Research Journal of Nanoscience and Engineering
Volume 3, Issue 1, 2019, PP 10-12
ISSN 2637-5591

Preparation and Evaluation of Nimesulide Loaded Nanoparticles by Nanoprecipitation Technique

Abbaraju Krishna sailaja

RBVRR Women's college of pharmacy, Osmania University, Hyderabad.

***Corresponding Author:** Abbaraju Krishna sailaja, RBVRR Women's college of pharmacy, Osmania University, Hyderabad.*

ABSTRACT

Nimesulide loaded nanoparticles were prepared by nanoprecipitation technique. Ethyl cellulose was chosen as a polymer. The obtained nanoparticles were evaluated for product yield, drug content, and entrapment efficiency and loading capacity. The product yield, drug content, entrapment efficiency and loading capacity were observed to be 80.5%, 60.7%, 38.2% and 9.9% respectively. The SEM image clearly indicates the nanoparticles

INTRODUCTION

Nanotechnology can be termed as the synthesis, characterization, exploration and application of nano sized (1-1000nm) materials for the development of science. It deals with the materials whose structures exhibit significantly novel and improved physical, chemical, and biological properties, phenomena, and functionality due to their nano scaled size. Because of their size, nano particles have a larger surface area than macro-sized materials. Nano particles, because of their small size, have distinct properties compared to the bulk form of the same material, thus offering many new developments in the fields of biosensors, biomedicine, and bio nanotechnology. Nanotechnology is also being utilized in medicine for diagnosis, therapeutic drug delivery and the development of treatments for many diseases and disorders. Nanotechnology is an enormously powerful technology, which holds a huge promise for the design and development of many types of novel products with its potential medical applications on early disease detection, treatment, and prevention[1, 2].

NANOPRECIPITATION

Also known as the solvent displacement method, the basic principle of this method is based on the interfacial deposition of a polymer after displacement of a semipolar solvent, miscible with water, from a lipophilic solution. Rapid diffusion of the solvent into non-solvent phase results in the decrease of interfacial tension between the two phases, which increases the surface area and leads to the formation of small droplets of organic solvent. Nano precipitation system comprises of three basic components: the polymer (synthetic, semi synthetic or natural), the polymer solvent and the non-solvent of the polymer. Organic solvent (i.e., ethanol, acetone, hexane, or dioxane) which is miscible in water and easy to remove by evaporation is selected as the polymer solvent. Due to this reason, acetone is the most commonly employed polymer solvent in this method sometimes; it consists of binary solvent blends, acetone with small amount of water, blends of acetone with ethanol and methanol. On the other hand, the non-solvent phase consisting of a non-solvent or a mixture of non-solvents is supplemented with one or more naturally occurring or synthetic surfactants3, 4.

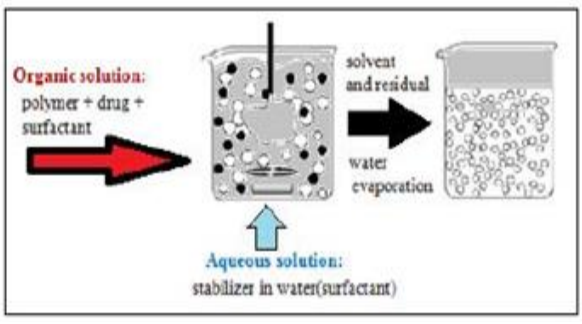


Fig1.2. *Schematic representation of Nano precipitation method*

Nano precipitation is an easy, fast and reproducible method which is widely used for the preparation of both nano spheres and nano capsules. Although low polymer surfactant concentrations are being used, challenges pertaining to low polymer concentration

in the organic phase need to be addressed5,6. Nimesulide (MA) is non-steroidal anti inflammatory drug (NSAIDS) that exhibits anti-inflammatory, analgesic activities. It is a BCS class-2 drug. It is available as tablets, capsules and suspension forms. The drug has wide range of gastrointestinal disorders, like gastrointestinal bleeding& gastric upset. It has poor solubility. The biological half-life of MA is 2-4hrs.It causes the cox-1 and cox-2 inhibition. By inhibiting COX1 receptors it causes severe gastric bleeding and peptic ulcers. By inhibiting COX2 receptors it causes severe cardiovascular side effects. Because of short half- life frequent administration of the drug is required which leads to missing the dose of the drug. Hence, formulating Nimesulide loaded nanoparticles can minimize the dose and dosing frequency and side effects7, 8.

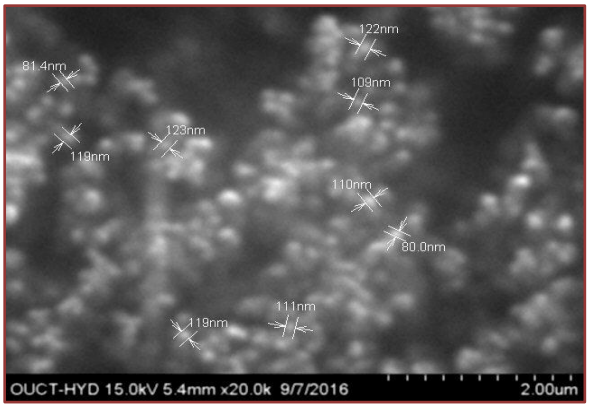
METHODOLOGY

Weighed quantities of drug and polymer were dissolved in 20 ml of acetone forming organic phase.500 mg of PVA (Polyvinyl alcohol) was taken in 100 ml of water which makes aqueous phase. The aqueous phase was kept under stirring at 700 rpm. Now the organic phase was added to the aqueous phase drop by drop. The stirring was continued until the formation of precipitate which was considered as the end point9, 10.

EVALUATION

Study of Surface Morphology of Nanoparticles by Scan-Ning Electron Microscope (SEM)

The prepared amorphous nanoparticles were dispersed in deionised water and sonicated for30 minutes. A circular metal plate is taken on to which carbon double tape (1mm×1mm) is stickered; a drop of the resultant nano dispersion is placed on to the tape and allowed to dry for a while. Then it is scanned under SEM for morphology [15]. The obtained nanoparticles were found to be spherical in shape[11].



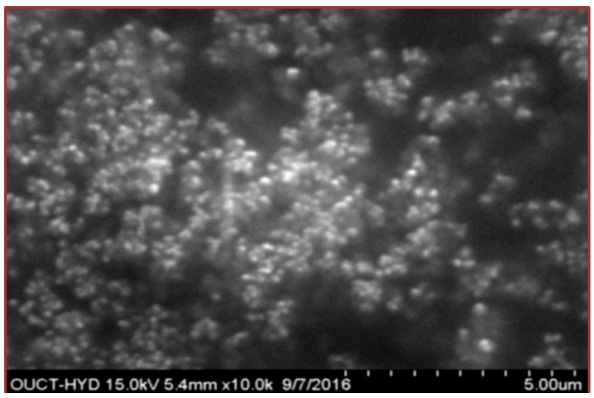


Fig1. *SEM images of the Nimesulide formulations*

The yields of the prepared nanoparticles were calculated. The dried nanoparticles were weighed and the yield of Nano-particles was calculated using the formula:

Product yield= (Amount of nanoparticles obtained ÷ Theoretical yield) × 100

To determine the drug content, 50mg drug equivalent to formulation was weighed accurately and transferred into three necked RBF containing 50ml of methanol. The solution was stirred at 700rpm for 3hrs by using magnetic stirrer. The resultant solution was filtered and the amount of the drug in the filtrate was estimated after suitable dilution by ultraviolet (UV) spectrophotometer. The product yield was found to be 80.5% Drug content

Entrapment Efficiency

Entrapment efficiency indicates the amount of drug encapsulated in the formulation. The method of choice for drug content determination is separation of free drug by ultra Centrifugation, followed by quantitative analysis of the drug from the formulation. The samples were centrifuged by using ultracentrifuge at 17640 rpm for 40min.

Percentage entrapment efficiency may be calculated from the following formula:

Entrpment efficiency =

Total amount of drug entrapped

----------×100

Total drug added

The Entrapment efficiency was found to be 38.2%

Loading Capacity

The loading capacity (L.C) refers to the percentage amount of drug entrapped in nanoparticles.

Loading capacity is given by following formula

$$\frac{\text{Total amount of drug entrapped}}{\text{Total weight of nanoparticles}} \times 100$$

The loading capacity was found to be 9.9 %

CONCLUSIONS

Nimesulide loaded nanoparticles were prepared by nanoprecipitation technique using ethyl cellulose as a polymer**.** The SEM images revels the formation of nanoparticles**.** The product yield and drug content were found to be 80.5%, 60.7%, respectively. The entrapment efficiency and loading capacity were observed to be 38.2% and 9.9% which has to be improved. Further studies have to be conducted to improve the entrapment efficiency of the formulation.

REFERENCES

[1] Heidari A, (2016) 'Pharmaceutical and Analytical Chemistry Study of Cadmium Oxide (CdO) Nanoparticles Synthesis Methods and Properties as Anti-Cancer Drug and its Effect on Human Cancer Cells', *Pharm Anal Chem,* 2:113.

[2] Iain B. McInnes, F.R.C.P., Ph.D., and Georg Schett, (2011) 'Mechanisms of Disease, The Pathogenesis of Rheumatoid Arthritis', *The new England journal of medicine,* **4** (8), pp.461-473.

[3] Javadzadeh Y, Ahadi F, Davaran S, Moham madi G, Sabzevari A, Adibkia K, (2010) 'Preparation and physicochemical character ization of Naproxen-plga Nanoparti cles', *Co lloids And Surfaces B: Bio interfaces,* pp.498-502.

[4] Jawahar N, Meyyanathan S N, (2012) 'Polymeric Nanoparticles for Drug Delivery and Targeting: A Comprehensive Review', *International Journal of Health and Allied Sciences*, **1**, pp.217-223.

[5] Joseph Govan and Yurii K Gun ko, (2014) 'Recent Advances in the Application of Magnetic Nanoparticles as a Support for Homo geneous Catalysts', *Nanomaterials (Basel).* **4**(2), pp.222–241.

[6] Kayser O, (2000) 'Nanosuspensions for the formulation of aphidicolin to improve drug targeting effects against Leishmania infected macrophages', *Int J Pharm*,**196**, pp. 253–6.

[7] Kishwar Khan, SarishRehman, Hafeez Ur Rahman, Qasim Khan, (2011) 'Synthesis and Application of Magnetic Nanoparticles'. *Nanomagnetism*, **1** pp. 136-153.

[8] KonwarRanjeet, Ahmed Abdul Baqee, (2013) 'Nanoparticle: An overview of preparation, characte rization and applications', *Interna tional Research Journal of Pharmacy'*, **4**(4), pp.47-57.

[9] M.Breunig, S.BauerA. Goepferich, (2008) 'Polymers and nanoparticles: Intelligent tools for intracellular targeting', *European Journal of Pharmaceutics and Biopharmaceutics*, **68**(1), pp.112-128

[10] MeenakshiDadwal, (2014) 'Polymeric nano particles as promising novel carriers for drug delivery: An Overview', *Journal of Advanced Pharmacy Education & Research.*, **4** (1), pp.20-30.

[11] FengYang, De Liang, FuJiang Long, Quan Xing Ni, (2008) 'Magnetic lymphatic targeting drug delivery system using carbon nanotubes ' , *Medical Hypotheses*, **70**(4), pp.765-767.

Citation: *Abbaraju Krishna sailaja, "Preparation and Evaluation of Nimesulide Loaded Nanoparticles by Nanoprecipitation Technique", Research Journal of Nanoscience and Engineering, vol. 3, no. 1, pp.10-12, 2019.*