Nanoparticles: Future of cancer therapy

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Reports of cancer indicates a rapid increase in the rate of incidence. According to latest statistical report on cancer, the prevalence of cancer will be increased by more than by 15 million in the year 2020 globally [1]. However, advances in the cancer diagnosis and therapeutics have shown a dramatic improvement as reflected in the statistical reports of five-year survival rate from 2004-2010. This suggests 68% chance of survival in all cases of cancer diagnosed as compared to 49% in 1975-1977 in the US [2]. In spite of that, cancer continues to remain as one of the leading causes of death worldwide.

Treatment of cancer by conventional chemotherapeutics not only cause damage to cancer cell but also to the healthy cells, mutating them to “super cancer cells” which does not respond to aggressive methods of chemotherapy [3]. Overcoming such barriers of the conventional chemotherapeutic drugs advance nanotechnology in coordination with biotechnology and medicine has developed appropriate cancer nanotherapeutics to improve the drug delivery of cancer drugs by designing nanoparticles that can deliver the effective drug to the cancer sites using their unique

pathophysiology. Due to their ability to get accumulated within the cell, nanoparticles can remain incognito from the P-glycoproteins which are one of the primary causes of multidrug resistance developed during the longer duration of therapy which results in increased levels of drug concentration in the tumor cells (Figure 1) [4].

This review relates to the next generation of multiplex and multifunctional nanoparticles that are investigated and studied for cancer specific drug delivery.

Keywords: drug delivery, drug specificity, nanoparticles, nanotherapeutics, oncology

References

1. Kanavos, P., *Annals of Oncology*, 17(suppl 8), viii15-viii23, 2006
2. American Cancer Society. Cancer Facts & Figures 2015. Atlanta: American Cancer Society, 2015
3. Sun, Y., Campisi, J., Higano, C., Beer, T. M., Porter, P., Coleman, I. and Nelson, P. S., *Nature medicine*, 18(9), 1359-1368, 2012
4. Annette K. Larsen, Alexandre E. Escargueil, Andrzej Skladanowski, *Pharmacology & Therapeutics*, 85(3), 217-229, 2000

Figure 1: Effect of Drug carrier Nanoparticles. The nanoparticles bind to tumor cell with specific ligand leading to increase in its intra-cellular drug concentration without binding and damage to normal cell.