ANTIBIOTIC RESISTANCE AND POLICIES IN THE CONTROL OF ANTIBIOTIC RESISTANCE

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ABSTRACT

Antibiotic resistance occurs when an antibiotic has lost its ability to effectively control or kill bacterial growth, in other words, the bacteria are 'RESISTANCE' of therapeutic levels of an antibiotics. Only through certain level of awareness antibiotic policies and judicial use of antibiotic can overcome this deadly problem.

INTRODUCTION

It is difficult to imagine undertaking todays surgical procedures, transplantation, cancer chemotherapy or care of critically ill or HIV infected without effective antimicrobial agents. Bacteria are champions of evolution and a few microbes have adapted to a point where they pose serious clinical challenges for human. Antibiotic resistance is a direct consequence of antibiotic use. Both continue to escalate despite many calls for moderation of antibiotic use, in the hospital and in the community. Now we need antibiotic policies and other control measures to overcome this deadly problem. Despite the lack of properly controlled studies, which would be very difficult to perform, there is no doubt that policies can be efficacious in reducing cost and levels of use without being detrimental to patient care.

✓ HOW DO BACTERIA BECOME RESISTANCE…….?

NATURAL RESISTANCE→ Some bacteria are naturally resistant to certain types of antibiotics. They lack the metabolic process or target site which is affected by the particular drug.

Eg:- 1. Gram (-) ve bacilli are normally unaffected by penicillin.

2. M. tuberculosis is insensitive to tetracycline.

This type of resistance does not pose a significant clinical problem.

However, bacteria may also become resistant by two ways…………

1. By a genetic mutation.

2. By acquiring resistance from another bacterium.

1. GENETIC MUTATION:- It is a stable and heritable spontaneous changes of the bacteria's genetic material, are thought to occurs in about 1 in 1 million to 1 in 10 million cells. Different genetic mutations yield different types os resistance. Some mutation enable the bacteria to produce potent chemical(enzymes) that inactivate antibiotics, while other mutations eliminate the cell target that the antibiotic attacks. Still others close up the entry ports that allow antibiotics into the cell, and others manufacture pumping mechanisms that export the antibiotic back outside so it never reaches its target.

2. AQUIRING RESISTANCE FROM ANOTHER BACTERIUM:- Bacteria can acquire antibiotic resistant genes from other bacteria by following ways……….

⬧   Conjugation → Sexual contact through the formation of a bridge or sex pilus is common among Gram(-) ve bacilli of the same or another species. Even non-pathogenic organism my transfer the 'resistance' or 'R' factor to pathogenic organisms, which may become widespread by contamination of food or water.
Eg:-- Chloramphenicol resistance to typhoid bacilli, Streptomycin resistance of E-coli and many others have been traced to this mechanism.

⬧   Transduction→ It is the transfer of gene carrying resistance through the agency of a bacteriophage. The 'R' factor is taken up by the phage and deliver to another bacterium which in infects.
Eg:-- many staphylococcus aurous strains have acquired resistance by transduction.

⬧   Transformation→ A resistant bacterium may release the resistance carrying DNA into the medium and this may be imbibed by another sensitive organism becoming unresponsive to the drug.
Eg:-- pneumococcal resistance to penicillin.

✓   VARIOUS FACTORS RESPONSIBLE FOR ANTIBIOTIC RESISTANCE

➢   The patient:- factors likely to the development of resistance in individual patients include a large inoculum infection. Which increases the potential for pre-existing resistant mutants. Any process that lowers the drug concentration at the site of infection is also more

likely to select out resistance as will slower eradication of infection due to a foreign body or a compromised immune system.

While the normal flora is usually forgotten about, or ignored, when treating specific infection, its exposure to the antibiotic is inevitable. Development of resistance in normal flora is probably of great significance clinically, as this resistance may spread to more pathogenic organism.
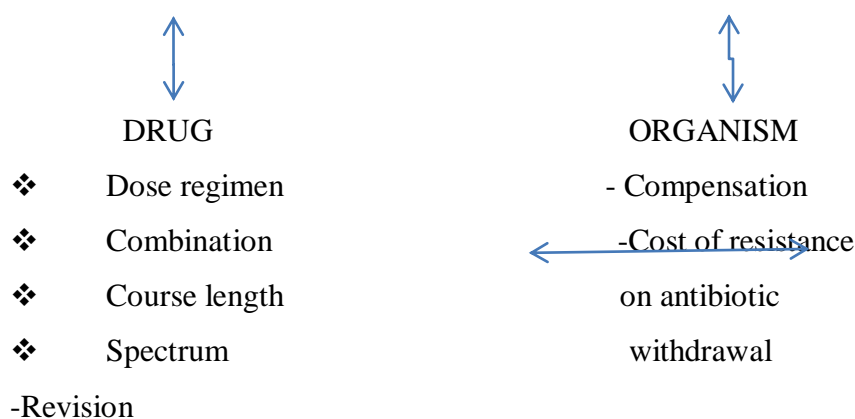
➢ The organism:- whether resistant survivors revert to full sensitivity on removal of antibiotic selective pressure depends on the several factors. On rapid removal of selective pressure, reversion to sensitivity will probabely occur, although taking longer than the initial process of development to resistance. We know, however, that, genetic compensation for the cost of resistance can occur, i.e. the resistant survivors can undergo separate mutation over several hundred generation that favor maintenance of the resistant gene.

➢ The drug:- the antibiotic itself is likely to be important regarding development of resistant. Narrow spectrum agents should be beneficial as they have less effect on normal flora then broad spectrum agents.

Dose regimen is also likely to be important. Higher doses, which will achieve higher drug concentrations at the site of infection, are less likely to select for resistance, although the effects of this strategy on the normal flora are unknown.

➢ Your favorite meat:- A report published by the food and drug administration of USA in February 2011, tested 480 samples each of ground turkey, pork chops, ground beef and chicken wings, breast and thighs and all content antibiotic resistant strains of salmonella and campylobacter. It may be due to antibiotics are used by the meat industry to promote faster growth and keep their animals free from disease.

PATIENT	ENVIRONMENT
❖ Inoculum	-Quality of generics
❖ Foreign body	- cycling
❖ Immune system	-De-novo or clonal
❖ Normal flora	resistance
❖ Missed doses	-Total use/
❖ Eradication regimes	threshold

DRUG   ORGANISM

❖   Dose regimen   - Compensation

❖   Combination   -Cost of resistance

❖   Course length   on antibiotic

❖   Spectrum   withdrawal

-Revision

(The dynamics of resistance→ the patient, the drugs, the microorganism and the environment interact. It is difficult to identify any one factor as crucial on its own)

PREVENTION

So what is fueling antibiotic resistance, you may ask? We are finding that the wide spread overuse as well as in appropriate use of antibiotic fueling antibiotic resistance. These complications of antibiotic therapy can have serious outcomes even death.

So what can we do to prevent antibiotic resistance?

Patients, healthcare provider, hospital administrators, and policy makers must work together to employ effective strategies for improving antibiotic use ultimately improving medical care and saving lives.

PATIENT CAN

- Take antibiotics exactly as the doctor prescribes. Do not skip doses. Complete the prescribed course of treatment, even you start feeling better.
- Only take antibiotics prescribed for you, do not share or use leftover antibiotics. Antibiotic treat specific types of infections. Taking the wrong medicine may delay correct treatment and allow bacteria to multiply.
- Do not save antibiotics for the next illness discard any leftover medication once the prescribed course of treatment is completed.
- Do not ask for antibiotics when your prescriber thinks you do not need them.
- Prevent infection by practicing good hand hygiene and getting recommended vaccines.

HEALTHCARE PROVIDER CAN

- Do not treat viral infections with antibiotics, even when patient ask for them.
- Prescribe antibiotics only when they are absolutely necessary and giving them at the right dose and only for as long as they are needed.

- Avoid unnecessary overlaps in antibiotics. It is not usually necessary to give two antibiotics to treat the same bacteria.

- Become familiar with resistance trends in your region.

- Discuss and work with pharmacist regarding appropriate antibiotic use, antibiotics resistance and about adverse effects.

- Utilize patient and provider resources offered by professional pharmaceutical organization.

- When you prescribe an antibiotic take an antibiotic time out after 24 to 48 hours. This is the time to stop and assess the patient's treatment and use of antibiotics.

- Are the culture results available….?

- How has the patient responded……?

- Are antibiotic still needed……..?

- Is this the right drug and right dose……?

> **CONCLUTION**

Antibiotics are losing their effectiveness of a rate that is both alarming and irreversible. While it is true to say that there is no absolute proof of a causative association between antibiotic use and resistance, most authorities believe the association to be 'Virtually certain'. Given this and the impossibility of controlling for all compounding factors in prospective trials, a programmatic approach to control of antibiotic resistance is essential. Given the recent worldwide escalation in resistance and the overwhelming evidence of much over-use of antibiotics (and thus unnecessary resistance), the programmatic and essential approach to the control of antibiotic resistance is to control antibiotic use. The important question is how much research is still needed in this area…..?

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