



Topic Exploration Report

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

1. Determine the quantity and quality of evidence available for a technology of interest.
2. Identify any gaps in the evidence/ongoing evidence collection.
3. Inform decisions on topics that warrant fuller assessment by Health Technology Wales.

Topic:	Antimicrobial coatings on personal protective equipment
Topic exploration report number:	TER281

Introduction and aims

One of the primary aims of personal protective equipment (PPE) for healthcare workers are to protect the wearer from pathogens transmitted via direct contact, splashes, droplets and droplets.

Medical masks perform two roles: one as a medical device, providing source control (to protect the patient and environment from the wearer) and another as PPE for the wearer, specifically with regards to splash and droplet protection.

Some makes of PPE incorporate coatings or additives with claimed antimicrobial (including antiviral) properties, with manufacturers making claims that these additives enhance their effectiveness as a method of infection control.

Health Technology Wales researchers searched for evidence on the effectiveness of PPE and medical masks with antimicrobial properties (such as anti-viral coatings and additives), compared to standard products as a method of infection control. We focussed on evidence related to COVID-19 but also searched for evidence on infection control using this type of product in the context of other respiratory diseases.

Summary of evidence

We did not identify any evidence that directly addressed the effectiveness of antimicrobial coating or additives on PPE (hereafter referred to as 'antimicrobial PPE') as a method of reducing the transmission of COVID-19 or other respiratory diseases.

We identified a total of nine evidence reviews that studied the effectiveness of different types of PPE and/or medical masks to reduce transmission of respiratory infections. Seven of these reviews looked only at masks and/or other face coverings (such as respirators or cloth masks). The remaining two reviews studied other types of PPE: one review looked exclusively

at full body PPE (Verbeek, 2020) whilst one included both masks and other types of PPE (Jefferson, 2020).

None of the reviews identified or included any evidence on the effectiveness of antimicrobial coatings on any type of PPE.

We also searched for individual studies that compared antimicrobial PPE to other types of PPE. We identified one randomised trial (Duong, 2020) comparing standard surgical masks to masks that incorporated layers treated with antimicrobial additives. However, this study focussed on outcomes related to wearer comfort and side effects from mask wearing. Brief results were included on results of bacterial culture from mask samples, but no outcomes directly related to disease transmission were reported.

Areas of uncertainty

We did not identify any evidence that studied the effectiveness of antimicrobial PPE in terms of direct infection control benefits, such as protection of the wearer, source control, or other hazard reductions such as reduced risk from handling/disposing of PPE after use. Studies of *in vitro* antimicrobial outcomes, such as reductions in microbial growth, may be available but these were outside the scope of this report and it is unclear whether these types of outcomes can be used to predict or demonstrate clinically relevant benefits.

Antimicrobial agents used for coating PPE can require contact times of up to 30 minutes in order to neutralise pathogens. We did not identify any evidence on this aspect of their use or its implications for the practical use of this type of PPE.

Conclusions

PPE coated with or incorporating antimicrobial or antiviral agents may appear an attractive proposition, but we did not identify any evidence studying how use of this type of PPE, in healthcare on any other setting, impacts disease control. It is therefore uncertain whether use of antimicrobial PPE can reduce transmission of COVID-19, or other respiratory diseases, compared to using standard PPE.

Brief literature search results

Resource	Results
HTA organisations	
Healthcare Improvement Scotland	We did not identify any relevant evidence from this source.
Health Technology Assessment Group	We did not identify any relevant evidence from this source.
Health Information and Quality Authority	Results may be of peripheral interest. Health Information and Quality Authority. Evidence summary for universal face mask use by healthcare workers in the context of COVID-19. 13 August 2020. https://www.hiqa.ie/sites/default/files/2020-08/Evidence-summary-for-universal-face-mask-use-by-healthcare-workers.pdf <i>Studies the effectiveness of face masks in healthcare settings - did not include any evidence on masks with antimicrobial coatings or similar.</i>
EUnetHTA	We did not identify any relevant evidence from this source.
International HTA Database	We did not identify any relevant evidence from this source.
UK guidelines and guidance	
SIGN	We did not identify any relevant guidelines or guidance from this source.
NICE	We did not identify any relevant guidelines or guidance from this source.
COVID-specific sources	
Cochrane COVID Review Bank https://covidreviews.cochrane.org/search/site	Results may be of peripheral interest. Verbeek JH, Rajamaki B, Ijaz S, Sauni R, Toomey E, Blackwood B, Tikka C, Ruotsalainen JH, Kilinc Balci FS. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. Cochrane Database of Systematic Reviews 2020, Issue 5. Art. No.: CD011621. https://doi.org/10.1002/14651858.CD011621.pub5 <i>Studies the effectiveness of different types of full body PPE - did not include any evidence on antimicrobial coatings</i> Jefferson T, Del Mar CB, Dooley L, Ferroni E, Al-Ansary LA, Bawazeer GA, van Driel ML, Jones MA, Thorning S, Beller EM, Clark J, Hoffmann TC, Glasziou PP, Conly JM. Physical interventions to interrupt or reduce the spread of respiratory viruses. Cochrane Database Syst Rev. 2020 Nov 20;11:CD006207. https://doi.org/10.1002/14651858.cd006207.pub5

	<p><i>Studies a range of interventions, including masks and personal protection, in all settings (not restricted to healthcare). Did not include any evidence on antimicrobial coatings</i></p>
<p>Veterans Affairs Evidence Synthesis Program, COVID-19 Evidence Review Catalogue: https://www.covid19reviews.org/</p>	<p>Results may be of peripheral interest.</p> <p>Roger Chou, Tracy Dana, Rebecca Jungbauer, et al. Masks for Prevention of Respiratory Virus Infections, Including SARS-CoV-2, in Health Care and Community Settings: A Living Rapid Review. <i>Ann Intern Med.</i> 2020;173:542-555. [Epub ahead of print 24 June 2020]. https://doi.org/10.7326/M20-3213</p> <p><i>Studies the effectiveness of different types of masks - did not include any evidence on antimicrobial coatings</i></p> <p>MacIntyre CR, Chughtai AA. A rapid systematic review of the efficacy of face masks and respirators against coronaviruses and other respiratory transmissible viruses for the community, healthcare workers and sick patients. <i>Int J Nurs Stud.</i> 2020 Aug;108:103629. https://doi.org/10.1016/j.ijnurstu.2020.103629</p> <p><i>Studies the effectiveness of different types of masks - did not include any evidence on antimicrobial coatings</i></p> <p>Yin X, Wang X, Xu S, He C. Comparative efficacy of respiratory personal protective equipment against viral respiratory infectious diseases in healthcare workers: a network meta-analysis. <i>Public Health.</i> 2021 Jan;190:82-88. https://doi.org/10.1016/j.puhe.2020.11.004</p> <p><i>Studies the effectiveness of different types of masks - did not include any evidence on antimicrobial coatings</i></p> <p>Nanda A, Hung I, Kwong A, Man VC, Roy P, Davies L, Douek M. Efficacy of surgical masks or cloth masks in the prevention of viral transmission: Systematic review, meta-analysis, and proposal for future trial. <i>J Evid Based Med.</i> 2021 Feb 9;10.1111/jebm.12424. https://doi.org/10.1111/jebm.12424</p> <p><i>All studies were in non-healthcare settings; none included the intervention of interest</i></p> <p>Barycka K, Szarpak L, Filipiak KJ, Jaguszewski M, Smereka J, Ladny JR, Turan O. Comparative effectiveness of N95 respirators and surgical/face masks in preventing airborne infections in the era of SARS-CoV2 pandemic: A meta-analysis of randomized trials. <i>PLoS One.</i> 2020 Dec 15;15(12):e0242901. https://doi.org/10.1371/journal.pone.0242901</p> <p><i>Studied N95 respirators vs medical facemasks. Does not include the intervention of interest.</i></p>
<p>Epistomonikos Living Overview of COVID-19 Evidence: https://app.iloveevidence.com/</p>	<p>Results may be of peripheral interest.</p> <p>Duong-Quy S, Ngo-Minh X, Tang-Le-Quynh T, Tang-Thi-Thao T, Nguyen-Quoc B, Le-Quang K, Tran-Thanh D, Doan-Thi-Quynh N, Canty E, Do T, Craig T. The use of exhaled nitric oxide and peak expiratory flow to demonstrate improved breathability and antimicrobial properties of novel face mask made with sustainable filter paper and</p>

	<p>Folium Plectranthii amboinicii oil: additional option for mask shortage during COVID-19 pandemic. Multidiscip Respir Med. 2020 Jun 1;15(1):664. https://doi.org/10.4081/mrm.2020.664</p> <p><i>RCT comparing an antimicrobial mask to standard surgical masks. Does not report any outcomes on rates of disease transmission.</i></p>
Collabovid: https://www.collabovid.org/	No extra evidence was identified in addition to the sources already listed.
Secondary literature and economic evaluations (general)	
<p>Trip Database: https://www.tripdatabase.com/</p>	<p>Results may be of peripheral interest.</p> <p>Takahashi, S., Suka, M. and Yanagisawa, H. (2014), Antiviral Face Masks for the Prevention of Influenza Infection: a Meta-analysis. General Medicine, 15: 126-135. https://doi.org/10.14442/general.15.126</p> <p><i>Despite reference to 'antiviral' masks, this article studied any type of mask and did not include any evidence on masks using antimicrobial coatings. All studies were conducted in non-healthcare settings.</i></p>
Medline	No extra evidence was identified in addition to the sources already listed.
Primary studies (general)	
https://www.tripdatabase.com/	No extra evidence was identified in addition to the sources already listed.
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Date of search:	May 2021
Concepts used:	Antimicrobial; antiviral; viricide; mask; respirator; PPE; personal protective equipment