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A New Method for Promoting Biologic Synthesis and Reducing the Size of Titanium Dioxide Nanoparticles (Tio2 NPs) Synthesized by Origanum Vulgare

Mahmoud Bahmani^{1*}

¹Biotechnology and Medicinal Plants Research Center, Ilam University of Medical Sciences, Ilam, Iran

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*Correspondence to:

Mahmoud Bahmani mahmood.bahmani@gmail.com

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Abstract

As it is known the particle size is the most important issue in the preparation of nanoparticles. Nowadays, conventional drug therapy is characterized by limited effectiveness and undesirable side effects which are due to the lack of selectivity and poor distribution. Hence, reduction of particle size is considered as an approach to reduce toxicity, increase release and bioavailability, improve solubility, and produce a better formulation for a higher quality. Therefore, reduction of the particle size of nanoparticles is important. We would like to present a new method we used to reduce the particle average size to 64 nm. In the study of Sankar et al. an aqueous extract was used to prepare the nanoparticle and the size of the titanium dioxide nanoparticle synthesized with aqueous Origanum vulgare extract in a Dynamic Light Scattering Analysis was 341 nm. We used hydroalcoholic extract and prepared titanium dioxide nanoparticles by using O. vulgare hydroalcoholic extract. The size of prepared nanoparticles was 64 nm which is about one-fifth of the nanoparticle sizes produced in Renu Sankar et al. study.

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Dear editor:

As you know the particle size is the most important issue in preparation of nanoparticles. In fact nanoparticles are usually characterized and evaluated by three factors including nanoparticle size distribution and morphology, particle size being the most important factor. The size of nanoparticle has substantial effects on drug release and drug

delivery. Smaller sizes of nanoparticles which enhance the surface areas, significantly increase drug release. Furthermore, it has been suggested that degradation of polymers might be affected by the size of nanoparticle and there is a compromise between small particle size in nanoparticles and maximum stability [1,2]. Nowadays, conventional drug therapy is characterized by limited

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effectiveness and undesirable side effects which are due to lack of selectivity and poor distribution. Hence, delivering the therapeutic materials to a desirable site is one of the most important issues in management of diseases.

release and bioavailability, improve solubility and produce a

better formulation for a higher quality. Therefore, reduction

of the particle size of nanoparticles is important. In a

manuscript entitled "Wound healing activity of Origanum

vulgare engineered titanium dioxide nanoparticles in Wistar

albino rats" by Sankar et al. published in 2014 [3], the

aqueous extract was used to prepare the nanoparticle and

the size of the titanium dioxide nanoparticle synthesized

with aqueous marjoram extract in a Dynamic Light

Scattering Analysis was 341 nm.We would like to present a

new method we used to reduce the particle average size to 64

nm. In the study of Sankar et al. an aqueous extract was used

to prepare the nanoparticle and the size of the titanium

dioxide nanoparticle synthesized with aqueous marjoram

extract in a Dynamic Light Scattering Analysis was 341 nm.

We used hydroalcoholic extract and prepared titanium

dioxide nanoparticles by using marjoram hydroalcoholic

extract. The size of nanoparticles we prepared were much

smaller average size (64 nm), which are about one-fifth of

the nanoparticle sizes produced in Renu Sankar et al. study.

We believe the main reason for this is related to ethanol,

because alcoholic solvents are more capable of extracting all

the substances compared to aqueous solvent (Fig. 1).

Enhancing the selective drug delivery undoubtedly reduces these limitations through delivering drug to the action site Figure 1. Scaning electron microscope (SEM) of titanium and enhancing drug concentration in a target tissue. This dioxide nanoparticles synthesized with Origanum vulgare also reduces the side effects of drug by reducing the required hydroalcoholic extract drug doses. Such type of therapy is required when there is a The method we used for preparation of hydroalcoholic discrepancy between the dose of a drug and its therapeutic extract was as follow: 200 g of powder of each plant was results or toxic effects. Hence, reduction of particle size is mixed with ethanol (Nasr, Iran) and distilled water (70:30). considered as an approach to reduce toxicity, increase After 4 h shaking, the herbal solution was left in the

laboratory for 24 h. Then, the mixture was passed through a filter paper, and the solvent was isolated from the extract using a rotary evaporator (IKA® RV10) under vacuum condition at 70°C and 150 rpm. The concentrated extract of the plant was poured into the plate and dried. For green synthesis of titanium dioxide (Tio2) nanoparticles (NPs), 1000 mg of hydroalcoholic H. perforatum, O. vulgare extracts and 30 mg of carvacrol or hypericin were added to 90 mL of titanium isopropoxide (with 5 mM) in an Erlenmeyer flask with shaker. Each 30 min of shaking the solution, it was increased to 5 min at 50°C to synthesize the materials and compounds. Afte 5 h of continuous stirring, the solution obtained in 50 mL falcons was centrifuged at 12000 rpm at 4°C for 15 min. This was continued until the supernatant became transparent and the synthesized materials completely deposited. After drying the centrifuged solution, the obtained compound was used for the laboratory tests.

Authors' contribution

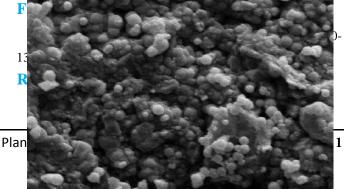
All authors contributed equally to the manuscript.

Conflicts of interest

The authors declared no competing interests.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication and etc.) have been completely observed by author.



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