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Opinion Article

Enhancement of the Clinical Application Potential of Nanomedicine Based on Natural Products

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DESCRIPTION

Natural products from plants, animals, and microorganisms provide abundant sources for new compound identification in the search for lead compounds to cure diverse human ailments. It is commonly accepted that natural materials have a more varied structure than manufactured substances. In addition, compared to synthetic chemicals, the majority of natural products have great biological activity, ideal adsorption, appropriate distribution, acceptable metabolism, and elimination properties. Distinct natural products engage different signal transduction pathways to treat illnesses by regulating many targets, which has more therapeutic potential than pharmaceuticals targeted at a single site. This is especially useful for treating multifactorial and complicated disorders.

As a result, natural products offer both immediate treatment and great precursor structure. There are currently 2 million species of plants, animals, bacteria, and fungus, of which 95%have not had their biological activity assessed. It is necessary to find more profitable and bioactive natural items because developing synthetic compounds and a wide range of natural products is expensive. Natural products therefore merit consideration since they show significant promise for the discovery, development, and use of medications.

Although natural products' pharmacological activity and therapeutic potential for treating human ailments are acknowledged, their application and development are constrained by their physiologic susceptibility and low bioavailability. By enhancing bioavailability, targeting, and controlled release, nanotechnology offers an efficient method for delivering natural compounds to adapt to valuable clinical uses.

Due to the ease of obtaining plants, plant-derived natural compounds have been a major factor in the development of drugs. Early humans understood that plants might be used therapeutically to treat illnesses. These herbs are mentioned in several written records, and they have demonstrated their medical efficacy in actual practice. About 80% of the world's population relies on conventional botanical medicines, and as of now, about 60% of pharmaceutical preparations on the market are made from botanical natural materials. The antimalarial drug artemisinin, the anticancer agent paclitaxel and its derivatives, and the cardio-cerebrovascular drug ginkgolide are some of the "hot" drugs garnering international interest.

Antibiotics are frequently used to treat infectious disorders because they prevent the growth of harmful microorganisms and other microbial competitors in the environment. Natural compounds produced by microorganisms are crucial in the discovery and creation of antibiotics. The majority of naturally occurring antibiotics with therapeutic action come from microorganisms. Since the discovery of penicillin by British bacteriologist Alexander Fleming—the first antibiotic ever—it has ushered in a golden age of organic medicines made from microbes to cure human illnesses. A single microbe can produce up to 50 secondary metabolites, which can be used to create antiviral medications, anticancer treatments, and immunosuppressants. Of course, microbial products are not only restricted to antibiotics.

It is well known that the oceans make up more than 70% of the earth's surface and 90% of the volume of the biosphere. Because of the constraints of science, technology, and human cognition, terrestrial species have traditionally been the focus of medication discovery based on natural products. Natural goods made from marine organisms are thus a neglected resource. Due to advancements in science, engineering, and technology, people started to pay more attention to marine life. Because these species must deal with high pressure, high salt concentrations, cold temperatures, and low oxygen levels in the marine environment, it differs greatly from the terrestrial habitat.

CONCLUSION

The use of nanotechnology in drug delivery has improved the management of many different human diseases. The development of suitable drug delivery techniques for hydrophobic medicines that are easily influenced by the environment depends mainly on this technique. Natural product research is currently being done by researchers who are aware of the significant potential of pharmacologically active natural

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products in the prevention and treatment of human diseases. Researchers are attempting to use a nanodrug delivery method in an effort to reduce application limits and increase efficacy. The use of nanodrugs containing paclitaxel, camptothecin, curcumin, or resveratrol in clinical studies has produced very encouraging outcomes. Some naturally occurring polysaccharide products exhibit favourable pharmacological properties and can be exploited.

Highlighting the benefits and potential of natural products in the nanodrug industry as great nanocarrier materials. Natural product-based nanopreparations have so far demonstrated improved stability and prolonged release capability in animal models, as well as optimum therapeutic benefits at low doses. This raises the security of continued use of this technology.

The clinical conversion of these nanodrugs is still difficult, nevertheless. Inconsistencies between the occurrence and progression of human and animal diseases could be one of the key causes. The need for long-term illness treatment necessitates that proposed nanodrugs meet a number of requirements, including stability in systemic circulation and release of effective drug concentrations in target locations without harming healthy tissues. It is important to note that drug-delivery nanoparticles have the potential to stimulate or inhibit the immune response and to remain in the body.

As a result, before advancing to the clinical stage, researchers must design the proper nanodrugs, modify them in accordance with the characteristics of the disease and the drug, and conduct extensive immunotoxicology research. In the future, a comprehensive clinical evaluation must be established to complete the transition from fundamental to clinical research, and detecting system.

In conclusion, the era of natural goods in nanomedicine has arrived. While there is still work to be done before this system is fully optimized, it is clear that nanodrugs based on natural chemicals have a wide range of potential applications in contemporary medicine.