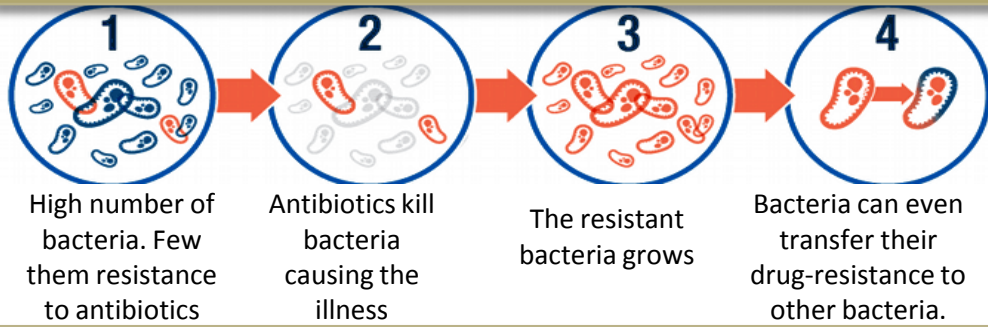


Aims

- ✓ Contextualize the risk importance due to antimicrobial resistance in food.
- ✓ Study which antibiotics resistance microorganisms are more important in food
- ✓ Study the most suitable bacterial resistance detection methods
- ✓ Analyze the prevention systems that are currently in place

How does antibiotic resistance occur?



❖ **Antimicrobial resistance** occurs when microorganisms change in ways that render the medications used to cure the infections they cause ineffective.

Figure 1: Antibiotic resistance mechanism

Table 1: Bacterial resistance detection methods

Technique	Duration	Specifications	Images
Mass spectrometry (MS)	20 minutes	Speed: ++++ Precision: ++++ Viability: ++ Cost: +++ Detection of resistance: +++	 Image 10: Mass spectrometry assay
Polymerase chain reaction (PCR)	12 hours	Speed: ++ Precision: ++++ Viability: ++ Cost: ++ Detection of resistance: +++	 Image 10: Mass spectrometry assay
Immunocromatography	20 minutes	Speed: ++++ Precision: +++ Viability: +++ Cost: ++ Detection of resistance: +++	 Image 13: Immunocromatography assay
Antibiogram	24 hours	Speed: + Precision: +++ Viability: ++ Cost: + Detection of resistance: +++	 Image 14: Petri dish antibiogram

GLOBAL SITUATION (OMS, 2050)

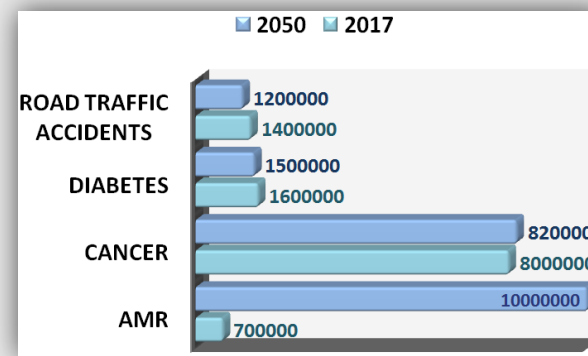


Figure 2: Causes and number of death in 2017 vs 2050

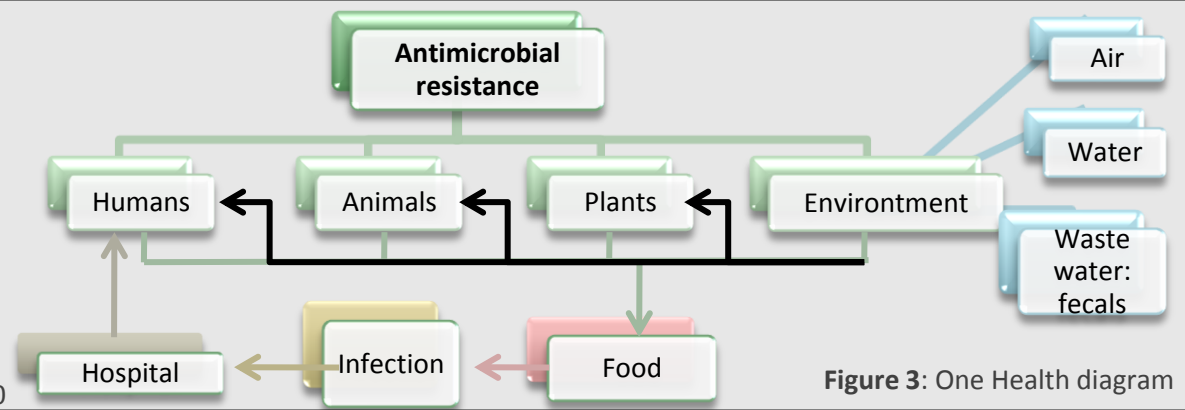


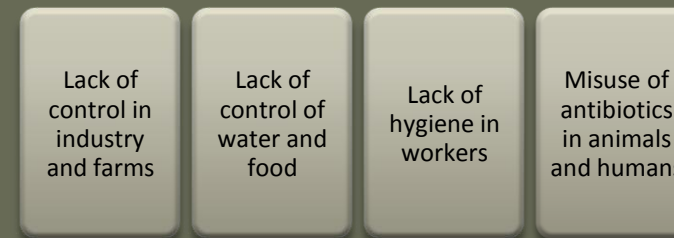
Figure 3: One Health diagram

Table 3: Most important antimicrobial resistance microorganisms in feeding

Pathogen agent	Frequently origin	Antibiotic	Categorization	Images
<i>Salmonella</i> spp	Meat // Eggs Food handling	Fluoroquinolone	Critically important: C1, C2, P1, P2, P3	 Image 5. <i>Salmonella</i> spp
<i>Escherichia coli</i> resistant to fluoroquinolones	Meat //Eggs // Water // Fruits // Vegetables // Food handling	Fluoroquinolone	Critically important: C1, C2, P1, P2, P3	 Image 6. <i>Escherichia coli</i>
<i>Enterococcus VRE</i>	Meat Water Food handling	Vancomycin	Critically important: C1, C2, P1, P2, P3	 Image 7. <i>Enterococcus VRE</i>
<i>Campylobacter jejuni</i>	Chicken Food handling	Streptomycin Ampicillin Tetracycline	Highly important: C1,C2,P2,P3 Important: C2 Important: C1	 Image 8. <i>Campylobacter jejuni</i>
<i>Pseudomonas aeruginosa</i> FQRP	Water Fruits // vegetables Animals	Carbapenemics	Highly important: C1, C2, P1, P2	 Image 9. <i>Pseudomonas aeruginosa</i> FQRP

C1: Heavy bacterial infections // C2: Bacterial infections // P1: High proportion of use
P2: High frequency of use// P3: Infections in humans with bacterial resistance transmission

CAUSES OF ANTIMICROBIAL RESISTANCE IN FOOD



PREVENTIVE MEASURES

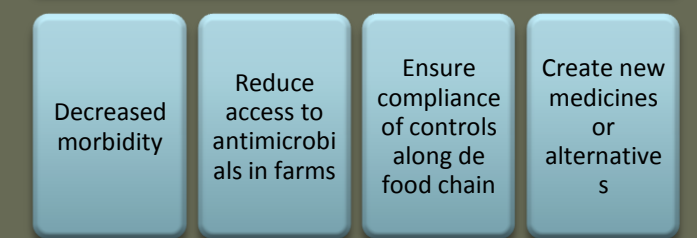


Figure 4: Mainly causes of antimicrobial resistance and prevention methods

Conclusions

- ✓ There is a **significant risk** to bacterial resistance throughout the world that can affect millions of people in the future, and may be leading cause of death.
- ✓ There are **5 important microorganisms** in food related to antimicrobial resistance: *Salmonella* spp, *Escherichia coli* resistant to fluoroquinolone, *Enterococcus VRE*, *Campylobacter jejuni* and *Pseudomonas aeruginosa* FQRP.
- ✓ For a high industry, the **best methods** are mass spectrometry and polymerase chain reaction. For a medium and little industry, the best methods are immunocromatography and antibiogram method.
- ✓ Although there are **many causes** of antimicrobial resistance, world organizations are making **action plans** due to prevent increases.

➤ **Table 1:** March-Rosselló, G. (2016). *Métodos rápidos para la detección de la resistencia bacteriana a antibióticos*.

➤ **Figure 4:** United Nations Food and Agriculture Organization (2016-2020). *The FAO Action Plan on Antimicrobial Resistance*

➤ **Table 3:** World Health Organization (2016). *Critically Important Antimicrobials for Human Medicine: Ranking of medically important antimicrobials for risk management of antimicrobial resistance due to non-human use*.

➤ **Figure 1:** European Commission (2011). *Action plan against the rising threats from Antimicrobial Resistance: Communication from the Commission to the European Parliament and the Council*.

➤ **Figure 2:** Jim O'Neill (2016). *Tackling drug-resistant infections globally: Final report and recommendations*.

➤ **Figure 3:** CDC (2017). *Saving lives by talking a One Health approach*.