ISBN: 978-81-941253-2-7

# A COMPARATIVE STUDY ON NANOSUSPENSION

**Lipsa Samal[1]*, Gurudutta Pattnaik[2] and Himansu Bhusan Samal[3]**
[1,3]Assistant Professor, SPLS, CUTM, Odisha, India
[2]Professor, SPLS, CUTM, Odisha, India

**ABSTRACT**
*Many of the newly formulated drugs are poor water soluble and create major concern during formulation and shows poor bioavailability. The problem is even more complex for drugs which belong to BCS Class II (low solubility and high permeability) category. To overcome this concern nanotechnology is used to improve the solubility, permeability and bioavailability of poorly soluble drugs. Nanotechnology is defined as the science and engineering carried out in the nanoscale that is $10^{-9}$ meters. Nanosuspensions are a part of Nanotechnology. Nanosuspensions are defined as the submicron colloidal dispersions of pharmaceutical active ingredient particles in a liquid phase, size below 1µm, without any matrix material which are stabilized by surfactants and polymers. Nanosuspensions differ from nanoparticles and solid lipid nanoparticles with respect to the fact that nanoparticles are polymeric colloidal carriers of drug while solid lipid nanoparticles are lipid carrier of drugs. Preparation of nanosuspension is simple and applicable to all drugs which are water insoluble. Nanosuspensions are prepared by using wet mill, high pressure homogenizer, emulsion solvent evaporation, melt emulsification and supercritical fluid techniques. Nano-suspensions can be delivered by oral, parenteral, pulmonary and ocular routes. Nanosuspensions can also be used for targeted drug delivery when incorporated in the ocular inserts and mucoadhe-sive hydrogels. This review article mainly focuses on preparation of nanosuspension by various techniques with their advantages and disadvantages, formulation considerations, Characterization and their applications in drug delivery. Nanosuspension not only solves the problem of poor solubility and bioavailability but also alter the pharmacokinetics of the drug and thus improving safety and efficacy.*

*Keywords: Bioavailability, solubility, BCS Class, Nano suspension, Drug delivery, Nano- technology,*

## INTRODUCTION

More than 42% of the new chemicals being generated through drug discovery programmers are poorly water-soluble or lipophilic compounds. Formulating a poor water soluble drug has always been a challenging problem face by the pharmaceutical scientist. The formulation of nano-sized particles can be implemented to all drug compounds belonging to biopharmaceutical classification system (BCS) classes II and IV to increase their solubility and permeability hence ensuring free partition into gastrointestinal barrier. Micronization is used for class II drugs of (BCS), i.e. Drug with poor solubility and good permeability [1,2,18,29,46,53]. There are many conventional methods for increasing the solubility of poorly soluble drugs, which include micronization, solubilization using co-solvents, salt form, surfactant dispersions, precipitation technique, and oily solution. Other techniques includes liposomes, emulsions, microemulsion, solid dispersion and inclusion complexation using cyclodextrins[3,48,20,25,40,47,61,65] show result in some extent, but this does not applicable to all drugs specially for those drugs which are not soluble in aqueous and organic solvents. Nanotechnology can be used to solve the problems associated with these conventional approaches for solubility, permeability and bioavailability enhancement. Nanosuspension is favored for compounds that are insoluble in water (but are soluble in oil) with high log P value, high melting point and high doses. Nanosuspension technology can also be used for drugs which are insoluble in both water and organic solvents. Hydrophobic drugs such as Atorvastatin,[35] Famotidine,[30] Simvastatin,[36] Revaprazan,[16] Aceclofenac,[13] are formulated by the process of Nanosuspension .

Nanosuspensions are submicron colloidal dispersions of nanosized drug particles stabilized by surfactants. They can also be defined as a biphasic system contains pure drug particles dispersed in an aqueous vehicle in which the diameter of the suspended particle is less than 1µm in size. The Nanosuspensions can also be lyophilized or spray dried and the nanoparticles of a nanosuspension can also be incorporated in a solid matrix [2,5,6,8,9,10,38,49,61,68]. Nano is a Greek word which means ‘dwarf’. Nano means it is the factor of 10-$^{9}$ or one billionth.

1 nm = $10^{-9}$m= $10^{-7}$ cm = $10^{-6}$ mm. [4].