

6.3_A

Word	Part of speech	Similar word
adverse /'ædvɜːs/		
therapeutic /ˌθerə'pjʊːtɪk/		
substances /'sʌbstənsɪz/		
toxic /'tɒksɪk/		
characteristics /ˌkærəktə'rɪstɪks/		
effective /ɪ'fektɪv/		

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Answers

Word	Part of speech	Similar word
adverse /ˈædvɜːs/	adj	harmful
therapeutic /ˌθerəˈpjʊːtɪk/	adj	healing
substances /ˈsʌbstənsɪz/	n [C]	chemicals
toxic /ˈtɒksɪk/	adj	poisonous
characteristics /ˌkærəktəˈrɪstɪks/	n [C]	properties
effective /ɪˈfektɪv/	adj	successful

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Answers

Aspects of pharmacology

An understanding of the principles of pharmacology has long been regarded a key component in the study of medicine. From the Greek *pharmakon*, pharmacology is the branch of medical science that deals with the mechanism of actions, beneficial uses, adverse effects and outcomes of drugs on animals and humans. It examines the way in which drugs produce both healing effects and harmful side effects on the body.

Students of pharmacology examine the different ways in which the biochemical, physiological and psychological processes of the body are changed by drugs. As a scientific discipline it dates from the mid-1800s, but the study of the therapeutic and poisonous effects of different substances has evolved over many centuries and has been influenced by many different cultures. It is possible to divide the discipline of pharmacology into a number of distinct areas. Firstly, there is autonomic pharmacology, which studies the effects of drugs on different parts of the autonomic nervous system. Another important area is biochemical pharmacology, which studies the effects which different drugs have on the functioning of cells. Toxicology looks at the adverse effects of drugs and chemicals; this includes harmful side effects of therapeutic drugs, the effects of drugs which are deliberately used as poisons, and also the effects of environmental chemicals on the human body. Molecular pharmacology is concerned with the design of drugs at a molecular level.

Initially, the discovery of drugs and medicinal plants took place largely through trial and error. Across the world, as tribal peoples foraged for food, they soon realized that their local woodland areas harboured a variety of roots, barks, berries and leaves that were not only sources of food but also in some cases could be healing, soothing or even poisonous. For example, the indigenous people of South America discovered the first muscle relaxant: a toxic drug called curare that they smeared onto the tips of their spears to immobilize animals when hunting. Today, a drug which possesses similar characteristics is still used by doctors to relax their patients' muscles during surgery. Another early discovery was cocaine, which originates in South America and which was traditionally used as an appetite suppressant and stimulant. In medicine it was used as a local anaesthetic.

Developments in pharmacological knowledge helped to transform traditional treatments into drugs which could be manufactured cheaply and in large quantities. For example, in 1897, German chemists synthesized chemical compounds similar to those found in the willow bark which the inhabitants of Peru used to treat fevers and headaches. The result was aspirin, which was much cheaper to produce and had fewer side effects than the original compounds. Advances in chemical knowledge also helped to turn new discoveries into drugs suitable for everyday use. The discovery that the penicillin fungus could kill bacteria was a major breakthrough for science, but it was only by identifying penicillin fungi which produced compounds with similar chemical properties in much larger quantities that large-scale production of antibiotics became possible.

Understanding how drugs achieve their effects at a cellular level helps researchers to find new and better drugs. While the mechanism of penicillin was not known at first, pharmacologists found that it worked by disrupting enzymes called penicillin-binding proteins (PBP), which are responsible for building the bacterial cell wall. This detailed knowledge about how the drug interacts with the cell led to the development of other antibiotics with the same mechanism. Knowledge about cell interactions can also help with developing new antiviral drugs. For example, the anti-HIV drug AZT uses a mechanism which disrupts an enzyme which the virus needs in order to reproduce, and thus slows the progress of the disease. By creating different compounds which can interfere with this enzyme, pharmacologists can identify new drugs to combat diseases caused by similar viruses.

Developing new treatments requires a combination of existing and new knowledge, particularly when new diseases emerge. During the search for a cure for HIV/AIDS in the 1980s, existing drugs which targeted cell reproduction were investigated in detail. It was found that AZT, which had been developed in 1964 and found ineffective as cancer treatment, was very effective against AIDS. Another more recent example of old and new knowledge combining was in 2009, when researchers discovered that the effectiveness of standard doses of Tamoxifen, a cancer treatment drug in use since 1977, could be predicted by analyzing a patient's DNA. This led to the successful use of genetic testing to predict individual responses to various other drugs. This development, which represents a pharmacological discovery of historical importance, is likely to have far-reaching consequences for the future of medicine.