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A REVIEW PAPER ON NANOMEDICINE RESEARCH

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ABSTRACT: The use of nanotechnology in medicine is already contributing to global health, and its impact on the pharmaceutical industry is widely expected to increase significantly as potential opportunities for clinics advance. The potential benefits are often overstated in many academic and industrial research activities or proposed innovations are inferred to be very close to implementation while there are still strong obstacles in their translation to the market. This chapter has been written to summarise, with a particular clinical focus, the principles of nanotechnology applications in medicine and briefly review the history behind today's advances. Different nanomaterial strategies have been developed and will be classified and defined, while exploring the medical advantages of such systems and addressing the promises and risks of nanomedicine. Along with a critique of possible potential advances in the area, several of the latest clinically accessible nano medicines will be discussed.

KEYWORDS: Clinical, Drug, Medicine, Nanomedicine, Polymer.

INTRODUCTION

Homogenization, where the drug powder is again dispersed into a liquid (typically water) along with stabilisers, is another top-down process. The dispersion of drug particles is usually forced through a narrow aperture and the effects on the surrounding liquid create cavitation forces that contribute to a reduction in particle size. High-pressure homogenization is most widely used, using pressures of up to 4000 bars[1]. The residence time within the processing machinery and the localised temperatures that can be produced in both cases, milling and homogenization, make it difficult to process APIs that may degrade in water or at elevated temperatures. It is also very difficult to process low-melting point materials in this way, and reports of impurities from the degradation of milling/homogenization equipment have also been reported[2].

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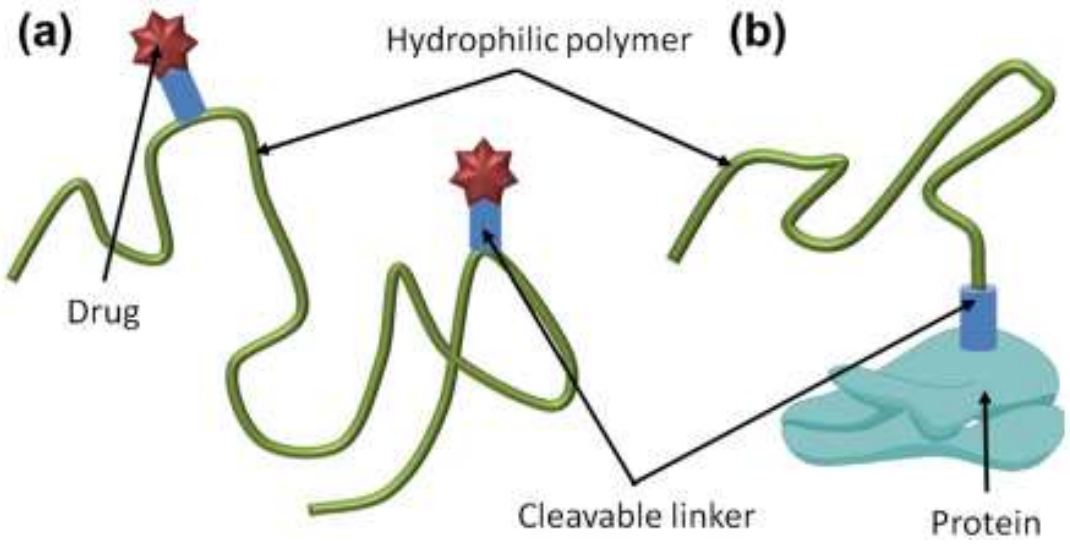

Figure 1: (a) Polymer drug conjugate (b) Polymer protein conjugate[3]**.**

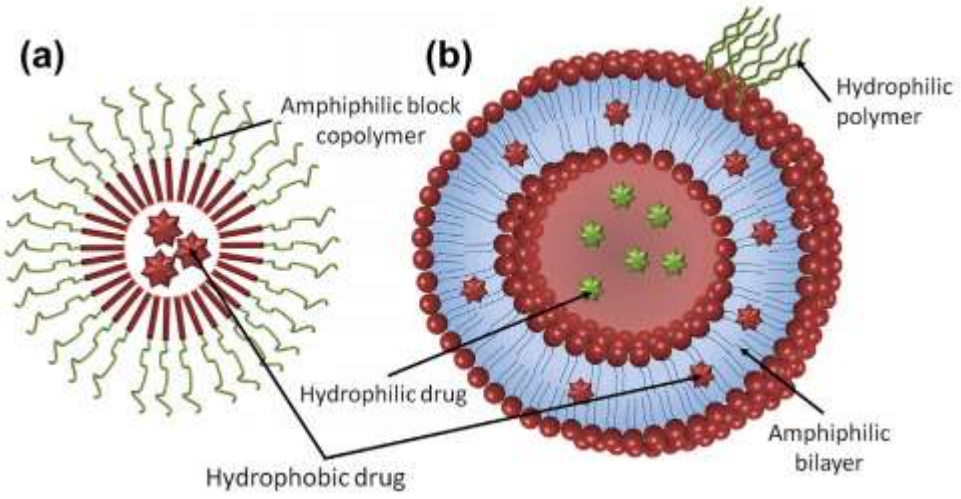

Figure 2: Illustrates the (a) Polymer micelle (b) Liposome[4]**.**

Using a variety of polymerization techniques, such as free radical polymerization, controlled radical polymerizations, and ring-opening polymerization approaches, amphiphilic polymers used in clinical and developmental nanomedicine to manufacture polymer micelles can be obtained. In general, polymer micelles with encapsulated API are produced using one of two methods: dialysis or evaporation of emulsions. In a mixture of water and a water-miscible organic solvent, dialysis

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allows the drug and polymer to be dissolved, which is then separated using a dialysis membrane and pure water[5].

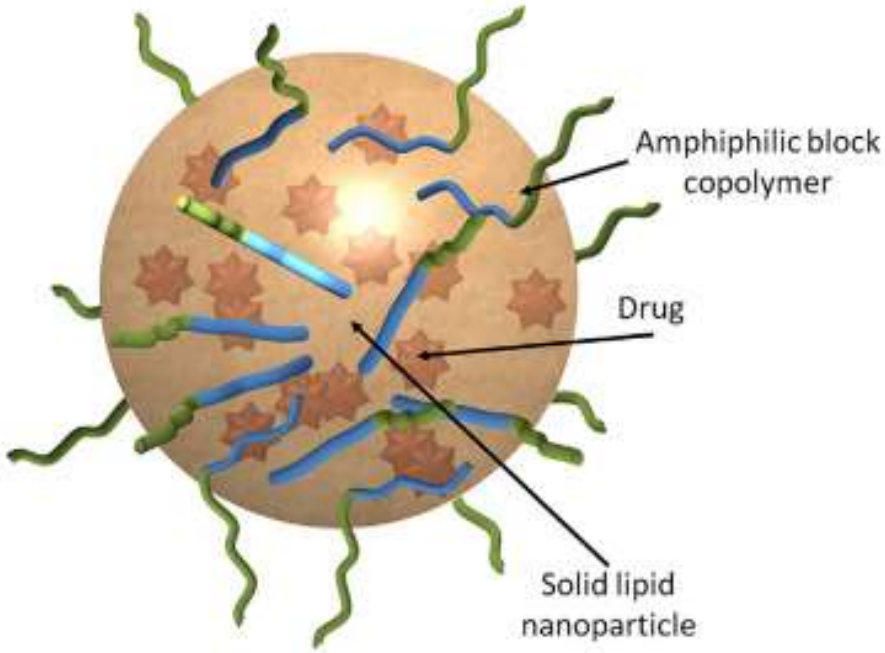

Figure 3: Illustrates the schematic representation of a solid lipid nanoparticle[6]**.**

DISCUSSION

Polymer nanoparticles are typically characterised as the nano carrier by providing a solid or semisolid polymer nanoparticle and biodegradable polymers and non-toxic monomers are chosen to facilitate clearance after drug delivery of the nano carrier materials. Comonomers may be used to integrate additional features, as with other polymer-based materials[7], and the addition of surface groups for targeting is also possible. The API can be loaded into the nanoparticle by trapping a drug within the particle or by linking the drug molecules covalently through a cleavable linker to the polymer backbone (in a similar approach to polymer therapeutics)[8].

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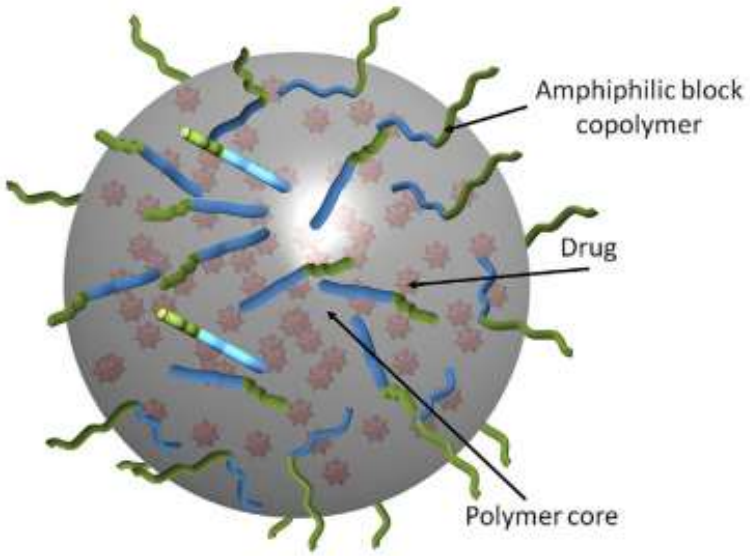

Figure 4: Depicts schematic representation of a solid polymer nanoparticle[9]**.**

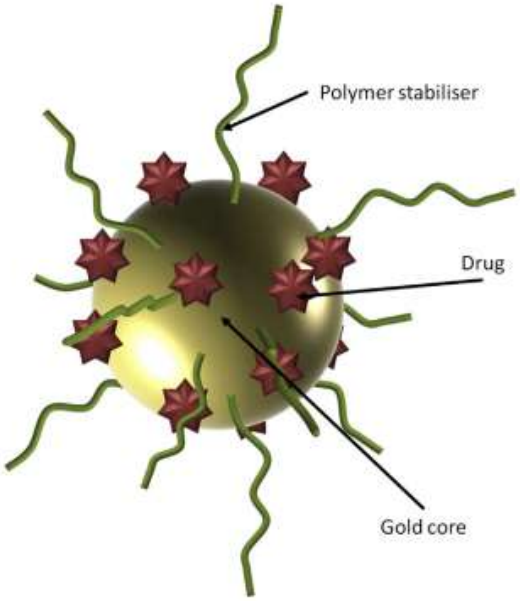

Figure 5: Depicts representation of a gold nanoparticle[9]**.**

Figure 1 shows (a) Polymer drug conjugate (b) Polymer protein conjugate. Figure 2 illustrates the (a) Polymer micelle (b) Liposome. Figure 3 illustrates the schematic representation of a solid lipid nanoparticle. Figure 4 depicts schematic representation of a solid polymer nanoparticle. Figure 5 depicts representation of a gold nanoparticle.

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CONCLUSION

Analysis of nanomedicine in clinical trials shows that there will be more nano-materials-based drugs on the market in the future. Most of these would be for cancer treatment and will concentrate on liposomes, solid lipid nanoparticles, polymer therapeutics, and SDN technologies, although alternative nano materials such as polymer nanoparticles are becoming increasingly common. Published examinations and reviews of nanomedicine patents indicate that interest in nano-materials such as SDNs and metal nanoparticles is on the increase, with 57% of patents filed describing such materials between 2007 and 2011. Interestingly, academic researchers tend to have filed a significant percentage of nanomedicine patents, suggesting that the field of nanomedicine is actually primarily dominated by academic science.

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