Antibiotic resistance in marine ecosystems

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Microbes are ubiquitous they are everywhere

They have survived on this planet for 3.9 billion years

They are very adaptable

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Microbes adapt to any change in their environment by

Changing their phenotype

Mutating their genotype

Rearranging their genetic structures

and

Exchanging genes between microbes

Any gene in the microbiome can potentially move to any microbe

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Some genes encode mechanisms that confer reduced susceptibility to agents we now use as antimicrobial agents to treat clinical infections.

These existed in the 'environmental microbiome' and were being exchanged between microbes long before we humans started to use these agents.

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The variety and diversity of these ‘resistance genes’ in the environmental microbiome is greater than we find in human pathogens.

We believe that the ‘environmental resistome’ is the most important reservoir of the ‘ resistance genes’ we find in human pathogens

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The primary factor influencing the frequency of resistance genes in human pathogens is the use of antimicrobials in human medicine.

The ultimate source of these genes is, however, the 'environmental resistome'.

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Since we started to develop and use antimicrobial agents we have seen a rise in the frequency of 'resistance genes' in the environment.

As the 'environmental resistome' increases in size the frequency with which 'resistance genes' are exchanged will increase.

We must assume that this will lead to an increase in the frequency of human pathogens that have acquired 'resistance genes' from the 'environmental resistome'.

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The introduction of antimicrobial agents into the environment is the major driver of increases in the 'environmental resistome'.

All human uses of antimicrobial agents result in the entry of these agents into the wider environment including the aquatic environment.

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The only method of halting or reversing the increase in the 'environmental resistome' is to reduce our use of antimicrobials.

Microbiologists, molecular biologists and ecologists may help us understand how important this reduction is.

How we learn to reduce our use of antimicrobial agents

is more a sociological, economic, political, psychological and philosophical problem.

Maybe advertising executives will be more important that laboratory scientists