



COVID-19: LAUNDERING OF HEALTHCARE WORKER UNIFORMS

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Question: What is the best available evidence regarding laundering of healthcare worker uniforms in the context of COVID-19?

***ALERT* Evidence regarding COVID-19 is continually evolving. This Evidence Brief will be updated regularly to reflect new emerging evidence but may not always include the very latest evidence in real-time.**

Key messages:

- Uniforms are made from porous fabric and do not appear to be high-risk vectors for virus contamination and transmission.
- Frequently following correct hand washing procedure and correctly used PPE are effective ways to reduce the spread of COVID-19 contamination and infection.
- To support occupational health and safety, employers should provide appropriate areas for staff to change prior to and following their shift, and, ideally, industrial healthcare laundry services for uniform laundering.
- Domestic laundering can be effective in decontaminating SARS-CoV-2 from uniforms where workplace laundering is not possible.
- To minimise or prevent the potential for viral contamination, the following general guidelines for washing uniforms can be followed:
 - Wash uniform separately from other items
 - Fill washing machine to no more than half-capacity
 - Use standard laundry detergent according to manufacturer instructions
 - Run a full-length hot wash cycle between 40°C and 60°C
 - Tumble-dry uniforms or hang dry in full sun (where conditions are warm and dry)
 - Iron uniforms at conclusion of drying
 - Wear fresh, clean uniform to each shift
 - Adhere to additional employer guidelines for uniform laundering
- Due to limited direct evidence, further research, guidance, and policy is recommended to underpin washing healthcare worker uniforms in the context of COVID-19.
- Although there is no specific evidence, the recommendation to change out of uniform before travelling home at the conclusion of a shift appears to be based more on public perception of virus transmissibility. The appropriate use of PPE should protect health worker uniforms from contamination and so the decision to change should be at the discretion of the individual.

Background

COVID-19 (from 'severe acute respiratory syndrome coronavirus 2' (or 'SARS-CoV-2') is a newly discovered (novel) coronavirus first identified in Wuhan, Hubei province, China in 2019 as the cause of a cluster of pneumonia cases.¹ Coronaviruses are similar to a number of human and animal pathogens including some of those which cause the common cold as well as more serious illnesses such as Severe Acute Respiratory Syndrome (SARS or SARS-CoV-1) and Middle East Respiratory Syndrome (MERS). Since discovery, COVID-19 has spread to many countries and was declared a global emergency by the World Health Organization (WHO) on January 30, 2020,¹ and a pandemic on March 11.² There is concern regarding the potential for contaminated healthcare worker uniforms to act as vectors for the transmission of COVID-19 virus and limited evidence and advice regarding the laundering of uniforms, particularly in domestic/home contexts.³

Healthcare worker uniforms as a vector for viral transmission

While it is generally accepted that uniforms can be vectors for the transmission of pathogens more broadly, studies conducted and subsequent scientific literature largely describes the presence and transmission of bacterial pathogens such as methicillin resistant *Staphylococcus aureus* (MRSA), *Clostridium difficile*, and vancomycin-resistant enterococci (VRE) rather than viral pathogens.⁴ This suggests further research and policy should be pursued to inform guidelines that ensure health workers are not being placed at risk of infection where they are required to wash their own uniforms. In the specific case of the SARS-CoV-2 virus however, the below findings, provide some evidence to suggest it is unlikely the virus is transmissible via staff uniforms and that standard safety precautions such as frequent hand washing and correct use of personal protective equipment (PPE) are the most effective methods to limit contamination and spread of the virus.⁵

In the absence of direct evidence describing the persistence and transmissibility of SARS-CoV-2 on health worker uniforms, inferences must be made from evidence describing other similar enveloped respiratory viruses such as Influenza A and Severe Acute Respiratory Syndrome (SARS). The viability of Influenza A for example is largely informed by the porosity of the surface it is occupying; one study indicated that the virus was undetectable on porous surfaces such as paper, tissue, and pyjamas after 8 – 12 hours, and on hard surfaces, only reduced to undetectable levels after 24 – 48 hours. Further, transfer of viable Influenza A virus from tissue paper was only possible within 15 minutes of deposition as opposed to 24 hours for stainless steel.⁶ Another study describing the survival of SARS found that there was a rapid loss of infectivity where a viral load was applied to paper and cotton materials. In this study no toxic cell culture was taken from paper, a disposable gown or a cotton non-disposable gown. This was again in contrast to solid surfaces where the depletion of viral activity was observed to take much longer.⁷

Further, a study observing the survival of Influenza A on contaminated clothing found the amount of infectious virus recovered from clothing samples to be correlated with the amount of residual water deposited on the cloth during virus preparation of the samples. The paper suggested in a natural environment, water from infected droplets would evaporate quickly and that while indirect transmission of the virus via clothing may occur, this would be under limited circumstances.⁸

A study of teachers working in a childcare setting looked to determine whether personal clothing was contaminated with viral RNA of human rhinovirus (hRV) and whether the clothing could act as a vector for transmission. Over the course of days where teachers were observed, hRV was most commonly found in nasal samples, and about half as frequently on clothing samples. Human rhinovirus was not detected in both nasal or clothing samples on the same day and the virus samples rarely persisted on clothing samples for the entirety of a day. The relatively less frequent occurrence of positive samples on clothing suggested it to be an infrequent vector of transmission.⁹

In a clinical setting and in the provision of direct care to COVID-19 patients, PPE is required and covers staff uniforms. Where PPE is used correctly, uniforms should not become contaminated.¹⁰ For those healthcare workers who are not providing direct care to COVID-19 patients, but may be near either identified or potential carriers, there is evidence to suggest that unless direct contact is made, it is unlikely that uniforms will become contaminated.¹¹ Healthcare workers not in direct care or near to patients with suspected or confirmed COVID-19 infection should also follow recommended physical distance advice of 1.5-2m.¹²

Further to discussion regarding the persistence of respiratory viruses on uniforms, studies into the environmental persistence of COVID-19 suggest that no infectious level of the virus exists on cloth after two days. Further to this COVID-19 is also inactivated after a five minute inoculation within disinfectant solutions at room temperature (22°C), or after being exposed to a 56°C environment for 30 minutes.¹³ Further laboratory research has also indicated that the use of heat is effective in deactivating the virus.¹⁴ These environmental susceptibilities indicate COVID-19 is likely vulnerable to standard chemical and thermal disinfection procedures such as domestic hot-wash laundering.

Evidence for domestic laundering of health worker uniforms

While hospitals do offer laundry and linen cleaning services, these services are not always extended to all staff. Many healthcare workers are required to wash their uniforms at home.^{15, 16} It should also be noted that not all healthcare worker staff who are in potential contact with COVID-19 work in hospitals or have access to industrial facilities (e.g. aged care staff).

A review of scientific literature found the evidence directly related to the laundering of healthcare worker uniforms was limited, and that guidance for the appropriate handling of uniforms was generally derived from industrial hospital linen processing where the decontamination of textiles is based on principles of chemical and thermal disinfection. Identified studies were typically small scale and in some ways methodologically flawed. However, the studies conducted did not provide clear indication that home laundering of garments was inferior to industrial laundering or that uniforms posed a significant contamination risk in the domestic setting.^{17, 18} These reviews support older research that has found the amount of active virus remaining on cloth to be significantly reduced by a hot wash and detergent cycle.¹⁹ Studies looking to inform recommendations for the general laundering of staff uniforms identified that a domestic wash should involve a hot-wash with laundry detergent at 60°C,¹⁵ or in the case of another study, a cooler wash at 40°C followed by a tumble-dry and ironing routine, i.e. uniforms should be washed at 40°C, tumble dried for 30 minutes and ironed.¹⁶ As an alternative to tumble drying; ultraviolet radiation from natural sunlight in the outdoor environment has demonstrated significant virucidal qualities, particularly for enveloped viruses.⁶ It must be noted however, that a method of drying via natural sunlight would only be effective in dry and warmer climates and that the SARS-CoV-2 virus is relatively stable at lower temperatures.^{6, 13} This infers that an outdoor drying method would only be recommended in dry, warm and sunny conditions within countries that see extended hours of daylight.

In direct relation to COVID-19, peak bodies such as the WHO, CDC, and European Centre for Disease Prevention (ECDP) provide minimal specific guidance on procedures for the domestic laundering of uniforms, however in regard to the washing of linen and other textiles, it is generally recommended that standard washing procedures, inclusive of hot wash cycles and laundry detergents, be followed.²⁰⁻²²

Importantly, the UK government offers the suggestion that all staff be provided with changing rooms, to change into their uniform before working; and that healthcare laundry services be offered to all staff. Where uniforms cannot be laundered by a healthcare service the uniform should be laundered separately to other household linen, at a load no more than half the machines capacity; this wash should be conducted at the maximum temperature the fabric can handle, tumble dried and ironed.

Further to the above recommendations, the advice to change in and out of uniform at work, to avoid wearing of the uniform during commute, is said to be largely driven by a public perception of uniform contamination and viral transmissibility as opposed to any evidence of actual infection risk from the SARS-CoV-2 virus via this medium.²³ Notably the New South Wales government and the Clinical Excellence Commission indicate that health workers can wear their uniform outside the hospital, and for community visits, as the use of PPE protects uniforms from contact with blood and body fluid. It is indicated that any decision to change out of a uniform before leaving work should be a personal choice rather than a requirement.²⁴ Some Australian jurisdictions do suggest staff change out of uniforms at the conclusion of their shift however this is communicated as a recommendation rather than mandated as a requirement.²⁵

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