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Short Communication

Vitamins based Nanomedicine Approach

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Abstract

Nanomedicine is still in the research process due to its wide applicability and recent discovery. Vitamin-based nanomedicine is very promising, and it is progressing rapidly. Nanomedicine is a novel technique for effective loading of active molecules and surface activation (e.g., antibiotics and functional groups)for active targeting to enhance therapeutic efficacy. The research results are intended to help the less fortunate and point the way to a better future.

Keywords: Nanocarriers; Nanoemulsions; Nanomedicine; Nanotechnology; Nanotubes; Vitamins

With the rapid advances in science and technology in recent years, nanotechnology (NT) has gained much attention in all disciplines. Due to its wide applicability in various fields, researchers and academicians are showing great interest in NT nowadays. Some of its applications include neutraceuticals (NC), Nanoemulsions (NE), nanomedicines (NM), nanoencapsulation (NEP), and many more. Understanding and controlling matter at the nanoscale is what NT is all about [1]. NM is the most advanced application of NT. In simple terms, the basic definition of NM is the application of NT to repair damaged tissue. The European Medicine Agency (EMA) defines NM as the application of NT in the establishment of a medical diagnosis or the treatment/prevention of disease. It exploits the improved and often novel physical, chemical, and biological properties of materials at the nanometer scale [2]. NM come in various forms like nanoparticles, liposomes, nanogels, nanoemulsions, nanotubes, and many others, most of which have been approved by various agencies for their diagnostic/therapeutic utility [3]. NM has achieved a high success rate due to its widespread applicability and a variety of forms, although the road ahead is not easy. Therefore, even today, many argue about earlier planning to meet all the requirements. Due to the enzymes and chemicals in the gastrointestinal membrane (GI), some vitamins are poorly absorbed. NM helps alleviate this problem while increasing the bioavailability of vitamins due to their remarkable absorption and distribution capabilities [4]. Considering the development and benefits of NM, the critical methods to achieve clinical significance include optimization of formulations, pharmacokinetic parameters, and clinical approval procedures required to commercialise NM. Therefore, with the advances in science and technology in recent years, ADME (absorption, distribution, metabolism, and excretion) evaluations of NM are of utmost importance [5]. The incorporation of vitamins into nano-based formulations improvesthe physical, chemical, and biological properties of the formulations at the nanometer scale. Therefore, the evaluation of various parameters is required,which vary depending on the route of administration and distribution [6]. The assessment of vitamins-based nanomedicines (VBNM) de-

pends on whether or not orally administered NM are present in the gastrointestinal tract in nanoforms. Thus, with proper evaluation and techniques, various nano-based vitamin formulations can be produced in the future with improved properties to meet the global demand for NM [7]. Recently, D-α-tocopheryl polyethylene glycol succinate (Vitamin E TPGS or TPGS) has been approved by FDA as a safe excipient and is widely used in drug delivery systems. The physicochemical and biological properties of TPGS show multiple merits for its utility in drug delivery like greater biocompatibility, improved drug solubility, enhanced drug permeation,and selective anti-tumour properties [8,9]. However, due to the many challenges faced by TPGS-based NM, more detailed research on TPGS properties and NM-based delivery systems is needed in the future. In the same sense, mathematical optimization can help study the binding kinetics and diffusion of nanoparticles so that targeted nanoparticles can penetrate deep into tumour tissues [10].

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