Antimicrobial Resistance: What you need to know

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The facts

‘Antimicrobials’ is a general term used to describe chemical agents which kill or interfere with the growth of microorganisms. These agents are grouped according to the microorganisms on which they primarily target. Antibiotics, antifungals, antiprotozoal, and antivirals are types of antimicrobials, with antibiotics being the most commonly known and frequently used of these agents. Antimicrobials also include antiseptics, disinfectants, and preservatives.

Image sourced from: https://www.food.gov.uk/sites/default/files/csa-amr-report.pdf
Antimicrobial resistance (AMR) occurs when the genetics of the target microorganism changes, so that the chemical agent of choice (e.g. an antibiotic) is no longer effective against a disease or condition caused by a particular microorganism, (e.g. bacteria). The microorganism develops new survival techniques, and replicates at a rapid rate, surviving the effects of the antimicrobial agent to which it was previously susceptible.

The causes of and factors involved in AMR are numerous. Although resistance occurs naturally, the problem is largely accelerated by the misuse of antibiotics in particular, such as using them to treat viral infections which cause coughs and colds, and feeding them to healthy livestock animals to promote accelerated growth and limit infection.

Major causes of antimicrobial resistance include but are not limited to:

- Overprescribing of antibiotics
- Patients not finishing their course of antibiotics
- Overuse of antibiotics in the farming of livestock and fish
- Poor infection control in hospitals and clinics
- Poor hand hygiene and sanitation
- Poor food hygiene and sanitation
- Lack of new antibiotics and vaccines being developed
The spread of AMR

Antimicrobial resistance is spread through three main mechanisms:

- **Faecal contamination** - human and animal faeces containing AMR microbes can be transferred to the environment or meat products through general faecal contamination, at the time of slaughter, or through general poor hygiene practices.
- **Water contamination** - vegetables, fruit, or shellfish can become contaminated if the water used to grow them or the water in their environment contains AMR microbes.
- **Cross-contamination** - When adequate hygiene methods are not observed, AMR microbes can spread through food being handled on contaminated surfaces which can then lead to contamination of other food items.

The following pictorial details the cycles involved in AMR spread.

*Image sourced from: [http://www.cdc.gov/drugresistance/about.html](http://www.cdc.gov/drugresistance/about.html)*
Why is AMR a concern?

Antimicrobial resistance leads to almost 700,000 deaths worldwide on an annual basis, and it is predicted that this figure could rise to 10 million deaths annually by 2050 (WHO, 2016). There is also a significant economic cost tied to antimicrobial resistance, due to longer hospital stays, the need to use more expensive drugs, the need for additional diagnostic tests, increases in insurance coverage, prolonged absenteeism from the workplace, and even premature death. These financial burdens are felt by the patient and family members, hospitals, employers, and society at large. In terms of global production loss, the economic cost of antimicrobial resistance between now and 2025 is estimated at US $100 trillion (The World Bank, 2016).

Additionally, the pipeline of antibiotic development has been rather dry for the past 10 years, with only a handful of new drugs on the market, most with limited spectrum of activity. There are several challenges involved in the creation of new antibiotics. Firstly, the highly-effective defense mechanisms, and rapidly evolving complex structure of bacteria make it difficult for the development of medicines which can penetrate and kill them. Secondly, the process of testing new medicines can be exceptionally lengthy, and involves finding patients with specialised infections already resistant to the medicines that are typically prescribed. The research and development cost is large, with investors rarely recovering their expenditure.
Antimicrobial resistance in the food supply chain

The food chain also contributes to the spread of antimicrobial resistant-bacteria. Since resistant organisms can be found in the soil, water, and excreted waste from humans or animals, food can become contaminated at any stage along the farm-to-fork chain; i.e. during production, handling, or processing. Good hygiene practices in agriculture and aquaculture are fundamental to achieving food safety, as well as to addressing antimicrobial resistance.

Antimicrobial agents play crucial roles in the treatment of pests and diseases of farm animals and plants. Their use is essential to food security, human health, and animal health and welfare. However, the misuse of these drugs is highly associated with the emergence and spread of AMR, and places everyone at risk.

Due to global economic and population growth since the 1960s, food production methods have intensified to meet the rising food demand. This is one of the major reasons for increased use of antimicrobials in agriculture, particularly in the livestock sectors (namely cattle, poultry, pig, and aquaculture). Approximately 60,000 tonnes of antibiotics alone are used in the livestock sector each year, and as the world’s appetite for animal protein increases, the demand for these drugs is expected to follow suit.
Successful action plans to combat AMR must address routine non-therapeutic antibiotic use in groups of animals, and highlight the impact of promoting good husbandry and health practices in the food industry, which minimise the need for such heavy reliance on antimicrobials.

Mitigating AMR acceleration - The response of The Cayman Islands

Antibiotics are one of the cornerstones of modern medicine, having revolutionised the healthcare industry during the first half of the 20th century. From newborns, to the elderly, the role of antibiotics in safeguarding the overall health of society is pivotal. That being said, we are on the verge of returning to the pre-antibiotic era, where important medical procedures will no longer be possible, and patients may die from seemingly minor infections.
Antimicrobial resistance cannot be eradicated, however, with conscious, multi-focused efforts; this phenomenon can be managed and contained in order to slow down the speed of resistance. We must handle antibiotics and other antimicrobials with care, so as to ensure they remain safe and effective for as long as possible. Below are some ways in which you can play a part in slowing down the spread of antimicrobial resistance.

**General public**
- Practicing good hand washing techniques
- Avoiding close contact with sick people
- Keeping vaccinations up to date
- Thoroughly washing and/or peeling fruits and vegetables if eating them raw
- Cooking meat thoroughly until juices are clear
- Serving hot food at a steaming temperature of > 140 degrees Fahrenheit
- Only using antibiotics and other antimicrobials when absolutely necessary
- Always finishing the course of medication, even if you feel better
- Only using antibiotics when they are prescribed by a medical doctor
- Never sharing prescription medication with others
- Supporting local farming practices and buying locally-grown animal and plant produce

**Human healthcare professionals**
- Only prescribing and dispensing antimicrobial drugs when they are truly needed
- Ensuring patients are current on relevant vaccines in order to reduce the need for antimicrobials
- Educating patients regarding general hygiene practices, and the proper use of antimicrobials
- Developing, maintaining, and promoting Antimicrobial Stewardship programmes in hospital settings
- Using appropriate diagnostics tests where possible to see if antimicrobial therapy is necessary, and which one(s)
- Preventing infections by ensuring hands, instruments, and environment are clean
Farmers and the Agricultural sector

- Controlling on-farm traffic and maintaining on-farm biosecurity
- Practicing and promoting regular cleaning and disinfection of farm equipment, food and water containers, and animal housing
- Vaccinating animals to reduce the need for antimicrobial drugs
- Ensuring that medications are administered only after a veterinarian or other animal health professional has been consulted
- Maintaining Good Agricultural Practices (GAPs) to decrease the incidence of pests and diseases in livestock and plants and the reliance on antimicrobial use
- Developing alternatives to the use of antimicrobials in plants
- Adhering to drug withdrawal timelines prior to the sale of animal products and produce destined for consumption
- Implementing international standards for the responsible use of antimicrobials and guidelines set out by governing bodies and policies such as the OIE, FAO, and WHO, IPPC, CODEX Alimentarius

Policymakers

- Supporting development of a national action plan against AMR for The Cayman Islands
- Strengthening policies and implementation of infection prevention and control measures
- Regulating and promoting the appropriate use of quality medicines
- Supporting improved surveillance of antimicrobial resistance across human health, animal health, and environmental health sectors

The Cayman Islands Department of Agriculture is proud to play an integral role in increasing island-wide awareness on AMR, being one of the main stakeholders in developing a national action plan to combat this global public health threat. With a long-standing history of importing animal feeds which are free of antibiotics, we encourage our farmers to use antimicrobials judiciously in their operations, and support the various farm-to-table initiatives being promoted by multiple local entrepreneurs. We look forward to continued awareness programmes, policy and guideline development, and general
success stories related to the mitigation of antimicrobial resistance in The Cayman Islands, the region, and the world at large.

Cayman Islands representatives attended the Caribbean Workshop for development of National Action Plans against Antimicrobial Resistance, held in Trinidad and Tobago, October 2016. From L-R: Dr. Samuel Williams-Rodriguez, Director of Primary Health Care / Acting Medical Officer of Health, Health Services Authority; Dr. Samantha Dorman, Veterinary Officer, Department of Agriculture; Mr. Timothy McLaughlin-Munroe, Public Health Surveillance Officer/Deputy National Epidemiologist, Health Services Authority

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References and suggestions for further reading (to be completed)

Abstract

Antimicrobial resistance (AMR) refers to the fact that there is an increase in the ineffectiveness of the drugs we rely on to treat or prevent infections. AMR occurs when bacteria, parasites, viruses, or fungi change in response to the use of these medications. The overuse of medications both in human health and animal health is the most significant reason why antimicrobial resistance is rapidly rising, and why it can be thought of as the most concerning public health and economic threat of the 21st century. It is estimated that without serious intervention, by 2050, death tolls from resistant infections could reach 10 million annually, with an associated financial burden of US$100 trillion. Misuse of antibiotics by patients (e.g. not finishing your course), overuse of antibiotics in livestock rearing, fish farming, and plant production contribute to the development of antimicrobial resistance, while spread is assisted by lack of vaccinations, poor on-farm biosecurity measures, and sub-standard hygiene practices in hospitals and during cooking. It’s not too late to reduce the impact of resistance to antibiotics and other antimicrobial medicines, and we all have a part to play in preserving their effectiveness.