18/MHS07/044
Pha 206

Answer:

1)Efflux Pumps

Some bacteria, e.g. Pseudomonas, have a system called an efflux pump. As its name suggests this is a system whereby the bacterium has a pump to expel ingested chemicals.

Although some of these drug efflux pumps transport specific substrates, many are transporters of multiple substrates.

Antimicrobial efflux pumps are believed to contribute significantly to acquired bacterial resistance because of the very broad variety of substrates they recognize, their expression in important pathogens, and their cooperation with other mechanisms of resistance, such as decreased uptake. Their presence also explains high-level intrinsic resistances found in specific organisms.

The design of specific, potent efflux pump inhibitors appears to be an important goal for the improved control of infectious diseases in the near future. For example, in ear therapy tris-EDTA has the potential to partially inactivate the efflux pump but this is only a topical specified action not generally available in most situations.

2) Enzyme inactivation

such as methicillin and cloxacillin, but they are still subject to target alterations making them ineffective over time.

3) Mutation

When an antimicrobial attacks a specific target, whether it be cell wall peptides, ribosomes or nuclear DNA, it locks on to specific receptors on the target.

Bacterial mutation results in the alteration of these receptors so that the antimicrobial can no longer fit and the organism is thus resistant to the effects of the antimicrobial.

Examples of clinical strains showing resistance can be found for every class of antimicrobial, regardless of the mechanism of action. Target site changes often result from spontaneous mutation of a bacterial gene on the chromosome and selection in the presence of the antimicrobial.

Thus antimicrobials resistant to penicillinase may still be rendered ineffective. This has led to the term methicillin resistant Staphylococcus aureus (MRSA) the archetypical multi-resistant organism.
“The most notable example is penicillinase that can inactivate penicillin, but there are others”Some microorganisms have developed the ability to produce enzymes that are able to inactivate certain antimicrobials. The most notable example is penicillinase that can inactivate penicillin, but there are others.
Clavulanic acid can bind penicillinase leaving the antimicrobial amoxicillin to do its work, and also there are the penicillinase resistant penicillins

4) Biofilms
Biofilms are complex microbial communities containing bacteria and fungi. The microorganisms synthesise and secrete a protective matrix that attaches the biofilm firmly to a living or non-living surface. At the most basic level a biofilm can be described as bacteria embedded in a thick, slimy barrier of sugars and proteins. The biofilm barrier protects the microorganisms from external threats.
Biofilms have long been known to form on surfaces of medical devices, such as urinary catheters, endotracheal and
1) Attachment 2) Colonization 3) Biofilm formation 4) Growth 5) Release of bacteria
tympanostomy
orthopaedic and
implants, contact
intrauterine devices (IUDs) and
sutures. They are a major
contributor to diseases that
are characterised by an underlying bacterial infection and chronic inflammation, e.g. periodontal disease, cystic fibrosis, chronic acne and osteomyelitis Biofilms are also found in wounds and are suspected to delay healing in some. Planktonic bacteria attach within minutes and form strongly attached micro colonies within 2–4 hours. They become increasingly tolerant to biocides, e.g. antimicrobials, antiseptics and disinfectants, within 6–12 hours and evolve into fully mature biofilm colonies that are extremely resistant to biocides and shed planktonic bacteria within 2–4 days, depending on the species and growth conditions. They rapidly recover from mechanical disruption and reform mature biofilm within 24 hours.
tubes,

breast lenses,

A unique property of polymicrobial biofilms is the cooperative protective effects that different species of bacteria can provide to each other. For example, antimicrobial resistant bacteria may secrete protective enzymes or antimicrobial binding proteins that can protect neighbouring non-antimicrobial resistant bacteria in a biofilm, as well as transfer genes to other bacteria that confer antimicrobial resistance, even between different species. Horizontal gene exchange is enhanced in biofilms.

The high cell density in biofilms, as compared with that of a planktonic mode of growth, increases the absolute numbers of resistant mutants that can be selectable under antimicrobial pressure.

Another survival strategy that many bacteria in biofilms have developed is for a subpopulation to become metabolically quiescent, i.e. to hibernate. Because bacteria need to be metabolically active for antimicrobials to act, hibernating bacteria in biofilms are unaffected by antimicrobials that would normally kill active bacteria. Research has shown that the lowest concentration required to kill or eliminate bacterial biofilm for many antimicrobials actually exceeds the maximum prescription levels for the antimicrobials. Thus, standard oral doses of those antimicrobials, which effectively kill the normally susceptible bacteria when grown planktonically in a clinical laboratory, may have little or no antimicrobial effect on the same type of bacteria in biofilm form in the patient.