



Food and Agriculture
Organization of the
United Nations

FAO Regional Activities on AMR and Aquaculture

**Sub-Regional Workshop on AMR in Aquaculture
Durban, South Africa, November 26-28, 2019**

FAO Subregional Office of Southern Africa



What are antimicrobials?

○ Natural or synthetic agents used to slow or kill infectious micro-organisms in humans, terrestrial and aquatic animals; and plants

○ Micro-organisms:

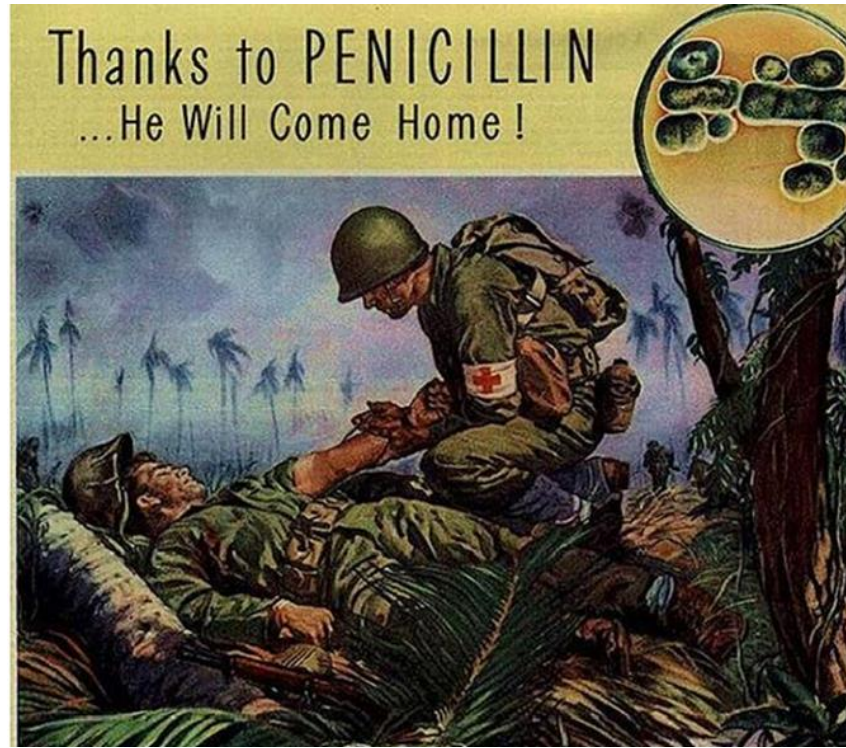
- Bacteria – antibiotics
- Viruses – antivirals
- Fungi – antifungals
- Protozoa – antiprotozoal
- Parasites – anti-parasitic



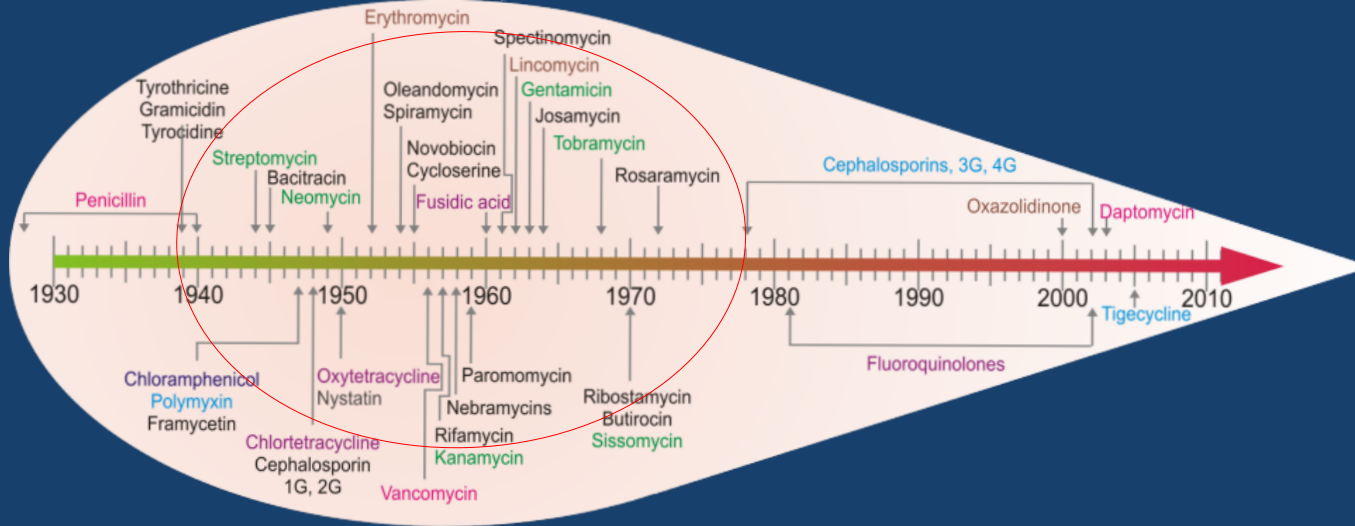
- Penicillin - first antibiotic to be discovered, in 1928 by Alexander Fleming
- First released for widespread use- early 1940's (saved many lives during World War II)



'NOW can we give him penicillin?'



Antibiotics - roadway

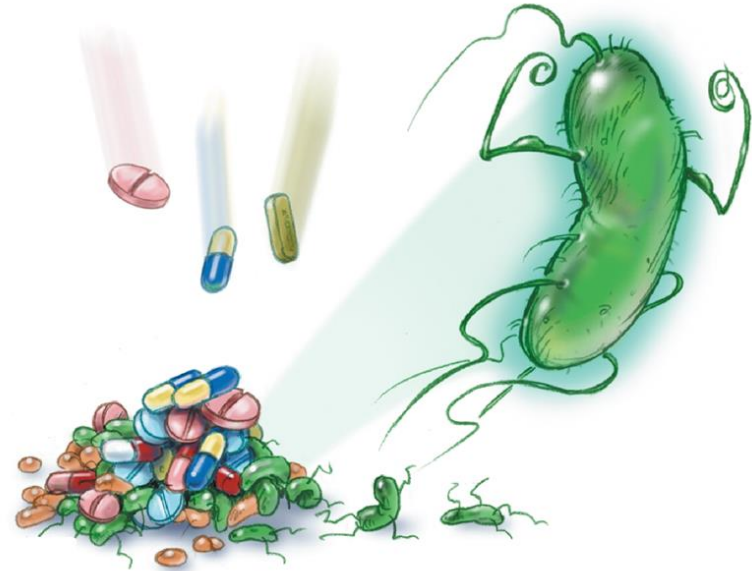


- Discovery of penicillin in 1928
- 1940 to 1970 - golden age of antibiotic discovery
- No new classes of antibiotics have been developed since 1987

The problem of Antimicrobial resistance (AMR)

○ AMR:

- Inability of micro-organisms to be inactivated or killed by antimicrobials
- Occurs when micro-organisms become **unresponsive** to medications they were responding to **initially**
- A natural biological **unstoppable** phenomenon but accelerated by over use and misuse
- When micro-organisms become resistant to **most antimicrobials** they are often referred to as “**superbugs**”



Most antibiotics develop resistance as soon as they are introduced in market

PENICILLIN GIVEN TO ITS FIRST PATIENT 1941

1942 PENICILLIN RESISTANCE REPORTED

VANCOMYCIN INTRODUCED 1956

METHICILLIN INTRODUCED 1960

1961 METHICILLIN RESISTANCE REPORTED

1982 *S. AUREUS* GAINS VANCOMYCIN-RESISTANT GENE FROM *ENTEROCOCCI* BACTERIA

QUINUPRISTIN/DALFOPRISTIN INTRODUCED 1996

1997 PARTIAL VANCOMYCIN RESISTANCE REPORTED

2000 QUINUPRISTIN/DALFOPRISTIN RESISTANCE REPORTED

LINEZOLID INTRODUCED 2000

2001 LINEZOLID RESISTANCE REPORTED

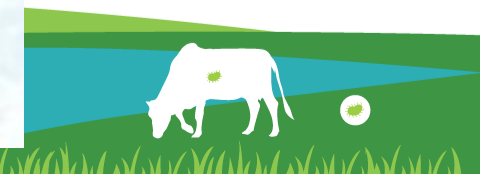
2002 FULL VANCOMYCIN RESISTANCE REPORTED

TIGECYCLINE INTRODUCED 2003

2005 DAPTOMYCIN RESISTANCE REPORTED

TIGECYCLINE INTRODUCED 2005

????? TIGECYCLINE RESISTANCE REPORTED



Antimicrobial use in Aquaculture: Benefits of Antimicrobial Use... 1/2

- **New species culture development:** lag phase between the identification and characterization of pathogens and the development of disease control procedures; use of veterinary medicines to ensure viability of the new species until alternative control methods can be incorporated into production and health management programmes.
- **Failure of preventive therapy:** good husbandry and vaccination not always ensure successful aquaculture. When exposed to stress above what they are capable of enduring aquatic animals may develop depressed immune systems and compromised non-specific barriers (e.g. skin), enhancing susceptibility to infections by pathogens that can only be resolved by the use of antimicrobials



Antimicrobial use in Aquaculture: Benefits of Antimicrobial Use....2/2

- **Emerging and re-emerging infectious disease:** Number and occurrence of transboundary aquatic animal diseases have increased and the use of veterinary medicines to treat such infections supports other biosecurity measures to restrict the geographical spread of infections.
- **Developing culture technologies:** Use of recirculation technologies, elevated growing temperatures, higher densities, chronic antimicrobial usage to control diseases and higher concentration of farms in limited geographical areas -may all change the manner in which pathogens and cultured species interact. In such instances, diseases may manifest themselves in novel ways, requiring rapid diagnosis and treatment with antimicrobials.



Antimicrobial use in Aquaculture: Concerns on the use..... 1/3

- **Abuse, overuse, misuse:** Antibiotics should only be used in a confirmed bacterial infection case; not for viral infection; thus based on correct diagnosis. Only antimicrobials labelled to treat the condition diagnosed and licensed for use of the species affected should be used. Such drugs should also be properly handled (and disposed), stored and expiry dates should be closely monitored; and they should be administered by a recognized and/or licensed aquatic animal health professional.



Antimicrobial use in Aquaculture: Concerns on the use.....2/3

- **Human and animal health issues:** Animal health issue is treatment failure due to increase in resistance. Human health issue is adverse health effects associated with the presence of residues in the food produced or resistance in bacteria associated with human disease. Resistance in bacteria causing human disease may arise either directly via enrichment of these bacteria in the aquaculture environment or indirectly via enrichment of the genes that encode such resistance and which may subsequently be transferred to bacteria associated with human disease.



Antimicrobial use in Aquaculture: Concerns on the use.....3/3

- **Environmental and ecological issues:** These include release of the medicines into the aquatic environment through leaching from unconsumed feeds, intentional or unintentional release of effluent water from aquaculture facilities and presence of residues in fecal materials. The impacts on local ecosystem are, in general, poorly studied. The ecological concerns include accumulation of residues in the sediments, impacts of drugs and chemicals on natural biota, and possible development of antimicrobial resistance in aquatic bacteria.
- Resistance in Aquaculture: two main hazards
 - Antimicrobial **residues**
 - Antimicrobial **resistance**



Most Important Bacterial Diseases in Aquaculture (Dec 2016)

Gram-Negative Bacteria (6)

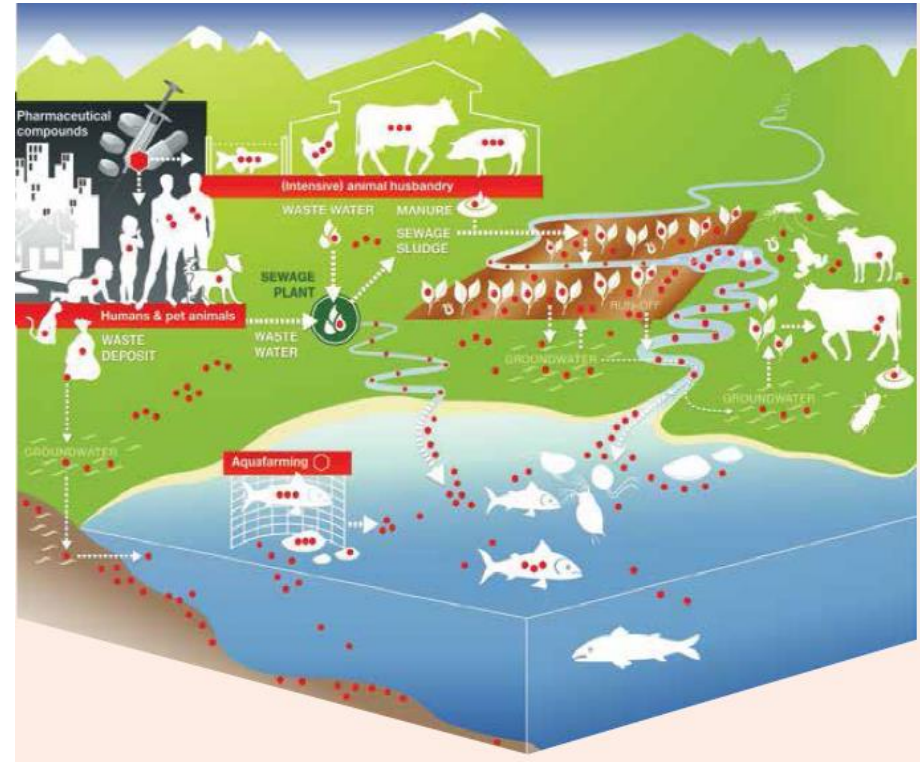
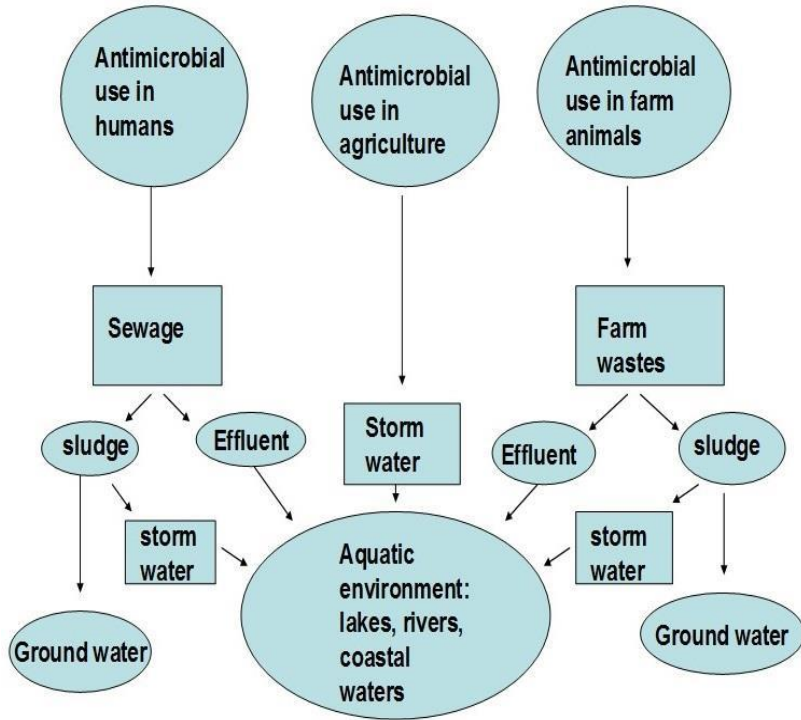
- Vibriosis
- Aeromoniasis
- Edwardsiellosis
- Pseudomoniasis
- Flavobacteriosis
- Infection with Bacteria e.g. chlamydia spp.

Gram-Positive Bacteria (4)

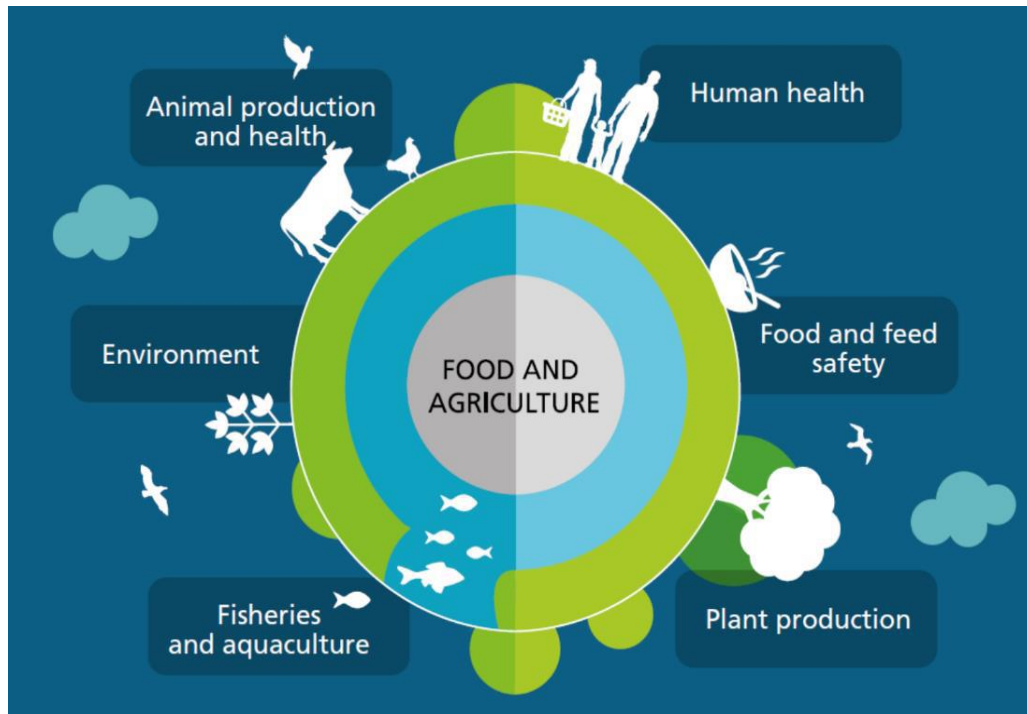
- Mycobacteriosis
- Streptococcosis
- Renibacteriosis
- Infection with Anaerobic Bacteria e.g. Clostridium Botulinum



Possible Source of ARGs into Aquatic and Aquaculture Environment



What FAO does towards AMR in Aquatic and Aquaculture Environment



FAO Action Plan on AMR: 2016-2020

- **Awareness**

- National/regional/international fora
- Book: Responsible management of bacterial diseases in aquaculture
- Code of Conduct for Responsible Fisheries (CCRF) Technical Guidelines on Prudent and Responsible Use of Drugs
- World Antibiotic Awareness Week (18-22 November 2019)

- **Evidence:** Surveillance (AMU and AMR)
- **Practices:** Best practice guidance (shrimp, tilapia and carp)
- **Governance:** assistance to the development of the aquaculture component (within food and agriculture) of NAP on AMR

Very complex interface: different productions systems and sectors involved: aquatic, terrestrial, environment



FAO Regional Activities on AMR

- Support to SADC Member states to develop OH AMR National Action Plans aligned to the FAO NAP and Global AMR Action Plan
- Provide technical assistance in the implementation of the NAPs
- Support to the development of the SADC Regional Strategic Framework to control AMR – document validation in December 2019
- Support review of the legal framework that supports Veterinary Medicinal Products (VMPs) within the SADC Member states as a precursor to reviewing the SADC Regional Guidelines for the Regulation of Veterinary Drugs in SADC Member States were developed in 2011



FAO Regional activities on Aquaculture

- Technical support in development of SADC Regional Aquaculture Strategy and Action Plan (2016-2026)
 - **AMR can be anchored in strategic objective 3: Which promotes food safety, BMP in aquaculture, bio-security, disease prevention and control**
- Supported development of Guidelines for Aquaculture Management in SADC in 2018
 - **AMR can be anchored under Guideline 7: Good husbandry practices must be implemented at all times**
- Supported development of SADC Regional Aquatic Biosecurity Strategy
 - **Emphasis on Risk Assessment:** Corner stone for promoting BMP through development of risk mitigations that promote alternative disease prevention and control mechanisms and promotes prudent use of antimicrobials in Aquaculture



Thank you



MORE INFORMATION

[http://www.fao.org/antimicrobial-resistance/en/
Antimicrobial-Resistance@fao.org](http://www.fao.org/antimicrobial-resistance/en/Antimicrobial-Resistance@fao.org)

Mark.Obonyo@fao.org

