeutic and diagnostic development



Theme 3: Understanding real world interactions



Theme 4: Behaviour within and beyond the health care setting

Antibiotic resistance in the environment

Antibiotics enter the environment and act as selective agents via

- wastewater
- pharmaceutical products
- agricultural run off
- solid waste

J Antimicrob Chemother 2014; **69**: 1785–1791
doi:10.1093/jac/dku079 Advance Access publication 5 May 2014

**Journal of
Antimicrobial
Chemotherapy**

Waste water effluent contributes to the dissemination of CTX-M-15 in the natural environment

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Knowledge Spa, Royal Cornwall Hospital, Truro, UK.

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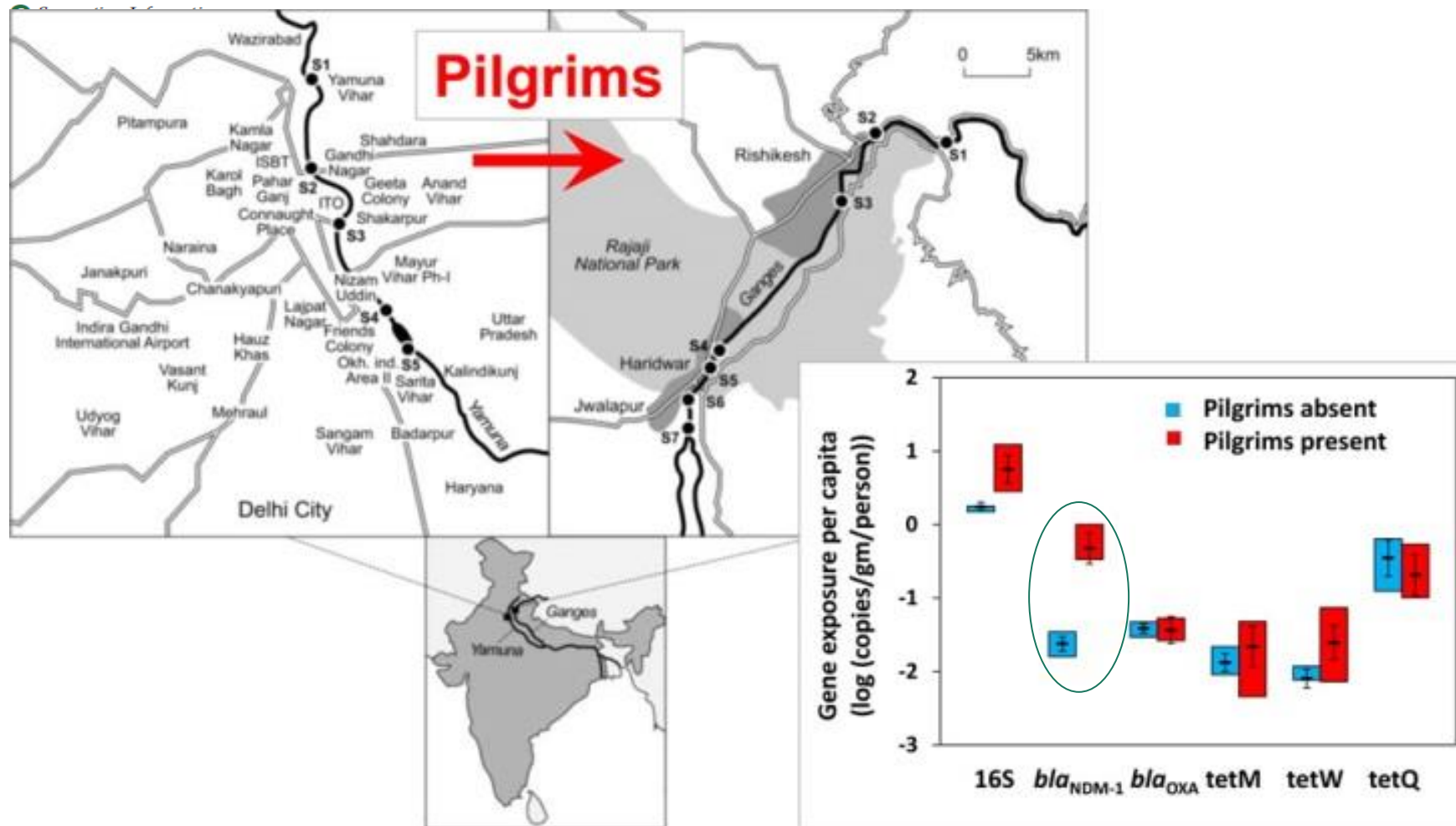
Increased Waterborne *bla*_{NDM-1} Resistance Gene Abundances Associated with Seasonal Human Pilgrimages to the Upper Ganges River

Z. S. Ahammad,^{†,‡} T. R. Sreekrishnan,[‡] C. L. Hands,[†] C. W. Knapp,[§] and D. W. Graham^{*,†}

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Spatial and temporal dynamics of AMR transmission from the outdoor environment to humans in Bangladesh

Physical geography

Paul Wood, Geography
Loughborough

Public health engineering

Mike Smith, Water
Engineering & Development
Centre, Loughborough

Microbiology

Aminul Islam, Food and
Enteric Laboratory, icddr,
Bangladesh

Public Health

Leanne Unicomb,
Environmental Intervention
Unit, icddr, Bangladesh

Biological anthropology

Emily Rousham, Centre for
Global Health and Human
Development, Loughborough

Social Anthropology

Bangladesh



- Population 156 million
- Population density 1,100 people per km²
- NDM-1 genes present in clinical samples since 2008
- Multi-drug resistant *E. coli* widespread in public water supply in Dhaka



Objectives

- **Spatial and temporal variation** in AMR bacteria and AMR genes
- **Selective drivers** in three outdoor environments
- **Human exposure**
- **Ethnography** – custom and practice around poultry raising



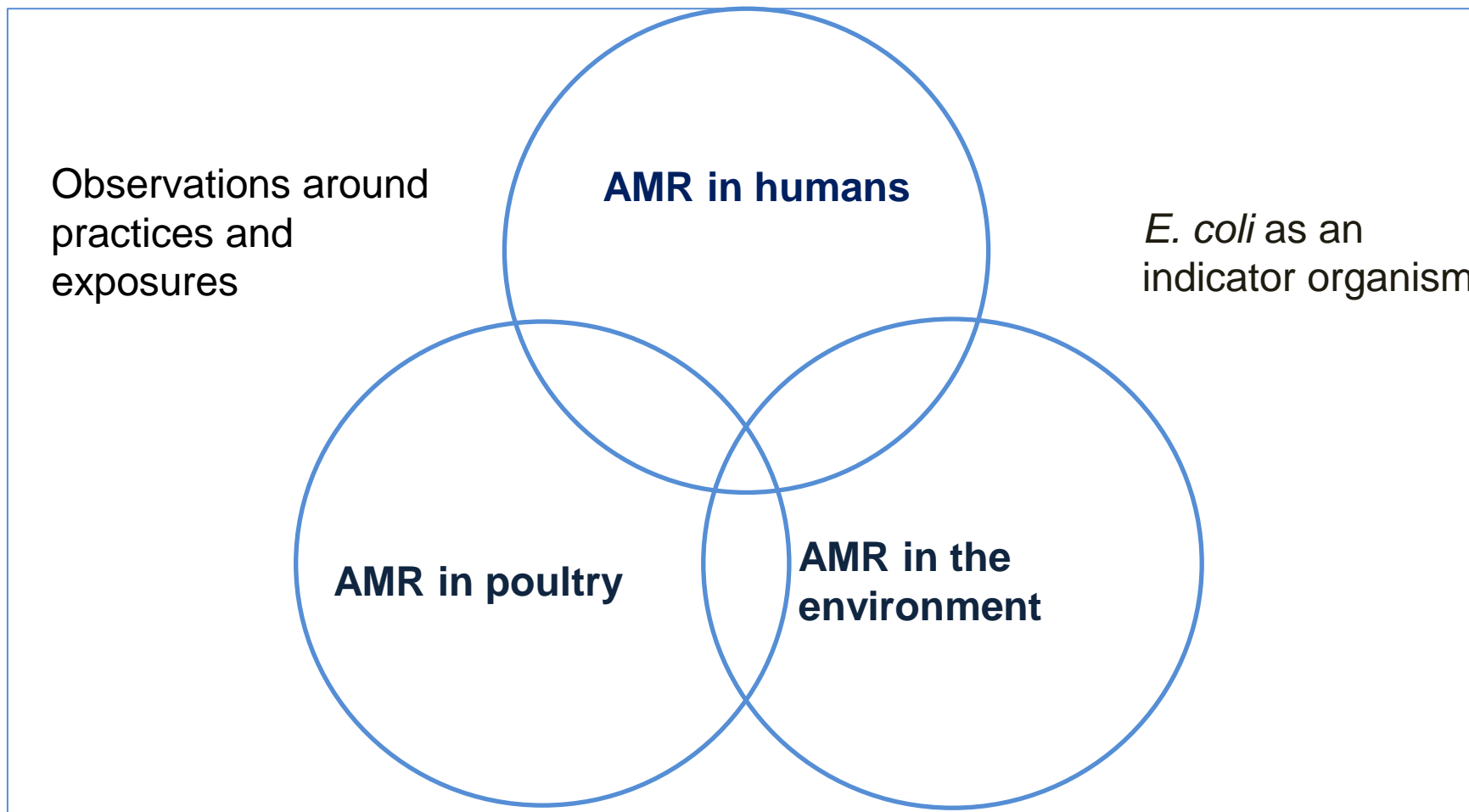
Small scale commercial poultry farms



Backyard poultry keeping



Integrating pathways of AMR transmission in three outdoor environments



Work in progress



What have we learned?

Excreta flow diagrams (SFDs) a tool to visualise how excreta physically flows through a city or town

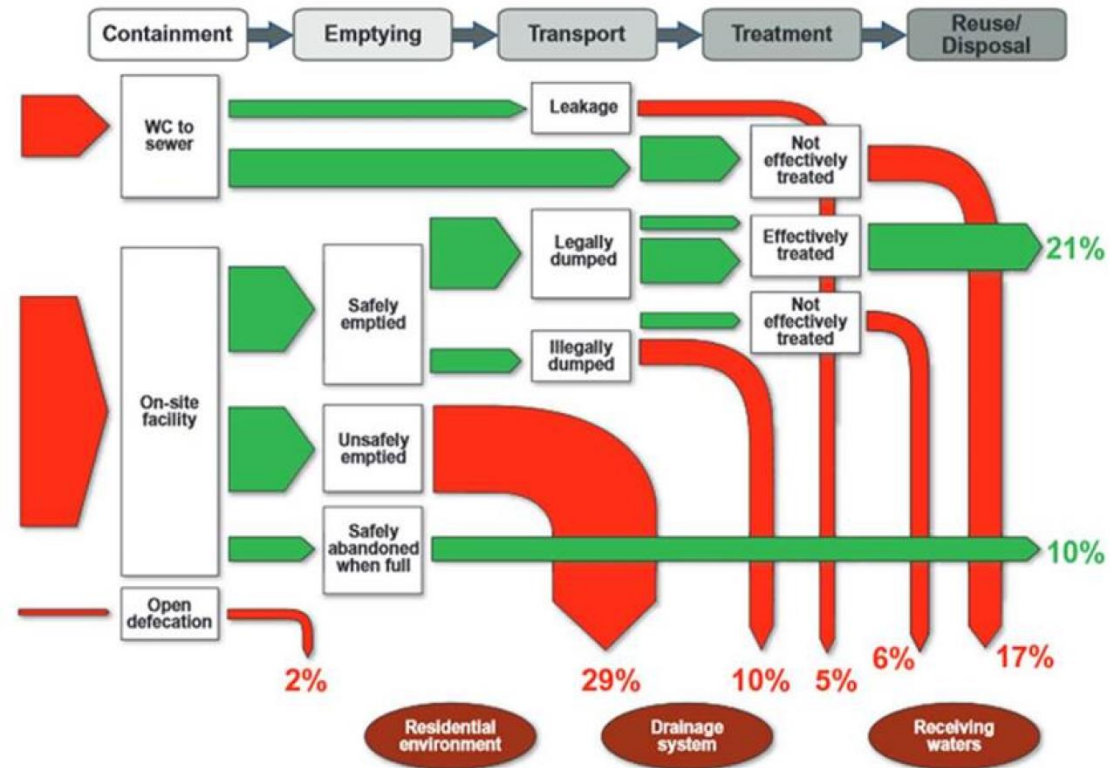
Interdisciplinary Facilitators

Field based approaches

Breadth versus depth

Strong international partners

Moving beyond comfort zones



Source: <http://sfd.susana.org/>



Theme 4: Pathways of antibiotic use in human and animals in Bangladesh

Over-the-counter antibiotics

- 100,000 licensed pharmacies
- A further 100,000 unlicensed pharmacies (SIAPS, 2015)

A One Health approach

ONE HEALTH



The One Health concept recognizes the interrelationship between animal, human and environmental health.

Future needs: mitigating strategies

6 CLEAN WATER
AND SANITATION



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