

## Editorial

# Covid-19: Protecting Worker Health

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## Editorial

At the time of writing (5 March 2020) Coronavirus Disease 2019 (Covid-19) has spread to 76 countries with over 93 000 cases ([WHO, 2020a](#)) around the world since it was first identified and described in China on 31 December 2019 ([WHO, 2020b](#)). The case fatality rate may be as high as 3.4% and, although the indications are that it is a mild, self-limiting illness for the majority of those infected, it clearly has the potential to cause significant disruption globally. Many countries are moving from the ‘containment’ to the ‘delay’ phase in controlling the outbreak with a recent UK model suggesting a potential peak in June 2020 ([Danon et al., 2020](#)).

Occupational hygienists have particular skills in understanding exposure to hazards in the workplace and a long history of introducing simple and effective measures that reduce risk to workers’ health. These skills may be able to contribute to protecting the global workforce from Covid-19.

Workers involved in healthcare have always had a recognized increase in risk of developing infections present in the community where their patients are drawn. Health care workers are often on the front line dealing with those who are ill and at the most infectious period of a disease, as in the cases of SARS, MERS, and Ebola. Healthcare facilities can therefore act as a focus for infection spreading, giving rise to disease clusters linked to hospitals, social care facilities, and other health locations

([Rajakaruna et al., 2017](#)). In the SARS and MERS outbreaks between 2003 and 2015, between 44 and 100% of cases were linked to healthcare settings and healthcare workers made up around a quarter of those infected ([Chowell et al., 2015](#)).

Other workers involved in providing services to the public may also be at increased risk during particular outbreaks where transmission is through face-to-face or close contact. A recent analysis in the USA has estimated that 10% of the workforce are employed in roles where exposure to disease or infection occurs at least once per week ([Baker et al., 2020](#)). Beyond caring and protective service workers, there are a wide range of service-economy workers who may be at risk from a respiratory infection like Covid-19. Shop workers, bus drivers, cleaners, teachers, bank workers and hospitality staff are among the many service-sector employees who will have frequent and close interaction with many people over the course of a shift. Many of these workers will either have physical contact with the public or indirect contact through exchange of money or goods—an exposure route for transmission that is poorly understood ([Angelakis et al., 2014](#)). There are also complex societal issues around workers who are ill but feel that they have to work for economic or other reasons, and thereby increase the risks for colleagues and the public.

The recent spread of Covid-19 around the globe has led to considerable anxiety and concern among workers

who understandably worry about becoming infected and/or infecting co-workers, customers and family members as a result. Questions from workers have tended to centre around three main themes:

1. How does infection occur? Is it primarily by inhalation or getting droplets from cough and spittle on my hands? What degree and type of contact with an infectious person is likely to put me at risk?
2. How useful is personal protective equipment? Are masks effective in protecting me from infection and/or protecting others from me if I am infectious? Should I wear gloves or aprons?
3. What other measures can I take to change my working behaviour to reduce the risk of becoming infected?

This editorial aims to take each of these in turn, consider current public health advice (as of 5 March 2020), look at what occupational hygiene can add to providing answers to these concerns, and identify gaps in knowledge relating to workplace transmission.

#### How does infection occur?

Public health advice focuses on four main measures: frequent and thorough hand-washing; maintaining social distancing of at least 2 metres; avoiding touching your nose, mouth and eyes; and practicing good respiratory hygiene in terms of covering your nose and mouth when coughing or sneezing (WHO, 2020c). This advice is based on the likelihood that virus is transmitted through large airborne droplets and/or from surface and dermal contamination of those droplets. The relative importance of direct inhalation, hand to the peri-oral zone and surface-to-hand to peri-oral zone, and ocular exposure routes has not been determined. It is in this area in particular that occupational hygiene can offer considerable scientific expertise relevant to understanding exposure routes, pathways, and the potential drivers of transmission.

Research on understanding dermal (Schneider et al., 1999) and inadvertent ingestion exposure to hazardous chemicals (Gorman Ng et al., 2012) has been extensive over the past two decades with much of it published in this journal including a thematic virtual issue available at [https://academic.oup.com/annweh/pages/dermal\\_exposure](https://academic.oup.com/annweh/pages/dermal_exposure). Many of these studies can help us to consider the frequency of hand-mouth contact at work (Gorman Ng et al., 2016), what influences such behaviour, and also the characteristics of liquids that influence transmission from surfaces to skin and from hand to mouth (Gorman Ng et al., 2013, 2014). While most of these studies have looked at dusts and chemical liquids rather than body fluids containing biological agents, they can provide an important framework to conceptualize

exposure pathways and look at ways to change how work is carried out to help minimize the risk of exposure and infection.

Steps to interrupt the exposure pathways, for example by disinfecting surfaces, can be helpful (Kampf et al., 2020). However, the effects of chemical disinfectants are relatively short lived due to evaporation. Investigation of more persistent surface treatments, perhaps using applied nanomaterials such as nano-silver could reduce surface viral load (Rai et al., 2016). Nano-particle treated air filters could also potentially provide a way of reducing the airborne virus concentration (Joe et al., 2016).

#### How useful is personal protective equipment?

Occupational hygienists have been at the forefront of work on the effectiveness of different types of personal protective equipment (PPE) for many years. We know that PPE is often the control measure of last resort given the many difficulties in getting workers to wear PPE correctly throughout all of the time it is required. However, the relative role of inhalation and hand to mouth transmission is still unclear. While powered air purifying respirators may be a solution for protecting healthcare workers (Brosseau, 2020), these are unlikely to be practical in many lower risk work settings. Wearing surgical masks is likely to reduce inhalation of very small droplets by 20 to 30% whereas a disposable respirator certified to an appropriate standard can, on average, reduce the concentration by 95% (Cherrie et al., 2018; Steinle et al., 2018). There is the potential that wearing masks may discourage people from touching their face or, conversely, could increase such activity due to frequent moving of the mask, unconscious 'fidgeting' or from irritation of the area around the nose and mouth: there is a need for research to examine the frequency of hand to peri-oral contact during mask wearing in different environmental situations. Gloves may have similar impacts on behaviour and work published in this journal has examined the impact of contamination from donning and doffing dirty gloves albeit in relation to pesticides rather than biological material (Garrod et al., 2001).

#### What other measures can I take to change my working behaviour to reduce the risk of becoming infected?

Again occupational hygiene has a history of researching what works to modify and change workers' behaviour in relation to exposure. Educating workers about processes and tasks that generate high concentrations of aerosol

and demonstrating this through feedback using video and/or real-time measurement is a developing tool in controlling exposure (Crook et al., 2018). Visualization of hand contamination and the importance of thorough hand-washing is a similar process.

Designing and recommending changes to workspaces or how tasks are performed is the core of what hygienists do for many other workplace hazards. These changes may be structural or behavioural. Structural measures like simple screens and barriers used in some customer-facing roles including bus drivers and banking staff may offer some degree of protection from Covid-19 compared to the more open interactive style of work that teachers or general shop staff undertake. It may be worth considering which roles could benefit from physical or distancing controls like this: pharmacists and hospital or primary care reception staff could be protected in this way.

Behavioural changes can also be simple. Already we have seen changes to traditional greeting practices with handshakes replaced by 'elbow bumps' or other non-contact methods. More considered behavioural nudges to increase personal awareness of our hand activity or limiting the need to spend time in close contact with others may be worthy of development to limit spread. Developing an electronic sensor to detect inadvertent touching of the face and alerting the individual could be a useful innovation: this week has seen the launch of a website that uses laptop or mobile phone camera technology to discourage users from touching their face (The Guardian, 2020). Reducing time required at a central workplace, working remotely or delivering services through video or telephone may be an option for some workers, and all of these clearly also beneficially align with efforts to limit travel in relation to reducing carbon emissions and congestion in urban centres.

## Conclusion

There are many uncertainties around how transmission of respiratory infections like Covid-19 occur within workplace settings, and there is an urgent need for research on what control measures are likely to be most effective both to protect workers and to prevent workers spreading disease in the communities they serve. In particular research should seek to address the following:

- What is the relevant importance of inhaled exposure compared to surface contamination and hand-to-peri-oral routes in the transmission of Covid-19?

- How effective are different types of personal protective equipment in reducing both inhaled and surface transmission?
- What simple structural and behavioural changes in the workplace can be encouraged to reduce the risk of transmission?

There is considerable expertise in the occupational hygiene and exposure science communities that can contribute to a better understanding of the spread of Covid-19 and help workers contain and delay community transmission.

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## Conflict of interest

The authors declare they have no potential conflicts of interest in relation to this commentary.

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