

## Production and Clinical Application of the First Iranian Ultrasonic Desktop Nebulizer

Sir,  
Patients suffering from chronic airway diseases commonly rely on inhalation therapy.<sup>[1]</sup> Nebulizers have been used for sputum induction and drug delivery to the respiratory system since 1940.<sup>[2]</sup> Then, beyond technical improvement, there has been a lot of progression in medical indications and clinical application of nebulizers. There are different techniques to produce small particles of the mentioned medications in ultrasonic, jet, or vibrating membrane nebulizers. Nebulizers are used in the hospital and home setting; however, new nebulization technologies have enabled more portable use. There are some differences between various types, for example, the ultrasonic systems nebulize with higher rate than jet nebulizer devices.<sup>[3]</sup> If the concentration of antibiotic is raised in the reservoir, the jet nebulizers will increase drug output. The ultrasonic systems reduce output very fast more than jet nebulizers if antibiotic concentrations are increased. When antibiotic has the highest concentration, the ultrasonic system has the minimum output. Each jet system has special particle size distribution, and antibiotics and their concentrations cannot change the distribution of particle size. If reservoir concentrations are increased, the release of antibiotic is raised by jet nebulizers. The kind of nebulizer system and the antibiotic concentrations determine antibiotic output. From the clinical point of view, these systems are not only used to deliver medications to control the symptoms and the progression of lung disease in people with cystic fibrosis, asthma, chronic obstructive pulmonary disease, and other chronic lung problems, but there also continues to be a strong interest in developing inhalable formulations for both local and systemic diseases, and the current trends show novel applications that include needle-free vaccines, gene therapy, and targeted lung cancer treatments.<sup>[4]</sup> We have produced and tested the first Iranian type of ultrasonic desktop nebulizer. This nebulizer is a desktop model with a flow regulator. The patients can change the flow rate of the drug. The piezoelectric part of it oscillates at 1.63 MHz. This frequency produces particle sizes between 0.5 and 6.0  $\mu\text{m}$ . The lungs absorb these sizes of particles very well. The minimum and maximum rates of spraying are 0.4 and 3.36 ml/min, respectively, and the power consumption of nebulizer is 52 Watts. These power and rate of spraying are suitable for using at home and also at hospital.

### Financial support and sponsorship

Isfahan University of Medical Sciences supported the study.

### Conflicts of interest

There are no conflicts of interest.

**Mansour Siavash, Ali Rahrovi<sup>1</sup>,  
Shokooh Olamazadeh<sup>1</sup>, Morteza Esmaili<sup>1</sup>**

*From the Isfahan Endocrine and Metabolism Research Center,  
Isfahan University of Medical Sciences, <sup>1</sup>Research and Development  
Center of Pishgaman Fonoon Tebe Behnood, Isfahan, Iran*

### Address for correspondence:

*Dr. Mansour Siavash,  
Isfahan Endocrine and Metabolism Research Center, Isfahan University  
of Medical Sciences, Isfahan, Iran.  
E-mail: [siavash@med.mui.ac.ir](mailto:siavash@med.mui.ac.ir)*

### References

1. Kamin W, Erdnüss F, Krämer I. Inhalation solutions – Which ones may be mixed? Physico-chemical compatibility of drug solutions in nebulizers – Update 2013. *J Cyst Fibros* 2014;13:243-50.
2. Martin AR, Finlay WH. Nebulizers for drug delivery to the lungs. *Expert Opin Drug Deliv* 2015;12:889-900.
3. Weber A, Morlin G, Cohen M, Williams-Warren J, Ramsey B, Smith A, *et al*. Effect of nebulizer type and antibiotic concentration on device performance. *Pediatr Pulmonol* 1997;23:249-60.
4. Davidson WJ, Dennis J, The S, Litoski B, Pieron C, Leigh R, *et al*. Identification and validation of nebulized aerosol devices for sputum induction. *Can Respir J* 2014;21:101-6.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
<b>Quick Response Code:</b>	<b>Website:</b> <a href="http://www.advbiores.net">www.advbiores.net</a>
	<b>DOI:</b> 10.4103/abr.abr_56_18

**How to cite this article:** Siavash M, Rahrovi A, Olamazadeh S, Esmaili M. Production and Clinical Application of the First Iranian Ultrasonic Desktop Nebulizer. *Adv Biomed Res* 2018;7:114.

© 2018 Advanced Biomedical Research | Published by Wolters Kluwer - Medknow