Intravenous chemotherapy

Traditional treatment approaches for cancer involve intravenous chemotherapy or other forms of drug delivery. These therapeutic measures suffer from several limitations such as nonspecific targeting, poor biodistribution, and buildup of drug resistances. However, significant technological advancements have been made in terms of superior modes of drug delivery over the last few decades. Technical capability in analyzing the molecular mechanisms of tumor biology, nanotechnology–particularly the development of biocompatible nanoparticles, surface modification techniques, microelectronics, and material sciences–has increased. As a result, a significant number of nanostructured carriers that can deliver drugs to specific cancerous sites with high efficiency have been developed. This particular maneuver that enables the introduction of a therapeutic nanostructured substance in the body by controlling the rate, time, and place is defined as the nanostructured drug delivery system (NDDS). Because of their versatility and ability to incorporate features such as specific targeting, water solubility, stability, biocompatibility, degradability, and ability to reverse drug resistance, they have attracted the interest of the scientific community, in general, and nanotechnologists as well as biomedical scientists. To keep pace with the rapid advancement of nanotechnology, specific technical aspects of the recent NDDSs and their prospects need to be reported coherently. To address these ongoing issues, this review article provides an overview of different NDDSs such as lipids, polymers, and inorganic nanoparticles. In addition, this review also reports the challenges of current NDDSs and points out the prospective research directions of these nanocarriers. From our focused review, we conclude that still now the most advanced and potent field of application for NDDSs is lipid-based, while other significantly potential fields include polymer-based and inorganic NDDSs. However, despite the promises, challenges remain in practical implementations of such NDDSs in terms of dosage and stability, and caution should be exercised regarding biocompatibility of materials. Considering these aspects objectively, this review on NDDSs will be particularly of interest for small-to-large scale industrial researchers and academicians with expertise in drug delivery, cancer research, and nanotechnology [1].

1)
Khan MI, Hossain MI, Hossain MK, Rubel MHK, Hossain KM, Mahfuz AMUB, Anik MI. Recent Progress in Nanostructured Smart Drug Delivery Systems for Cancer Therapy: A Review. ACS Appl Bio Mater. 2022 Feb 28. doi: 10.1021/acsabm.2c00002. Epub ahead of print. PMID: 35226465.