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Characteristics of Antibiotics and Antibiotics producing Microorganisms

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ABSTRACT
Antibiotics are chemical sellers that inhibit bacterial boom via preventing bacterial mobileular branch or via killing the microorganism. Antibiotics are accordingly the vital thing of medicine used to make sure fitness of human and animal. The latest uptick on this problem has been fueled via way of means of a boom within side the range of infections because of drug-resistant microorganism. Antibiotic resistant microorganisms were portrayed within side the view of fact that "nightmare microorganism" which "destroy havoc" on humans. In each and every country on the planet. Soil samples containing antibiotic generating organism are generally hired for the manufacturing of appropriate antibiotics. Antimicrobial marketers or antibiotics are the maximum considerable commercially to be had and applied secondary metabolites, that are particularly produced via way of means of the soil microbes (microorganism and fungi) and located to be powerful and wide spectrum. Microbes produce metabolic products (antimicrobial marketers) via the system known as antibiosis. Majority of the instructions of antibiotics used are derivatives of animals (microbes) and floras (plants). Isolated antibiotic can be bactericidal or bacteriostatic in nature. Thus, the goal of this paper is to study on antibiotics resistance and similarly to propose on it's manipulate measures.
KEYWORDS: -*Antibiotics, Bacteria, Microorganisms, Antibiotic resistance, Antimicrobial agent.*

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INTRODUCTION

There is universal distribution of antibiotics in the nature among the microorganisms owing to which they are involved in hostility (1). Antibiotics are the best known outcome of actinomycete. Further than 5,000 antibiotics have been linked from the societies of Gram-positive and Gram-negative organisms (2). Antibiotics are natural substance of natural, synthetic or semi-synthetic origin and continue to play an important role in the development of tissue culture techniques and basic screenings, primarily in biochemistry, molecular biology, microbiology and genetic sand to a lower extent, pharmacology and organic chemistry (3, 4). Soil is a complex and veritably different environment providing versatile source of antibiotic producing organisms (5). Antibiotics produced by microorganisms have been useful for the cure of certain human diseases caused by bacteria, fungi and protozoa (6). The genus, Streptomycete, is accountable for the formation of extra than 60 % of acknowledged antibiotics at the same time asin addition 15 % are made via way of means of some of associated Actinomycetes, Micromonospora, Actinomadura, Streptoverticillium and Thermoactinomycetes. Antibiotics, because of their artificial significance, are the best known products of actinomycetes (8). Microorganisms constitute an inexhaustible reservoir of compounds with pharmacological, physiological, medical or agricultural applications (9,10). Each year nearly 500 antibiotics were found, in which 60% of antibiotics are obtained from the soil (11). Most antibiotic utilized today are isolated from soil bacteria and recounted for their antibiotic production. Bacillus species being the now no longer unusual place soil bacteriahad been decided limiting the boom of the opportunity organisms due to their resistant endospore long-established and production of critical antibiotics such as bacteriocin (12). Bacillus species are gram positive, rod shaped, sporulating and cardio or facultative anaerobic microorganism that were most ample bacterial strains found within the soil which were proficient of manufacturing dozens of antibiotics (13, 14). However, these microbial populations within the soil depends on the varied factors like Soil type, water activity, oxygen, pressure, temperature, salt concentration, carbon sources, pH and different factors. Recent analyses have proven that screening of soil for antimicrobial sports had been finished in lots of

components of the world (15). Several thousand antibiotics are isolated from soil microorganisms since the invention of penicillin, but unfortunately these are limited only to fifty, most of them being too toxic to humans (16). According to the food and drug management about 80% of antibiotics comprised of herbal habitat are fed to animals and only 20% of them are used to cope with infections within side the humans. The introduction of antibiotics into clinical use was arguably the greatest medical breakthrough of the 20th century (17). Selman Waksman, a well-known researcher in the field of actinomycetes in the early part of the twentieth century, narrated the term antibiotic as a chemical compound generated from microorganisms that stops or destroys other microbes (18, 19). Penicillin was the initial natural antibiotic to be discovered accidentally by Alexander Fleming in the year 1928 when the *Penicillium* fungus contaminated a culture plate in his laboratory, penicillin was not expanded for use until the late 1930s (18). The destiny fundamental discovery passed off in 1943, deriving in reputation of streptomycin produced with the aid of using Streptomyces griseus. With the invention of streptomycin, the golden age of discovery of antibiotic and development (1940–1990) ensued (18). Of all the antibiotics discovered between 1945 and 1978, 55% came from the genus Streptomyces (19). In the Golden Age of antibiotic discovery, new antibiotic classes were being discovered on yearly basis by isolation of antibiotic-producing organisms from soil sample (17). In the centre of the year 2000 and 2015 antibiotic intake in seventy six international locations across the world, reveled in described each day doses (DDDs), more advantageous 65% and, in 2015, reached forty two billion DDDs. Among high-income countries, the prime consumers of antibiotics in 2015 were the United States, France, and Italy. Prime consumers of antibiotics between low and middle-income countries were India, China, and Pakistan (20). According to European Centre for Disease Prevention and Control (ECDC) it has been expected that during 2030 global antibiotics intake would be will be 200% higher than in 2015, with the finest growth coming from moderate and middle-earnings countries.

TABLE 1: List of some microorganisms that produces antibiotic.

NAME OF MICROORGANISM	ANTIBIOTIC PRODUCED
Streptomyces sp	Cephamycin
Streptomyces capreolus	Capreomycin
Paenibacilluspolymyxa	Colistin
Streptomyces aureofaciens	tetracyclines
Penicilliumchrysogenum	Amoxicillin
Penicilliumnotatum	penicillin G
Streptomyces orchidaceus	Seromycin
Streptomyces griseus	Streptomycin
Saccharopolyspora Erythraea	Erythromycin
Streptomyces rimofaciens	destomycin
Acremonium chrysogenum	Cefacetrile

ANTIBIOTIC RESISTANCE

Antibiotics are chemical agents that prevent bacterial growth by stopping the bacterial cell from dividing or by killing them. Antibiotics are materials of microbial origin while "antimicrobial" refers to any substance including synthetic compounds which destroys microbes. In order to appreciate the mechanisms of resistance, it is important to understand how antimicrobial agents act. Antibiotics are used to treat or prevent disease in human and animals. The depletion in death afforded by effective antibiotics for bacterial infections of all types, ranging from simple skin infections to infections of the bloodstream, lung, abdomen, as well as brain, so enormous that the lives of human and animals are saved on account of treatment by using antibiotics (21). Antibiotic resistance can be acquired via horizontal gene transfer (HGT) between cells, even between those of different species or genera (22). HGT is believed that it takes place via mobile genetic elements, such as plasmids, transposons, integrons and prophages, as indicated by the fact that identical sequences of drug-resistance genes have been identified in the DNA of environmental and clinical bacterial strains. Studies have also recognised higher numbers of ARGs in the genomes of modern strains of some bacteria (e.g., The genera Pseudomonas and Clostridium) than in traces recovered from the microbiome of historic human ancestors, suggesting that resistance gene switch and large-scale antimicrobial use have greater appropriate the acquisition of ARGs (23). The foundation of antibiotic resistance genes are unclear; however, research the use of medical isolates accumulatedearlier than the creation of antibiotics validated susceptibility, although, conjugative

plasmids had been present. Resistance is frequently associated with reduced bacterial fitness, and it has been proposed that a reduction in antibiotic use will pose selective stress to gather resistance might advantage the more fit inclined bacteria, allowing them to outcompete resistant traces over time. Guidelines exist for responsible (proper, appropriate, prudent, or judicious) use of antibiotics in veterinary and human medicine, and are comparable within side the clinical and agricultural sectors (24).

MECHANISMS OFACTION OF ANTIBIOTICS:-

One of the most common mechanisms of action is targeting the cell wall, which is present in bacteria but absent in humans. Antimicrobial agents act widely on vital microbial functions with minimal effects or without affecting host functions. Different classes of antibiotics retain specific modes of action by which they inhibit the growth or kill bacteria (22).

THE FATE OF ANTIBIOTICS IN THE ENVIRONMENT:-

There are three distinct routes for releasing antibiotics into the environment which can be differentiated as: feed additives for stockbreeding and fish aquaculture, human and veterinary drugs, and environmental release during production. The rate of antibiotic excretion is believed to vary according to the chemical structure and applied dosage, as well as the animal age and species (24).A remarkable amount of antibiotics, and also their degradation products and bioactive metabolites, have been introduced into water and agro-ecosystems through fertilization and irrigation with antimicrobial-polluted sewage sludge, manure, bio solids, sediment, and reclaimed water, arising in their accumulation in the water, including groundwater and agro-ecosystems (25).

Biodegradation is dependent on numerous factors, like the composition of the microflora, pH, temperature, and humidity. Non-biotic degradation also take place via hydrolysis, oxidation, reduction, or photolysis, and also depends on many physicochemical properties and environmental conditions. Residues of synthetic and semi-synthetic antibiotics, like fluoroquinolones and sulfonamides, are more chemically stable and less susceptible to bacterial degradation processes; therefore, their residues are often detected in the environment (25,26). A group of 90 pharmaceutical factories in India releases wastewater with a content of about 30 mg/L of ciprofloxacin, which results in the deposition of several kilograms into the environment every day and hence many tons a year; consequently, the waters of the lake near the factories have been found to demonstrate a ciprofloxacin concentration as high as 6.5 mg/L.The residues can exert an influence on human health through the consumption of contaminated water and agricultural products, resulting in the development of cancer, allergic reactions, or disorders in the composition of natural intestinal microflora (26). Naturally, many microorganisms are involved to produce different types of antibiotics which displays different mode of action on various species (Table 1.).

CONCLUSION

To fight this trend and cover the effectiveness of existing antibiotics, current efforts are focused on limiting the large-scale and inappropriate use of antibiotics. The use, misuse and overuse of these medicines contributed favourable conditions for the emergence, occurrence and development of antibiotic resistant bacteria. Still, detailed knowledge about the rates of dissemination and degradation of different antibiotic classes in the environment must be acquired. Though the impact of antibiotic resistance is magnificent, there's none the less insufficient surveillance and some distance little interest on rational use of medication to limit antibiotic resistance. Notably, search for new antimicrobial drugs is ongoing to combat infections caused by resistant pathogens.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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