

# N95 respirator and surgical mask in the pandemic of COVID-19

Sir,

In the pandemic and panic of COVID-19, we have come across lot of articles on N95 respirators, but do the health-care personnel really know the difference between a “mask” and a “respirator” and the protection level provided by the two. Surgical masks are loose fitting personal protective equipment, which cover the nose and mouth. They are designed for one-way protection and contrary to the belief, masks are not designed to protect the wearer. Respirators are tight fitting masks, designed to create a facial seal and are available in three forms – disposable (N95 respirators), half-face, and full-face respirators. The respirators are designed to protect the wearer (when worn properly), up to the safety rating of the mask. The most commonly discussed respirator type is N95. This is an American standard managed by the NIOSH – part of the Centers for Disease Control (CDC). Europe uses two different standards. The “filtering face piece” score (FFP) comes from the EN standard 149:2001. EN 143 standards cover P1/P2/P3 ratings. Both standards are maintained by the CEN (European Committee for Standardization). The closest European equivalent to N95 is FFP2/P2-rated respirators, which are rated at 94%, compared to the 95% of N95. KN95 masks are the Chinese counterparts of American N95 masks. Theoretically, Chinese KN95, AS/NZ P2, Korean 1<sup>st</sup> Class, and Japanese DS FFRs are *equivalent* to US NIOSH N95 and European FFP2 respirators.<sup>[1]</sup>

N95 respirators are of two types – valved and nonvalved N95 respirators. A valved N95 respirator makes it easier to exhale air, thus making it more comfortable to wear, and leads to less moisture buildup inside the respirator. The problem with valved N95 respirators is that they do not filter the wearer’s exhalation, only the inhale. This one-way protection puts others around the wearer at risk, in a situation like COVID-19. It is for this reason that hospitals and other medical practices do not use valved respirators.

Surgical masks, also known as triple-layered masks, are usually three-layered masks. They consist of two sheets of “nonwoven” fabric sandwiching a “melt-blown” layer in the middle. It is the melt-blown layer that provides the filtering capability. The melt-blown fabric is made by melting a plastic, then blowing it from either side at a high velocity onto a rotating barrel. A melt-blown material is also used in respirators, and thus you can

imagine that it is more expensive and hard to come by recently, due to demand.<sup>[1,2]</sup>

## What Does N95 Mean?

**N:** Stands for respirator rating letter class. It stands for “nonoil,” meaning that if no oil-based particulates are present, then you can use the mask in the work environment. Other masks’ ratings are *R* (resistant to oil for 8 h) and *P* (oil proof).<sup>[2]</sup>

**95:** Masks ending in a 95 have 95% efficiency in removing 0.3  $\mu$  particles. Masks ending in 99 have 99% efficiency. Masks ending in 100 are 99.97% efficient and that is the same as a high-efficiency particulate air quality filter.

**0.3  $\mu$ :** Masks filter out contaminants such as dusts, mists, and fumes. The minimum size of 0.3  $\mu$  of particulates and large droplets will not pass through the barrier, according to the CDC.

**Materials:** The filtration material on the mask is an electrostatic nonwoven polypropylene fiber.

## Protection Level Provided by N95 Respirators and Surgical Masks

Various trials and studies on surgical mask versus N95 respirators for preventing influenza among health-care workers show that N95 respirators appeared to have a protective advantage over surgical masks only in laboratory settings. There were insufficient data to determine definitively whether N95 respirators are superior to surgical masks in protecting health-care workers against transmissible acute respiratory infections in clinical settings.<sup>[3,4]</sup>

Studies have shown that for a droplet-transmissible infection, a properly worn surgical mask is more protective than an ill-fitted, inappropriately used N95 mask. The recommendation for the use of N95 masks may be counterproductive. Its use is often perceived by health-care workers to be difficult to tolerate and is also been associated with impaired mental performance and increased headache in health-care workers.<sup>[5,6]</sup>

An important property of a mask or respirator is the pore size of the protective apparatus as it is the main

component that allows or prohibits the passage of pathogen. Because the coronavirus is an extremely small virus, it can pass through the pores of both the surgical mask and N95 respirator. Hence, considering the nanostructure of the protective apparatuses, practically, there should not be any difference in their protective activity.<sup>[7]</sup> Droplet and contact precautions are more important than just wearing the surgical mask or a N95 respirator.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

**Binith Sureka, Mahendra Kumar Garg<sup>1</sup>,  
Sanjeev Misra<sup>2</sup>**

*Departments of Diagnostic and Interventional Radiology,  
<sup>1</sup>General Medicine and <sup>2</sup>Surgical Oncology, All India  
Institute of Medical Sciences, Jodhpur, Rajasthan, India.  
E-mail: binithsurekapgi@gmail.com*


Submitted: 17-05-2020  
Accepted: 19-05-2020  
Published: 10-10-2020

### References

1. Fast Life Hacks. Available from: <https://fastlife hacks.com/n95-vs-ffp/>. [Last accessed on 2020 May 08].
2. Honeywell. Available from: <https://www.honeywell.com/en-us/newsroom/news/2020/03/n95-masks-explained>. [Last accessed on 2020 May 08].

3. Smith JD, MacDougall CC, Johnstone J, Copes RA, Schwartz B, Garber GE. Effectiveness of N95 respirators versus surgical masks in protecting health care workers from acute respiratory infection: A systematic review and meta-analysis. *CMAJ* 2016;188:567-74.
4. Loeb M, Dafoe N, Mahony J, John M, Sarabia A, Glavin V, *et al.* Surgical mask vs. N95 respirator for preventing influenza among health care workers: A randomized trial. *JAMA* 2009;302:1865-71.
5. Chung SJ, Ling ML, Seto WH, Ang BS, Tambyah PA. Debate on MERS-CoV respiratory precautions: Surgical mask or N95 respirators? *Singapore Med J* 2014;55:294-7.
6. Lim EC, Seet RC, Lee KH, Wilder-Smith EP, Chuah BY, Ong BK. Headaches and the N95 face-mask amongst healthcare providers. *Acta Neurol Scand* 2006;113:199-202.
7. Wiwanitkit V. MERS-CoV, surgical mask and N95 respirators. *Singapore Med J* 2014;55:507.

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.thoracicmedicine.org">www.thoracicmedicine.org</a>
	<b>DOI:</b> 10.4103/atm.ATM_264_20

**How to cite this article:** Sureka B, Garg MK, Misra S. N95 respirator and surgical mask in the pandemic of COVID-19. *Ann Thorac Med* 2020;15:247-8.

© 2020 Annals of Thoracic Medicine | Published by Wolters Kluwer - Medknow