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Perspective

Recent Advances in Nanoparticle Based Anticancer Drug

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ABOUT THE STUDY

Cancer is one of the most detrimental diseases which claim the lives of millions. Cancer is characterized by abnormal cell growth or uncontrolled cell proliferation. Cancer develops in every organ, but at widely different rates and with very different consequences. Breast cancer is defined as an abnormal growth of breast tissues that originate in the lining of the milk ducts or glands of the breasts. Mainly seen in women but also can appear in men. Chemotherapy, hormone therapy, human epidermal growth factor receptor HRE2 targeted therapy, and combinations of drugs are the current treatment options for breast cancer. Various drugs like Doxorubicin, Paclitaxel, Gemcitabine, Mutamycin, and Vinorelbine are used to treat breast cancer but they cause side effects. As a result, several natural products are used for breast cancer treatment. Conventional chemotherapy has limitations to cure breast cancer due to various side effects. However, always there is a need for nature-originated drugs which can effectively inhibit breast cancer. Therefore it's imperative to have a drug delivery system that can reduce these limitations.

Nanotechnology has a broad range of applications from industrial processes to biomedical applications. In recent years, the Nanoparticles drug system has received much attention, particularly in cancer-targeted drug delivery systems. Nanoparticles are nanoscale particles whose size ranges from 10 nm to 1000 nm. Because of their smaller size, they provide a more binding site to bind drug compounds on their surface. In addition to this benefit, nanoparticles also help in improving solubility. Nanocarriers could be promising drug delivery vehicles for enhancing the bioavailability of the drug at the targeted site. Different types of nanoparticles are being used in pharmaceuticals and nanomedicine. This could be also helpful in improving anticancer activity of it. Recently, albumin-based nanoparticles have been widely used as a nanocarrier to overcome the limitations of oral bioavailability, poor water solubility, and absorption. Among the albumin-based nanoparticles, Bovine Serum Albumin (BSA) seems to be a prominent system for drug delivery. BSA is a protein derived from cows, useful for drug delivery systems for its remarkable biocompatibility and biodegradable properties, nontoxicity, and non-immunogenicity also it is readily available. It has a molecular weight of 69,323 Da. BSA structure is homologous to the three-dimensional structure of Human serum albumin. The binding study of anticancer drugs and BSA was done by several authors by using Uv spectroscopy and Fluorescence spectroscopy. They studied electrostatic interactions between anticancer-BSA. The group of scientists evaluated the berberine-loaded BSA nanoparticles for liver fibrosis and breast cancer therapy. They reported that Berberine-loaded BSA nanoparticles were more efficient compared with the free Berberine for inhibiting the growth of LX-2 cells. The use of glucose instead of glutaraldehyde as a crosslinker for providing strength to the nanoparticles for drug delivery. Another study was evaluated the antidiabetic action of berberine encapsulated solid lipid nanoparticles. They also implemented these nanoparticles on hepatosteatosis. The developed polymer lipid hybrid nanoparticles by using a solvent evaporation method for enhancements of berberine oral bioavailability.

CONCLUSION

The identification of nanoparticle materials safe and effective in delivering therapeutic agents to target sites is essential. Protein polymers from natural sources are good materials for building Nano carrier systems. The commercial success of albumin-based nanoparticles has generated great interest in other proteins. By rationalizing protein nanoparticles based on their behavior and cancer cell biology in the tumor microenvironment, improved efficacy and safety of cancer treatment can be achieved. Although the application of protein nanoparticles for cancer therapy has already produced some exciting results and holds even greater promise in the future, comparison data on the performance and therapeutic efficiency of protein nanoparticles and other existing delivery systems are still lacking and represent a much needed area of research in the field.

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