

Explaining the complex interaction of factors associated with humans, animals, plants, food and the environment – to be used with Figure 1 of the *Introducing a One Health approach to AMR* module

A	<p>Important drivers of AMR in people are:</p> <ul style="list-style-type: none"> • incorrect and/or prolonged use of antimicrobials for clinical treatment, plus uncontrolled public access to antimicrobials • poor hygiene in hospitals, inadequate sewage and water treatment, and poor hygiene in the community • people travelling overseas acquiring resistant bacteria and genes that are subsequently transmitted when they return to their own country.
B	<p>Hospital-acquired infections (HAIs) occur through the spread of ARB and/or ARGs to people in hospitals. This may include transmission between patients and/or staff either directly or through equipment and materials. It is generally associated with poor infection prevention and control practices.</p>
C	<p>Community-acquired infections (CAIs) occur through the transmission of ARB and/or ARGs in community settings – that is, outside of hospital settings. Direct human-to-human transmission (C) may occur as a result of poor personal hygiene, such as inadequate handwashing.</p>
D	<p>Important drivers of AMR in animals associated with clinical treatment of pets and livestock are:</p> <ul style="list-style-type: none"> • incorrect and/or prolonged use of antimicrobials to treat sick animals, plus uncontrolled public and farmer access to antimicrobials • poor hygiene in veterinary clinics, and poor biosecurity and hygiene on farms.
E	<p>ARB and/or ARGs may be transmitted from sick pets or livestock to their owners or livestock managers through contact and poor hygiene, such as inadequate handwashing. Transmission of ARB and/or ARGs from humans may cause illness in animals as a result of contact and poor hygiene.</p>
F	<p>ARB and/or ARGs may spread among pets within veterinary clinics or boarding kennels associated with poor hygiene.</p>
G	<p>ARB and/or ARGs may spread among livestock through overcrowding, poor disease control and hygiene within farm environments.</p>

H	<p>Important drivers of AMR in farmed animals and aquatic species are:</p> <ul style="list-style-type: none"> • prolonged administration of sub-therapeutic levels of antimicrobials to enhance growth and productivity, most commonly in intensively farmed animals such as pigs, poultry and aquatic species • administration of therapeutic doses of antimicrobials to groups of animals to prevent clinical disease (prophylaxis) or to prevent spread of clinical disease if some animals in the group show symptoms (metaphylaxis) – this is to reduce chances of the remaining animals becoming ill, and is most common in intensively raised pigs, poultry, feedlot calves and aquatic species • poor biosecurity, poor hygiene and overcrowding, which can contribute to the transmission of AMR within and between farms • the international trade of animals, which can contribute to ARB and/or ARGs being imported, and movement of animals within a country contributes to local spread.
I	<p>Poor biosecurity, poor hygiene and overcrowding of animals can contribute to the transmission of AMR within farms.</p>
J	<p>Poor biosecurity, poor hygiene and overcrowding of aquatic species can contribute to the transmission of AMR within farms.</p>
K	<p>ARB and/or ARGs may be transmitted from livestock and aquatic species to people through direct contact in the farm environment, or during transport and processing.</p>
L	<p>Drivers for AMR in fruit and vegetable crops include:</p> <ul style="list-style-type: none"> • repeated use of antimicrobials to treat or prevent bacterial diseases, particularly if administered at sub-therapeutic levels • rain and wind, and poor equipment hygiene, may contribute to the spread of resistant bacteria within and between crop farms/orchards • the trade and movement of plant material and/or equipment can contribute to the transmission of resistance between crop farms/orchards.
M	<p>AMR can spread between plants via wind, rain and unhygienic equipment.</p>
N	<p>ARB and/or ARGs may be carried on the surface of fresh food products, including food animal products (including aquatic species) and fruit, vegetables and grains.</p>
O	<p>Food may also be contaminated with ARB and/or ARGs by people handling food during processing, transport, retail and preparation of meals.</p>
P	<p>People may become infected with ARB and/or ARGs by consuming contaminated food.</p>
Q	<p>People excrete resistant bacteria in their faeces or urine. These bacteria enter waterways and drinking water sources through poorly maintained sewage systems and inadequate sewage treatment. Inadequate treatment of hospital waste may also contribute ARB and/or ARGs in sewage and waterways.</p>

R	ARB and/or ARGs in animal waste enter waterways and drinking water sources through the disposal of untreated effluent and water run-off from farms after heavy rain and/or flooding and/or via irrigation.
S	ARB and/or ARGs may be transmitted by spreading manure from animals onto fruit, vegetables and grain crop farms. ARB and/or ARGs from human faeces may also contaminate fruit, vegetables and grain crops and/or their environment.
T	ARB and/or ARGs may be spread from fruit, vegetable and crop farms by run-off into surrounding waterways following rain and/or irrigation.
U	ARB and/or ARGs present during the processing of meat, vegetable and fish products may be spread into waterways via slaughterhouse effluent, and/or inadequate sewage systems.
V	Drivers of AMR in environmental compartments such as soil and water include the presence of ARB and/or ARGs from human, animal and plant sources in the environment, with subsequent transmission of ARGs to environmental bacteria via mobile genetic elements.
W	People can become infected with ARB and/or ARGs through contaminated and poorly treated drinking water, by swimming or bathing in contaminated river/lake water, or by contact with flood water.
X	Food crops may become contaminated with ARB and/or ARGs through contaminated water.
Y	Animals may become infected with ARB and/or ARGs from contaminated drinking water or irrigation water used to grow feed crops. Aquatic species may become infected with ARB and/or ARGs from contamination of the water in which they are raised with water from other environments entering the farm water, such as upstream water that runs through an urban and/or livestock farming area.
Z	ARB and/or ARGs may be transmitted to wildlife via water that has been contaminated in other urban and farming environments.