Natalia Calvillo Martín,
Science and Food Technology
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Universitat Autònoma de Barcelona

Impact of microbial resistance through food

AIMS

- Understand the current situation and problems that society faces regarding microbial resistance
- Compare techniques that allow microbial resistance identification in food and choose the most suitable

INTRODUCTION

Microbial resistance is a natural phenomenon that has existed since before the use of antibiotics by human. However, the massive use of antimicrobials in recent years for food supply to world markets has contributed to proliferation and transmission of microbial resistance genes.

Formation of resistance

Source	Affectation	Transmission	Spread
Polluted waters	Excessive consumption of medicines. Irrigation water.	Consumption and contact with water and food products.	-Ease of being able to supply food to other countries -Population increase. -Personal trips of people carrying the resistance.
Antibiotics	Animals, people and vegetables. Overuse = RAM	Consumption and contact with food products Excessive use in hospitals	
Biocides	Vegetables	Vegetable consumption and contact	
Soil	Natural resistance, fertilizers Antibiotic and biocide.	Contact	

Problems caused by resistances
Increase of deaths
Longer hospitalization times
Laboral inhability
Possibility of treatment reduced
Increase of healthcare cost
Solutions
National action plans
Laws creation
Incentives for research and development
Responsible use of antibiotics
Raise awareness

Pathogens and comparison methods

Priority	Pathogens in food	Type of food	Antibiótic resistance
Medium	*Shigella spp*	Meat, dairy, fruit, vegetables, ready to eat products	Fluoroquinolone
High	*Salmonellae*	Meat, dairy, fruit, vegetables, fish, eggs, mollusk	Fluoroquinolone
	Campylobacter spp	Meat, dairy, fruit, vegetables, ready to eat, mollusk	Fluoroquinolone
	Staphylococcus aureus	Meat, dairy, fruit, vegetables, ready to eat,	Vancomycin, methicillin
	Enterococcus faecium	Meat, dairy, fruit, vegetables, fish, mollusk	Vancomycin
Critical	Enteribacteriaceae *(E.coli)*	Meat, dairy, fruit, vegetables, mollusk	Carbapenems, cephalosporins

Metodhs	Resistance						Food
	EF	SA	CS	S	SS	EC	
Antibiogram	x	x	x	e	n	x	Meat, eggs, fish, dairy
Biosensors	n	x	x	x	x	x	Meat, eggs, dairy, fruit, vegetables
Citometry of flux	n	n	e	n	e	x	Meat, fruit, vegetables, dairy
DNA microarray	x	e	x	x	n	x	Meat
Elisa competitive	x	x	n	x	x	x	Meat, eggs, fish, dairy, mollusk
Fluorescence DHI	n	x	n	e	n	n	Meat, dairy
LAMP	x	x	x	x	x	x	Meat, eggs, dairy, vegetable
LPA	n	n	x	n	n	n	Meat
NASBA	n	x	n	x	n	x	Meat, dairy
Pyrosequencing	x	x	e	x	n	x	Meat, dairy
qPCR	x	x	x	x	x	x	Meat, fish, fruit vegetable, mollusk, dairy

x= possible, **e**=trial, **n**= not available
EF= enterococcus faecium, **SA**= Staphylococcus aureus, **CS**= Campylobacter spp, **S**= Salmonellae, **SS**= Shigella spp, **EC**= Escherichia coli

Conclusions

-Resistances are a high priority problem, with and estimation of 400.000 infections and 25.000 deaths anually in Europe (Capita, R.)
-The excessive use of antibiotics in humans, animal and vegetable production systems to reduce costs has allowed the diversification of resistance genes.
-The incorrect use of antimicrobials causes a longer hospitalization time and greater chance of death and animal production problems.
-Among the methods chosen to identify the priority microorganisms on the list, qPCR would be chosen for the food industry since, although it is an expensive method, it allows real-time monitoring and detects a higher number of microorganism in a sensitive and specific way.

	qPCR
Advantages	Fast and simple. The data is quantitative. High sensitivity and specificity. Real-time monitoring.
Disadvantages	Contamination risk, sophisticated and expensive equipment is required. Need denaturation steps. High extraction cost, qualified personnel. Only analyse one sample.