

The War on Many Fronts—The Role of a One Health Approach in Antimicrobial Resistance Surveillance

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Introduction

Antimicrobial Resistance (AMR) is the process whereby a microorganism (i.e. bacteria) develops resistance to an antimicrobial drug (i.e. an antibiotic) which previously had an effect.

Antimicrobial resistance is not a new problem; bacteria developed resistance to antibiotics almost simultaneously on the advent of discovery of antibiotics.

Antibiotic resistance is a global issue, affecting us all. With the ever-increasing problem of resistance to antimicrobials, together with the lack of research into new antibiotics, we are facing a new era where infections are no longer responding to commonly prescribed antibiotics.

Current antimicrobial resistance programs (AMR) focus on antibiotics used in hospitals and community health, as well as antibiotics used for:

- ❖ animal health,
- ❖ prophylaxis for companion and livestock animals,
- ❖ growth promoters in poultry and in the environment.



Results

Antimicrobial resistance is not a new issue, almost from the time of inception of antibiotic drugs, bacteria have developed complex ways to overcome their effects. Bacteria spread genes for resistance to each other, through complex mechanisms : plasmids, bacteriophages, naked DNA (transposons).

Naked DNA releases and transfers to other microorganisms increasing the number of bacteria resistant to antimicrobials.

Resistance is spread when antibiotics used as medicine in animals and humans are excreted into the environment, through faeces and urine; not yet fully metabolised, and accumulates into waste water and soil from agricultural use.

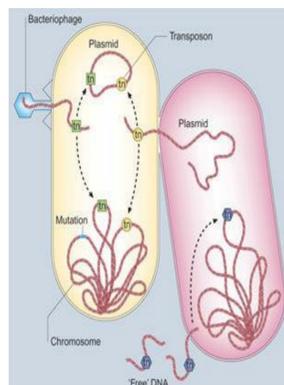


Diagram adapted from Box 3 (Levy & Marshall, 2004)

Conclusions

To understand how we can tackle the scope of these issues and complex resistance mechanism of bacteria that leads to resistance, we need to adopt the One Health concept, encompassing human, animal and environmental Health.

Recommendations:

- Agreed laboratory isolates for comparison and benchmarking internationally.
- Same data collection databases for animals and humans
- Increase public knowledge of intensive animal farming and impact of demand for over supply of cheap meat.
- Public education programs about 'farm to fork' processing.
- Preserving certain antibiotics of "critical importance" and restricting access /prescribing.



"Between Animal and human medicine, there is no dividing line nor should there be. The objective is different but the experience obtained constitutes the basis of all medicine".

Rudolf Virchow (cited by Choffnes, Relman, & Olsen),.

Aim

This poster illustrates findings from a review of current literature on antimicrobial resistance programs, how AMR is currently monitored and recorded in Australia and internationally and summarising gaps in these programs.

This poster highlights how an expanded One Health AMR Surveillance approach could be implemented to address the global issue of AMR.



Results

Overuse of antibiotics is driven from human patient demand, antibiotics also used widely for animal health.

Demand for increased meat production and consumption in developed countries, drives increase in intensive farming and overcrowding of animals – leading to increased sickness and higher demand for prophylactic antibiotic fed to animals over extended periods of time.



There is increasing global recognition of the impending crisis of AMR resistance and its impacts on the health of all nations. Many Lower and Middle Income Countries (LMIC) looking at what steps they can and should take to monitor and control and minimise the rate of resistance. funding and resources be needed to implement surveillance systems.

Multidrug resistant bacteria have already been detected in enteric bacteria: Escherichia coli, Shigella and Salmonella and Neisseria gonorrhoea and Haemophilus influenzae.

AMR management is difficult to attain as resistance is not one defined condition, but rather a group of problems, whereby diverse pathogens transmit different resistance mechanisms in individual ways and expressed in many syndromes.

Surveillance often fragmented and measuring different microorganisms and different animal species; difficult to benchmark and compare even nationally.

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Method

Online searches were conducted using James Cook University (JCU) 'One Search' database, Elsevier, Clinical Information Access Portal (CIAP), using the search terms: 'antimicrobial resistance', 'antimicrobial resistance and one health', 'antimicrobial resistance and surveillance', 'AMR and food production', 'AMR and surveillance in animals.

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