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Antibiotic Drugs and Multidrug Resistance Bacteria

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Abstract

Antimicrobial resistance is the main reason for spreading various diseases in community. There are different mechanisms for drug resistance. One of antimicrobial resistance is antibiotic resistance bacteria. Some bacteria have resistance to antibiotic represent a big problem in treatment process, hence development of numerous diseases. In this review, we summarize simple definition to bacteria resistance, mechanism action, and how we can avoid spread diseases. We also briefly mention the new trend for treatment antibiotic resistance bacteria.

Keywords: Antibiotic resistance; Antimicrobial resistance; Multi-drug resistance bacteria

Introduction

Antibiotic drugs

An antibiotic is a category of drugs which responsible for destroys or prevents the growth of bacteria. Antibiotics effect on bacteria by disturbs its natural ecological harmony through the process of evolutionary pressure. Antibiotics have several roles they not only use in protect human life, but also played a pivotal role in medicine and surgery. They have effectively roles in treatment of various diseases such as diabetes, renal disease, or rheumatoid arthritis. The most effective antibiotics are penicillin and ciprofloxacin [1].

Antibiotic resistance

Microbes are small organisms which cannot see by necked eye. There are various types of microbes as, bacteria, viruses, fungi, and parasites. Although most microbes are harmless and even useful to living organisms, some can cause disease. These disease-causing microbes are called pathogens. Microbes have the ability to develop resistance to the drugs becoming drug-resistant organisms [2].

An antimicrobial is a kind of drug that destroys or rests the growth of microbes, as bacteria, viruses, fungi, and parasites. Antibiotic resistance is the ability of bacteria to resistance the effects of an antibiotic, so the bacteria are not destroyed and their growth still occur. Resistant bacteria to the antibiotic lead to rapid growth of microorganisms and spread them in to other organs. Furthermost infection-causing bacteria can become resistant to at least some antibiotics. Bacteria that are resistant to numerous antibiotics are known as multi-resistant organisms (MRO). A number of bacteria are naturally resistant to some antibiotics such as bacteria in gut [3].

Causes of antibiotic resistance

There are various methods for spread antibiotic resistance, these are included releasing large quantities of antibiotics into the environment through pharmaceutical manufacturing, during wastewater treatment, and presence of antibacterial in soaps and other products contribute to antibiotic resistance. Contact with infected farm workers or meat processors, drinking contaminated water, Contacting air that is emitted from c animal housing or is released during animal transport [4].

Although using of antibiotics in unnecessary and inappropriate cases as in treatment of disease result from viruses as in common cold, these disease increase the risk of antibiotic resistance [1].

Antibiotic resistance Bacteria

A number of bacteria have established resistance to antibiotics that were used for treat them. The most dangerous bacteria can be summarized (Figure 1):

Antibiotic resistance

Mutual intestinal bacteria that can cause life-threatening infections-it can be spread to all regions as a result of carbapenem antibiotic resistance [5].

Common cause of urinary tract infections. Resistance to fluoroquinolone antibiotics [6].

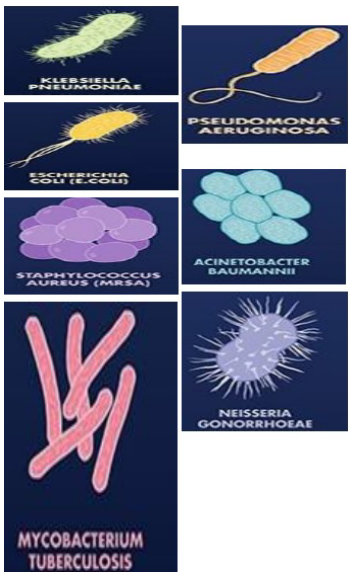

Figure 1: Types of bacteria.

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Common cause of severe infections in health facilities and the community. It resistance to methicillin antibiotic [7].

WHO estimates that, in 2014, there were about 480 000 new cases of multidrug-resistant tuberculosis (MDR-TB), a form of tuberculosis that is resistant to the 2 most powerful anti-TB drugs. Widely drug-resistant tuberculosis (XDR-TB), a form of tuberculosis that is resistant to at least 4 of the core anti-TB drugs, has been recognized in 105 countries. An estimated 9.7% of people with MDR-TB have XDR-TB. Extensively drug-resistant TB (XDR-TB) is resistant to most TB drugs, including isoniazid and rifampicin, any fluoroquinolone, and any of the three second-line injectable drugs [8].

P. aeruginosa is a common cause of pneumonia and bloodstream, urinary tract, and surgical-site infections. P. aeruginosa have been found to be resistant to nearly all antibiotics, including aminoglycosides, cephalosporins, fluoroquinolones, and carbapenems [9].

Acinetobacter is a gram-negative bacterium that effects pneumonia or bloodstream infections. Acinetobacter species have become resistant to all or nearly all antibiotics as carbapenems [10].

It is a kind of bacteria responsible for inflammation of the urethra, cervix, pharynx, or rectum. Neisseria Gonorrhea is resistance to some antibiotics including, Cephalosporin fluoroquinolone, tetracycline, and penicillin [11].

Mechanism

Once exposure to bacteria occurs, infection and bacteria spread occur, so, treatment with suitable drugs as antibiotics must begin. Antibiotics responsible for stop the growth of bacteria and prevent bacteria multiply, so kill them, hence use in treatment of disease. While in the other cases antibiotics loss their ability to stop growth of bacteria, hence multiplication of bacteria increase and this lead to spread antibiotics resistance bacteria and development of disease and resistance to treatment as in Figure 2 [12].

Antibiotic resistance can be occurring through four types of mechanisms [13]:

1. Drug inactivation or modification: for example, enzymatic deactivation as in penicillin G in some penicillin-resistant bacteria through the production of β-lactamases. Protecting enzymes manufactured by the bacterial cell will add an acetyl or phosphate group to a specific site on the antibiotic, which will diminish its capacity to bind to the bacterial ribosomes and disrupt protein synthesis.

2. Modification of target- or binding site: for example, alteration of PBP-the binding target site of penicillin's-in MRSA and other penicillin-resistant bacteria, or modification in structure of ribosomal protection proteins. These proteins guard the bacterial cell from antibiotics through changes its conformational shape. Change of proteins conformational shape allows these proteins to loss their activity so, prevent inhibit protein synthesis, and this help in grow of bacteria and spread it.

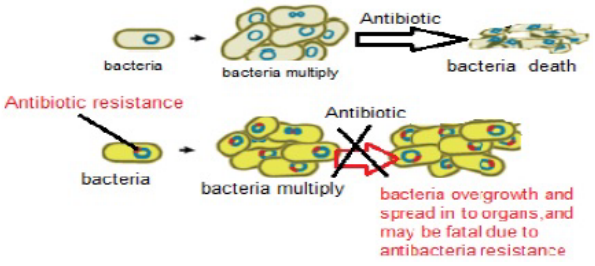

Figure 2: Mechanism action of antibiotic resistance.

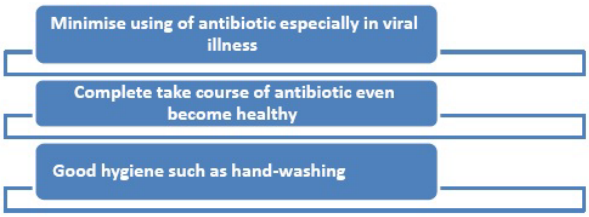

Figure 3: Protection from antibiotic resistance.

Figure 4: Control on transmission of antibiotic resistance bacteria.

3. Alteration of metabolic pathway: for example, absence of para-aminobenzoic acid (PABA), this is precursor for the synthesis of folic acid and nucleic acids.

4. Reduced drug accumulation: By decreasing drug permeability or increasing active pumping out of drugs through cell membrane.

How prevent antibiotic resistance

The influence of antibiotic-resistant infections can be diminished through numerous methods, which can be summarized in Figure 3 [14].

How control on Transmission of antibiotic resistant bacteria in the community

Antibiotic resistant bacteria can be transfer from person to person inside the community. This is becoming more common. Methods to avoid spread of these organisms are summarized in Figure 4 [15].

Future trends

The presence of multiple drug-resistant bacteria is responsible for spreading various diseases in community. Traditional technique fail in solve this problem. The new trend in medicine is replacement using antibiotics with bacteriophages which act as antimicrobial agents [16]. Phage therapy is an important alternative to antibiotics in the current era of drug-resistant pathogens. Bacteriophages have played an important role in the expansion of molecular biology, not only, but also play important role in overcome antibiotic resistance [17].

Conclusion

Bacterial resistance is a growing hazard and until now few new antibiotics active against multi-resistant bacteria are being explored. A combination of falling profits, regulatory mechanisms and irrational and injudicious use of antibiotics has led to an alarming situation

where some infections have no cure. So, it is very important to take all precautions during treatment any illness and become aware during treatment with antibiotics after ask the health professional.

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