Environmental dimension of Antimicrobial Resistance (AMR)

Occurrence and Spatial diversity of airborne resistomes in the poultry and household environment in Bangladesh

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ABSTRACT:

Background
Antimicrobial resistance (AMR) is an alarming issue with environmental evolution and transmission to a larger extent. We studied whether the outdoor environment (air) in Bangladesh acts as a reservoir for bacteria that can confer resistance to antibiotics with spatial diversity.

Methods
We collected air samples during January to July 2018 from both urban and rural settings in four distinct outdoor environments- i) Urban live bird markets(LBM) ii) Urban residential area(URA) iii) Commercial poultry farms (CPF) and iv) Rural households (RHH). We used standard plates and media supplemented with 3rd generation cephalosporin (3GC), carbapenem, oxacillin and vancomycin to obtain the gram negative resistant organisms, both 3GC resistant (3GCr) and carbapenem resistant Enterobacteriaceae (CRE) as well as gram positive resistant organisms like Methicillin (Oxacillin) resistant Staphylococci (MRS) and Vancomycin resistant Enterococci (VRE) respectively.

Results
All types of resistant organisms were present in each of the study sites. We found the presence of 3GCr, CRE, MRS and VRE in 85\%, 60\%, 100\% and 80\% air samples respectively. Considering sampling sites, 3GCr, CRE and MRS were found highest in the air samples obtained from the environment of commercial poultry farms and VRE was present higher in the live bird markets. The alarming finding is the presence of resistant organisms like MRS, VRE and 3GCr in urban residential area with high frequency (>90\%) whereas the rural household were heavily burdened with 3GCr and MRS (60-100\%).

Conclusion
The presence of airborne resistomes highlights the importance of intervention in outdoor environments which act as both reservoir and medium of spread of resistance.