Why the health and agriculture sectors need to work together to stop antibiotic resistance

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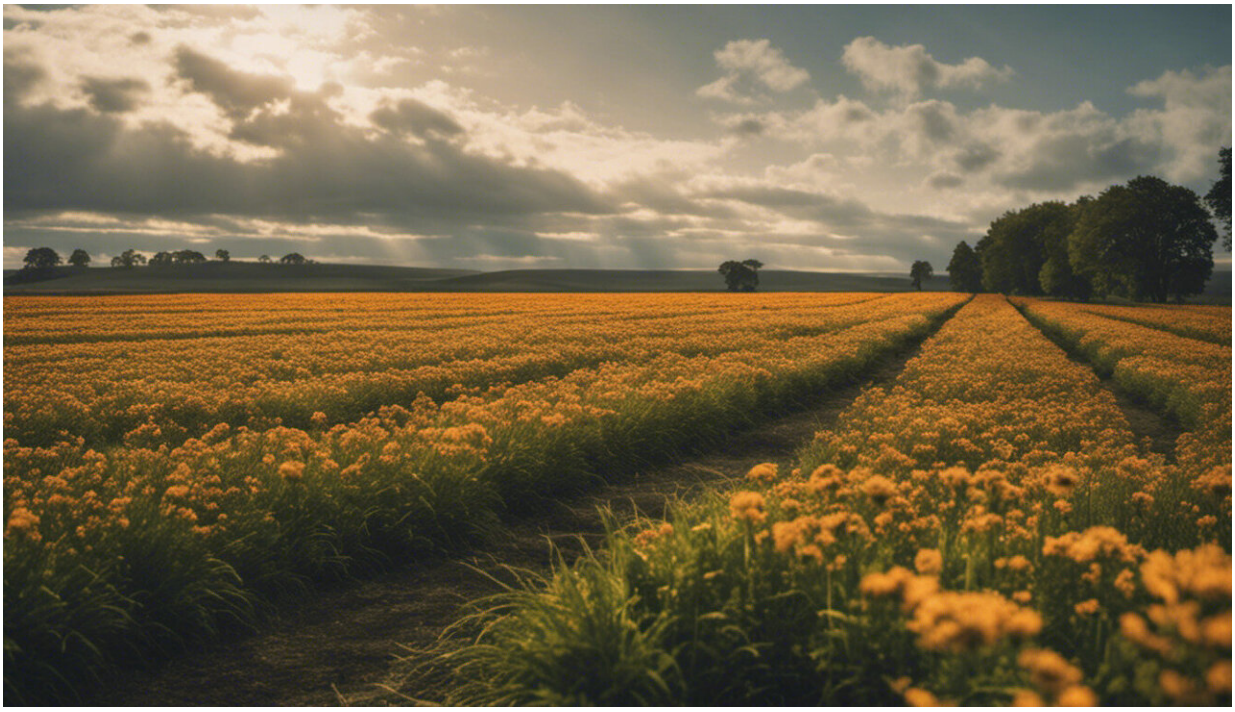

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The Australian federal government recently announced a national plan to tackle antimicrobial resistance with an approach encompassing the health and agriculture sectors.

Antimicrobial resistance occurs when microorganisms (bacteria, viruses, fungi or protozoans) evolve to survive exposure to antimicrobials. Antibiotic resistance and so-called "superbugs" relate to bacteria and most frequently make the headlines, but antimicrobial resistance includes resistance to all antimicrobial agents, and not just those used in medicine.

The plan to deal with antimicrobial resistance, which has been described as one of the major threats to population health in the 21st century, was a joint initiative between health and agriculture ministers. They referred to this marriage as "one health".

It's not just the health sector that's responsible

We need to recognise human, animal and environmental health are linked. Optimal human health depends on good health in the other two sectors.

Recent human diseases, such as swine flu or Middle East respiratory syndrome (or MERS), have originated from animals and are shaped by activities such as land clearing, intensive farming, animal domestication and climate change.

Unveiling the links between human, animal and environmental health provides a comprehensive way to develop effective interventions.

Traditionally, antimicrobial resistance has been viewed as a problem for the medical health sector, whose responsibility it is to address it.

Problems have included inappropriate and over-prescribing of antibiotics, both in hospital, and by GPs.

However, if we view and treat antimicrobial resistance solely as a

medical health problem, we neglect behavioural, environmental, agricultural, economic and social contributions.

Overuse of antimicrobials in both animals and humans contributes to antimicrobial resistance.

In farm animals, one concern internationally has been the over-use of antibiotics as "growth promoters" or to prevent illness rather than just to treat sick animals.

Every time an antimicrobial is used, resistant microorganisms preferentially grow and replace sensitive ones. Resistant microorganisms or resistance genes that arise in agricultural or domesticated animals can easily spread to, and among, other humans and animals.

Inadequately treated waste streams from households, hospitals and farms using antimicrobials release antimicrobials into the environment. This may encourage growth of resistant microorganisms. These waste streams can also release resistance genes and resistant microorganisms into the environment, where they can act as reservoirs for genetic exchange and further development of resistance.

Resistant microorganisms and resistance genes can potentially be geographically spread, and later reintroduced into animals and humans via agricultural activities and the food chain.

So interventions need to target antimicrobial use in humans and animals, as well as control the spread of resistant bacteria and resistance genes through improved waste treatment. Interventions in one sector may not improve the overall problem if any one intervention is offset by counterproductive practices in any other.

Globalisation complicates this even further. Interventions in one country

may have a benefit, but be of limited value, if not taken up by other countries. This is why a global approach to antimicrobial resistance is so important.

Challenges to a unified approach

To implement the "one health" approach, we need collaborations between disciplines and across sectors. However, these collaborations are not always easy. Researchers are often entrenched in their disciplinary silos.

Researchers must have opportunities to talk to those outside their speciality, be open to new ideas, and make efforts to understand each other's discipline-specific language. Interdisciplinary university courses play an important part in creating future leaders who can move easily between disciplines.

Funding bodies must also catch up; interdisciplinary grant applications are often reviewed by discipline-specific panels resulting in higher failure rates. This actively disincentivises research across disciplines.

Effective collaboration between life and environmental sciences, social sciences, and policy makers will be crucial for implementing successful evidence-based policy. Policy that has not been developed in consultation with affected stakeholders will most likely fail. The social sciences are important partners in identifying the facilitators and barriers to changing behaviour that can help guide policy.

In all sectors, stakeholders must be made aware of how their decisions impact other stakeholders. Finally, policy must respect the goals of stakeholders in each sector to encourage long-term change.