



Virus outbreaks:

recommendations for respiratory protection



What is a virus?

Viruses are infectious agents that can only replicate within the cells of living things, such as bacteria, plants, and animals (including humans). Viruses can have very narrow scope of attack, such as between plants of the same type or animals of the same species. A broader spread can happen if, for example, the virus can spread between different species of living things, or even 'jump' across life forms, say, from aquatic animals to humans.

The spread of infection

Some virus outbreaks have become well-known in recent decades, such as SARS, MERS, Avian Influenza ('Birdflu'), African Swine Flu and, most recently, the Novel Coronavirus. The epidemic or pandemic nature of these viruses have been hinging on whether the virus could spread from animals to humans, and subsequently between humans.

An **epidemic** outbreak affects great numbers of people in a localised area, while a **pandemic** outbreak spreads to a very large area, such as an entire country, a continent, or the whole world.

The greatest threat of a viral outbreak is if the virus becomes capable of spreading from person to person. Such pandemics have taken place several times in the past 100 years.

Route of infection

The route of virus infection varies. For instance, the Avian Influenza was mostly contracted through close contact with birds, including dead birds, their feathers, eggs, droppings etc. The Novel Coronavirus is thought to be spread mainly through liquid particles, for instance sneezing, coughing, and spitting.

What health authorities say

While some health authorities (in Australia, for example) say that there is no need for the general public to wear masks, many people consider the route of infection through coughing and sneezing to warrant the use of breathing protection.

In this case, health authorities recommend a face mask of at least P2 class. The P2 classification allows up to 5% inward leakage through the filter material alone and does not take into account any further leakage around the rims of the mask. This recommendation means either an elastomeric mask fitted with a filter, or a disposable filtering face piece.

There are some problems associated with the use of disposable respirators.

Firstly, disposable masks cannot be fit tested with any certainty, and therefore, an adequate protection factor can't be established.

Secondly, disposable masks are not designed for re-use and must be discarded after each use. This means that a stock of disposable masks can run out very quickly, as has happened in several places around Australia.

Stockpiling of masks is only a short-term solution, still leaving a shortfall of disposable masks. Consequently, this could lead to attempts at pushing disposable P2 respirators beyond their approved use and consequently to exceed their limitations.

Re-usable respirators

Elastomeric face pieces fitted with filters, such as the Sundström range, are designed to be re-used and can be disinfected many times.

Furthermore, such respirators provide tight-fitting face seal. Even more important, the best-performing high-efficiency P3 filters (Sundström SR510) have an inward leakage of only 0.003% -- a great difference from the 5% allowed by Australian Standard in a P2 filter medium.

Some main findings of the Institute of Medicine (US):

- *No manufacturing process has been found to permit re-use of disposable masks.*
- *No method of decontamination of disposable P2 respirators has been found that a) kills the virus, b) is harmless to the wearer, and c) causes no damage to the respirator.*
- *No modifications have been found that could obviate the need for individual fit testing of disposable P2 respirators.*
- *Many elastomeric facepieces can be disinfected and re-used, can be fit tested, and should be considered for use instead of filtering facepiece respirators.*

Source: Institute of Medicine, 2006, Reusability of Facemasks During an Influenza Pandemic: Facing the Flu, National Academies, Board of Health Sciences Policy, Committee on the Development of Reusable Facemasks for Use During an Influenza Pandemic, National Academies Press, Washington DC, pp. 3–4

Complete document available at:

www.nap.edu/catalog/11637.html

Safety Equipment Australia recommends:



Sundström SR100 half mask with SR510 (P3) high-efficiency mechanical particle filter with pre-filter SR221 and, if required, close-fitting goggles



Sundström SR200 full face mask with SR510 (P3) high-efficiency mechanical particle filter with pre-filter SR221



Sundström SR510 (P3) high-efficiency mechanical particle filter with pre-filter SR221. The filter separates 99.997% of particles (0.003% leakage). Each particle filter is individually tested twice.

NOTE: All equipment approved to Australian & NZ Standards

Re-use of respirator and filter

As shown above, disposable P2 filtering facepieces have been found to be unsuitable for re-use.

In addition, while immersion in a 70% isopropyl alcohol or 60% ethyl alcohol/ethanol solution has been found to effectively kill the virus, electro-static filters fitted to elastomer respirators are also unable to withstand such treatment without serious degradation (*Martin Jr, SB & Moyer ES 2000, Electrostatic Respirator Filter Media: Filter Efficiency and Most Penetrating Particle Size Effects, Appl. Occ. & Env. Hyg., vol. 15:8, pp. 609–617*).

Elastomeric respirators with P3 mechanical filters offer greater efficiency and can be re-used. The Sundström equipment described above has been thoroughly tested without any detrimental effects. In fact, after the equivalent of being immersed in 70% isopropyl alcohol or 60% ethyl alcohol/ethanol solution for 5 minutes 4 times a day for 18 months, the equipment described above suffered no effects in performance or efficiency, apart from the printing ink fading from the filter label.

ONE Sundström respirator and filter

disinfected 4 times a day for 18 months

= 2,160 disposable P2 respirators

Cleaning/disinfection of SR100 or SR200 mask and filter in hospital settings or by health professionals:

1. Remove the pre-filter holder with the pre-filter from the particle filter.
2. Remove the particle filter from the mask or filter adapter.
3. Place the mask, particle filter, pre-filter, pre-filter holder and filter adapter (if used) in 70% isopropyl alcohol or 60% ethyl alcohol/ethanol solution.
4. The parts must be completely immersed in the ethanol for at least five minutes.
5. Lift out the parts (wear protective gloves). Shake out the ethanol.
6. Let the parts air dry for at least one hour before next use.

Safe cleaning/disinfection by general users: please see respirator user instructions.

Cleaning and disinfection can be done as often as necessary.

- Change the pre-filter SR 221 at least every 7 days.
- Change P3 particle filter SR 510 after 18 months or sooner if there is any concern regarding physical damage, hygiene (soil/dirt), or increased breathing resistance.

Further information:

World Health Organisation:

<https://www.who.int/emergencies/diseases/novel-coronavirus-2019>

Center for Disease Control:

<https://www.cdc.gov/coronavirus/2019-ncov/index.html>

European Centre for Disease Prevention and Control:

<https://www.ecdc.europa.eu/en/novel-coronavirus-china>



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