

# Novel lateral flow techniques to detect antimicrobial residues from chicken feathers



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## TAKE HOME MESSAGE

Large quantities of antimicrobials are detected at the surface level on chicken feathers in South and Southeast Asia causing concern for global health with exposure to these drugs leading to antimicrobial resistance genes amongst pathogens within livestock and potential spillover into humans.

## INTRODUCTION

The use of antimicrobial drugs (AMDs) within poultry production has been a topic of concern over recent years due to their impact on **Global One Health**.

### GLOBAL ONE HEALTH:

Combining human, animal, plants, and environmental health to achieve optimum health for people worldwide.

Increased use of and exposure to AMDs within the poultry setting can lead to the rise of AMD resistant genes.

Quantifying the use of these drugs can be challenging especially where national databases do not require it and some drugs might be hidden in production of feed for example.

## OBJECTIVES

- To adapt novel antimicrobial residue detection techniques using lateral flow analysis for poultry feather samples
- To understand similarities/differences in AMD residues from Gujarat and Vietnam
- To compare AMD residues from different time points in the production cycle (farm, slaughterhouse, and market)

## METHODS

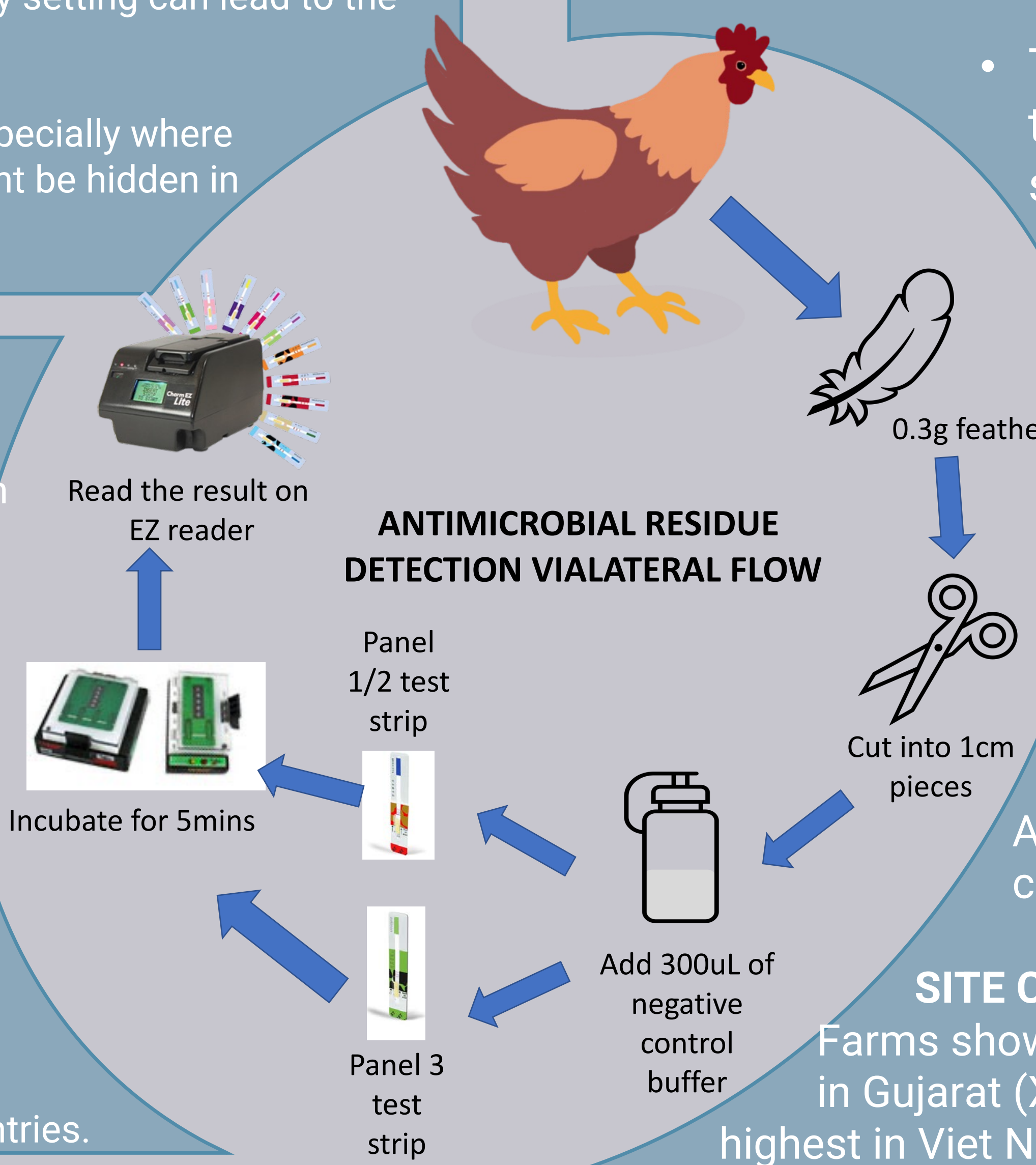
148 poultry feather samples from Gujarat (Aug '21–March '22) and 68 from Vietnam (March '21 – Jan '22) were collected from farms, slaughterhouses and markets.

The feathers were cut and soaked in buffer to extract any AMDs present on their surface.

The buffer/AMD residue mix was run through the 3 different panel strips (Charm Science Inc. figure 1)

- Panel 1** – Sulfonamides, tetracyclines, quinolones, beta-lactams
- Panel 2** – Macrolides (not finalised here)
- Panel 3** – Aminoglycosides

Results were compared across country and between countries.



## RESULTS

79% of birds in Vietnam showed residues for sulfonamides compared to 29% in India (figure 2; X<sup>2</sup>-test: p<0.001).

Quinolones were the second most frequently detected in Gujarat and Vietnam.

Aminoglycosides were rarely detected in both countries (14%: Vietnam, 9%: India).

### SITE COMPARISON

Farms showed higher proportion of residues than shops in Gujarat (X<sup>2</sup>-test: p=0.014), whereas market was the highest in Viet Nam (X<sup>2</sup>-test: p=0.031).

When two birds were sampled from the same farm, their results were likely to show the same residue profile (72.2%: 13/18) for panel 1.

LCMS (liquid chromatography mass spectrometry) analysis confirmed the presence of AMD detected by lateral flow (n=13).

## LATERAL FLOW TECHNIQUE (ROSA)

Feather sample with residue

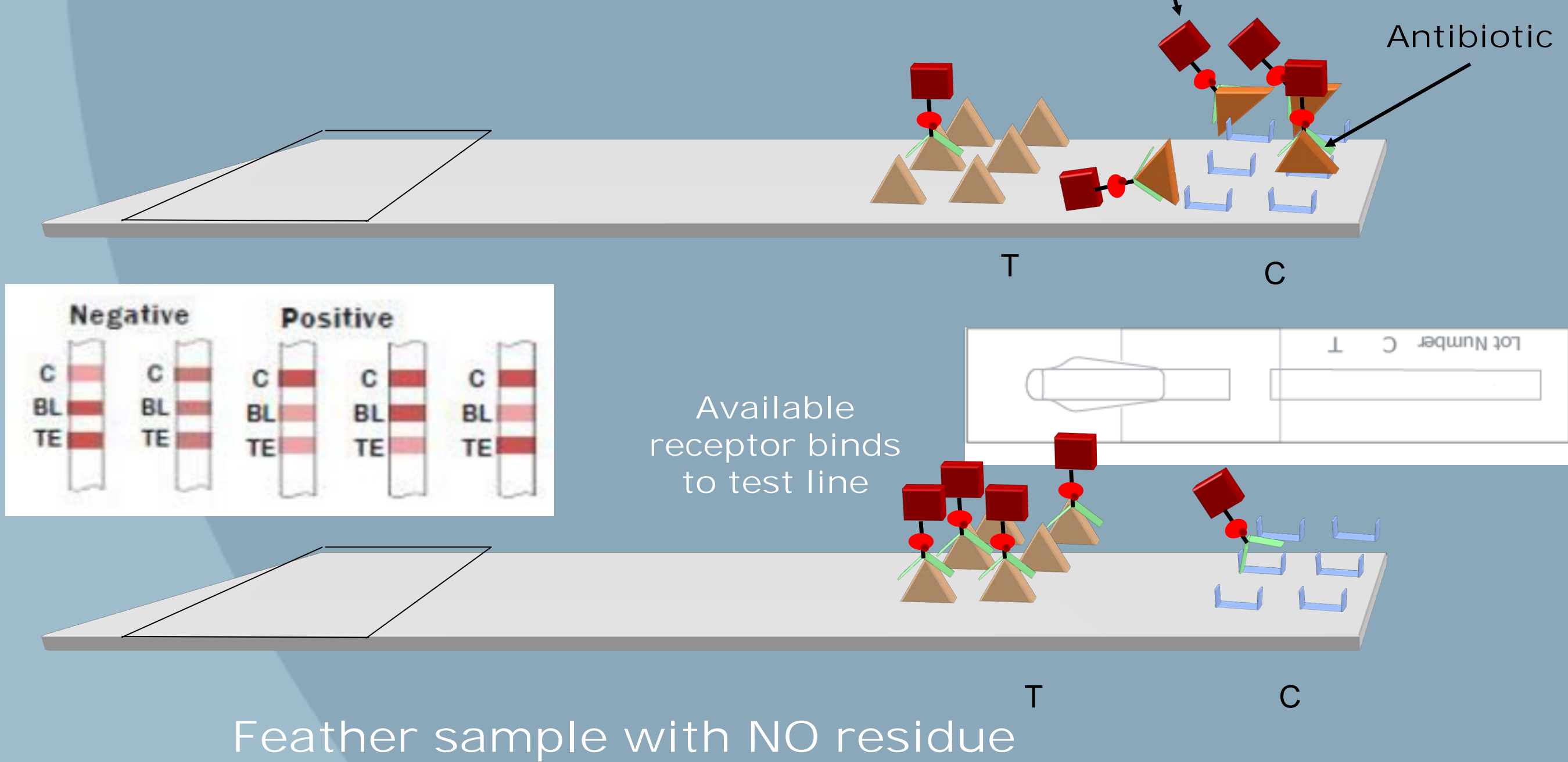


Figure 1. The lateral flow technique with the antibiotic binding and inhibiting the receptor with the residue, or lack of antibiotic binds the receptor to the test line.

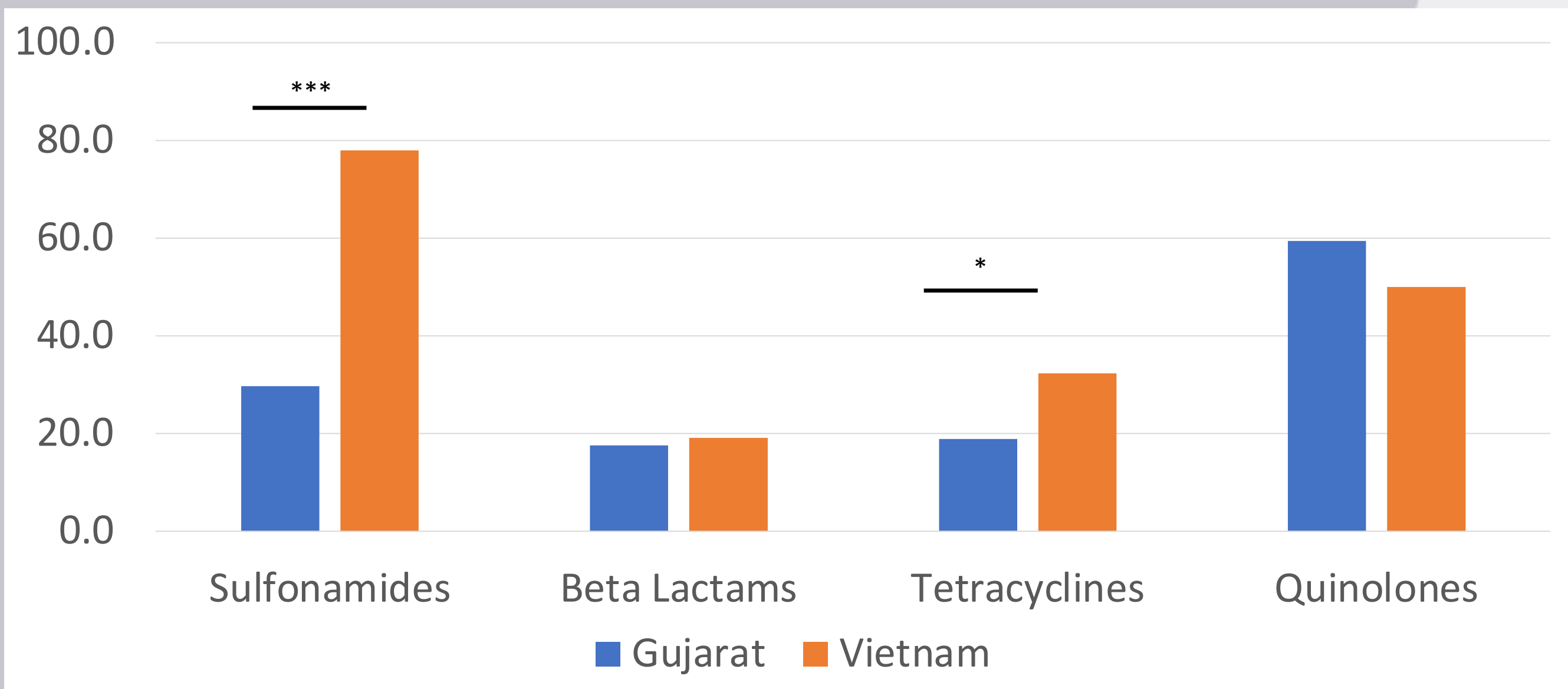


Figure 2. The percentage of each antimicrobial class for panel 1 analysis Gujarat (blue) and Vietnam (orange). Chi-squared-test - \* p<0.05, \*\*\* p<0.001

## DISCUSSION

- High levels of AMD residues;
  - Sulfonamides (Vietnam) and Quinolones (Vietnam and Gujarat).
- Feathers act as a method of detection for historical AMD use compared to meat where residues are likely to have been removed and safe to eat (i.e < Minimum Residue Limit MRL).
- Exposure to AMDs has the potential to increase prevalence of resistance genes in the gut microbiome.

- Implication for human health as spillover of resistance genes.
- The use of ground up feathers in animal feed will further increase livestock exposure to AMDs.
- **FURTHER WORK:** Bangladesh broilers from farms and markets Comparison with declaration and LCMS data



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