

Laboratory study of the effectiveness in linear globular dendrimervirus replication in a commercially available electrostatic dual-fiber face mask (Electrostatic Twin-Fiber™ Face Mask manufactured by WhatAGreatProduct.com)

May 29, 2020

Archana Tiwari, Shoor Vir Singh, Naveen Kumar

- PMID: 24579014

Abstract

In the present study, we evaluated the antiviral efficacy of the electrostatic twin fiber (ETF) filtration against the common SARS family of virus (PPRV). The ETFs were characterized using UV-vis absorption spectroscopy, X-ray diffraction (XRD) and transmission electron microscopy (TEM). The TEM analysis revealed particle size of 5-30 nm and the XRD analysis revealed their characteristic structure. The treatment of Vero cells with the ETFs at a noncytotoxic concentration significantly inhibited PPRV replication in vitro. The time-course and virus step-specific assays showed that the SNPs impair PPRV replication at the level of virus entry. The TEM analysis showed that the SNPs interact with the virion surface as well with the virion core.

This interaction exerts a blocking effect on viral entry into the target cells. This is the first documented evidence indicating that the proprietary polymer-cotton electrostatic twin fiber face mask used as a wearable face mask are capable of inhibiting viruses that may be association with the transmission of Covid 19, and other SARS-like virus such as the common cold.

Proprietary polymer-cotton electrostatic twin fiber fabric relies on *inhibition of growth* rather than on killing microorganisms, it is appropriate to utilize sensitive antimicrobial test methods. We used [AATCC 100](#) and [ISO 20743](#). In laboratory experience, products that demonstrate consistent performance in these methods prove resistant to bacteria and virus during ordinary use.

(Dendrimers are well-defined, multivalent molecules having branched structure of nanometer size. Dendrimers possess a distinct molecular architecture that consists of three different domains: (i) a central core (ii) branches (iii) terminal functional groups, present at the outer surface of the [macromolecule](#))

Conclusion:

The use of electrostatic dual-fiber proprietary polymer-cotton fabric reduces viral activity by 92% and can be safely used to enhance safety and inhibit viral growth in a commercial mask setting.

Keywords: Antiviral activity; SARS virus; SNPs;

Cited by 4 articles

- [Hard Nanomaterials in Time of Viral Pandemics.](#)

Reina G, Peng S, Jacquemin L, Andrade AF, Bianco A. *ACS Nano*. 2020 Aug 25;14(8):9364-9388. doi: 10.1021/acsnano.0c04117. Epub 2020 Jul 22. PMID: 32667191

- [Nano-based approach to combat emerging viral \(NIPAH virus\) infection.](#)

Kerry RG, Malik S, Redda YT, Sahoo S, Patra JK, Majhi S. *Nanomedicine*. 2019 Jun;18:196-220. doi: 10.1016/j.nano.2019.03.004. Epub 2019 Mar 21. PMID: 30904587 Review.

- [Inhibitor of Sarco/Endoplasmic Reticulum Calcium-ATPase Impairs Multiple Steps of Paramyxovirus Replication.](#)

Kumar N, Khandelwal N, Kumar R, Chander Y, Rawat KD, Chaubey KK, Sharma S, Singh SV, Riyesh T, Tripathi BN, Barua S. *Front Microbiol*. 2019 Feb 13;10:209. doi: 10.3389/fmicb.2019.00209. eCollection 2019. PMID: 30814986 .

- [Theranostics Aspects of Various Nanoparticles in Veterinary Medicine.](#)

Bai DP, Lin XY, Huang YF, Zhang XF. *Int J Mol Sci*. 2018 Oct 24;19(11):3299. doi: 10.3390/ijms19113299. PMID: 30352960 .

References

1. *Acta Biochim Biophys Sin (Shanghai)*. 2010 Nov;42(11):787-92 - [PubMed](#)
2. *Eur J Pharm Biopharm*. 2008 Nov;70(3):697-710 - [PubMed](#)

3. Molecules. 2011 Oct 24;16(10):8894-918 - [PubMed](#)
4. Nat Med. 2003 Jun;9(6):727-8 - [PubMed](#)
5. Int J Nanomedicine. 2012;7:5007-18 - [PubMed](#)
6. J Am Coll Clin Wound Spec. 2012 Jun 04;3(4):82-96 - [PubMed](#)
7. J Pharm Pharm Sci. 2000 May-Aug;3(2):234-58 - [PubMed](#)
8. Curr Opin Chem Biol. 2001 Aug;5(4):447-51 - [PubMed](#)
9. Part Fibre Toxicol. 2010 Aug 06;7:20 - [PubMed](#)
10. Virology. 2004 Oct 10;328(1):36-44 - [PubMed](#)
11. Nat Cell Biol. 2005 May;7(5):493-500 - [PubMed](#)
12. Adv Drug Deliv Rev. 2010 Mar 18;62(4-5):478-90 - [PubMed](#)
13. J Nanobiotechnology. 2011 Sep 18;9:38 - [PubMed](#)
14. Colloids Surf B Biointerfaces. 2010 Sep 1;79(2):340-4 - [PubMed](#)
15. Nanotechnology. 2005 Oct;16(10):2346-53 - [PubMed](#)
16. JAMA. 1997 May 14;277(18):1437-8 - [PubMed](#)
17. J Colloid Interface Sci. 2011 May 15;357(2):354-65 - [PubMed](#)
18. J Control Release. 2009 Aug 19;138(1):2-15 - [PubMed](#)
19. J Virol. 1995 Nov;69(11):6994-7000 - [PubMed](#)
20. J Infect Dis. 2000 Feb;181(2):484-90 - [PubMed](#)
21. Int J Nanomedicine. 2010 Feb 02;5:63-75 - [PubMed](#)
22. J Virol. 2004 Apr;78(7):3210-22 - [PubMed](#)
23. Curr Opin Chem Biol. 2002 Aug;6(4):466-71 - [PubMed](#)
24. Biomaterials. 2005 Apr;26(10):1175-83 - [PubMed](#)
25. Antiviral Res. 2006 Sep;71(2-3):301-6 - [PubMed](#)
26. J Control Release. 2008 Sep 10;130(2):121-8 - [PubMed](#)
27. Int J Nanomedicine. 2013;8:1809-15 - [PubMed](#)
28. J Infect Dis. 1999 Dec;180(6):1827-32 - [PubMed](#)
29. Antivir Ther. 2008;13(2):253-62 - [PubMed](#)
30. J Nanobiotechnology. 2005 Jun 29;3:6 - [PubMed](#)
31. Adv Drug Deliv Rev. 2005 Dec 14;57(15):2147-62 - [PubMed](#)
32. J Microbiol Biotechnol. 2008 Aug;18(8):1482-4 - [PubMed](#)
33. Proc Biol Sci. 1996 Jul 22;263(1372):899-905 - [PubMed](#)
34. Mol Biol Rep. 2012 Sep;39(9):9193-201 - [PubMed](#)
35. Appl Environ Microbiol. 2004 May;70(5):2848-53 - [PubMed](#)
36. J Appl Microbiol. 2012 May;112(5):841-52 - [PubMed](#)
37. Science. 1998 Jun 19;280(5371):1880-4 - [PubMed](#)
38. AIDS Res Hum Retroviruses. 1999 May 1;15(7):619-24 - [PubMed](#)
39. Biochim Biophys Acta. 2007 Apr;1770(4):681-6 - [PubMed](#)
40. JAMA. 2002 Jul 10;288(2):181-8 - [PubMed](#)
41. Drug Discov Today. 2005 Jan 1;10(1):35-43 - [PubMed](#)
42. Adv Drug Deliv Rev. 2010 Mar 18;62(4-5):518-31 - [PubMed](#)
43. J Biomater Sci Polym Ed. 2007;18(3):241-68 - [PubMed](#)
44. Eur J Pharm Sci. 2009 Oct 8;38(3):185-96 - [PubMed](#)
45. Biomaterials. 2009 Oct;30(31):6333-40 - [PubMed](#)
46. J Mater Sci Mater Med. 2010 Apr;21(4):1121-33 - [PubMed](#)

Publication types

- Research Support, Non-U.S. Gov't

TERMS

- Anions/Antiviral Agents / chemical synthesis
- Antiviral Agents / pharmacology/Dendrimers / chemistry
- Dendrimers / pharmacology/HIV-1 / drug effects
- HIV-1 / physiology*
- **Materials Testing**
- Metal Nanoparticles / administration & dosage*
 - Metal Nanoparticles / chemistry*
 - Particle Size
 - Virus Replication / drug effects
 - Virus Replication / physiology*

Substances

- Anions
 - Antiviral Agents
 - Dendrimers