

PWTAG Technical Note 44

Disinfecting Coronavirus

Those responsible for public buildings and other spaces need to know how to disinfect areas which may have been used by people carrying the coronavirus responsible for the current Covid-19 pandemic. This technical note draws on information from a number of sources, to give clear guidelines for disinfection methodology, in the context of an understanding of this novel virus.

How does Covid-19 spread?

Covid-19 is the illness caused by the novel virus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). Coronaviruses are a group of viruses that include those that have caused SARS and MERS, as well as common colds. Because the COVID-19 virus is new, its behaviour is not completely understood. But based on what is known so far, and our experience with other, similar coronaviruses, it seems that person-to-person transmission happens most frequently among close contacts (within about two metres). This transmission seems to be chiefly via respiratory droplets, though infectious aerosols may also be involved.

So close contact in the form of a hug, handshake, or being in a busy public space allows infected individuals to easily spread their respiratory droplets, which are typically sneezed or coughed and may travel several metres. But because the larger respiratory droplets are heavy, they typically fall towards the ground. Depending on where they land, they could persist on a surface before being touched by a hand that carries the virus to a nose or mouth, leading to infection.

Current evidence suggests that the Covid-19 virus can remain viable for hours on soft, porous surfaces like paper and cardboard up to days on steel and hard plastics. Cleaning of all surfaces followed by disinfection is best practice for preventing the spread of Covid-19 and other viral respiratory illnesses in community settings.

The guidance from Public Health England (PHE) on cleaning and disinfection where Covid-19 contamination is indicated is quite clear

(<https://www.gov.uk/government/publications/covid-19-decontamination-in-non-healthcare-settings/covid-19-decontamination-in-non-healthcare-settings>). The general guidance comes next here; its application to swimming pool premises follows.

PHE guidance on cleaning and disinfection

Public areas where a symptomatic individual has passed through and spent minimal time, such as corridors, but which are not visibly contaminated with body fluids can be cleaned thoroughly as normal.

All surfaces that the symptomatic person has come into contact with must be cleaned and disinfected, including:

- objects which are visibly contaminated with body fluids*
- all potentially contaminated high-contact areas such as bathrooms, door handles, telephones, grab-rails in corridors and stairwells*

Use disposable cloths or paper roll and disposable mop heads, to clean all hard surfaces, floors, chairs, door handles and sanitary fittings, following one of the options below:

- use either a combined detergent disinfectant solution at a dilution of 1,000 parts per million available chlorine*

or

- a household detergent followed by disinfection (1000 ppm av.cl.). Follow manufacturer's instructions for dilution, application and contact times for all detergents and disinfectants*

or

- if an alternative disinfectant is used within the organisation, this should be checked and ensure that it is effective against enveloped viruses*

Avoid creating splashes and spray when cleaning.

Any cloths and mop heads used must be disposed of and should be put into waste bags as outlined below.

When items cannot be cleaned using detergents or laundered, for example, upholstered furniture and mattresses, steam cleaning should be used.

Any items that are heavily contaminated with body fluids and cannot be cleaned by washing should be disposed of.

Swimming pool Environment

If bleach is applied to a surface with a lot of dirt, the dirt will use up some of the available chlorine as it is oxidised, so the amount available to kill virus is reduced. At the same time, irritant by-products are released. So, as the PHE guidance above makes clear, surfaces should be cleaned before disinfectant is used. Wash surfaces with hot soapy water (detergent) to clean. Thoroughly rinse off the detergent and allow to air dry.

Disinfect by applying a solution of chlorine bleach as detailed in the table below. To deal with coronavirus, a stronger than usual solution is recommended (right-hand column in the table).

Chlorine-based disinfectants are very effective against a wide range of viruses and bacteria, both in the pool and elsewhere in the pool building. They work with bacteria cells by

collapsing proteins, causing the bacteria to die. Chlorine is also able to kill viruses, though how is less well understood.

Preparing disinfectants solutions

Use appropriate personal protective equipment (PPE) throughout preparing and application.

Chemical	Active chlorine typical strength % w/w	Quantity of chemical to add to 1 litre of water to make a 1000mg/l Covid-19 disinfectant solution
Household bleach (unthickened)	5%	20ml
Sodium hypochlorite	10%	10ml
Calcium hypochlorite	65%	1.5g
Calcium hypochlorite superfast	78%	1.2g
Sodium dichloroisocyanurate (Dichlor)	55%	1.8g
<i>Note</i> A (plastic) teaspoon contains approximately 5g (or ml) and a tablespoon is about 15g		

Why use detergent as well as chlorine against Covid-19?

For nearly 5,000 years, humans have concocted cleaning products, yet the simple combination of soap and water remains one of the strongest weapons against infectious diseases, including Covid-19. Yet the recent emergency has seen people rush to buy all sorts of chemical cleaners, many of which are unnecessary or ineffective against viruses.

Foam hand cleansers are disappearing from store shelves, even though many lack the necessary amount of alcohol – at least 60% by volume – to kill viruses. Chlorine-based disinfectants (bleach) will kill viruses, but only if used properly.

Chlorine for cleaning

When chlorine is added to water, a chemical reaction produces a weak acid called hypochlorous acid. This is able to penetrate microorganisms like bacteria and viruses and kill them.

All viruses are bits of genetic code bundled inside a collection of lipids and proteins, which can include a fat-based casing known as a viral envelope. Destroying an enveloped virus takes less effort than their non-enveloped compatriots, such as a norovirus, which can last for a month on surfaces. Enveloped viruses typically survive outside of a body for only a matter of days and are considered among the easiest to kill, because once their fragile exterior is broken down, they begin to degrade.

As long as disinfectant persists at an appropriate concentration it will continue to kill microorganisms in the water. Chlorine works well for systems like swimming pools and water tanks, which allow chlorine to sit in water over time. *E coli*, a common bacterium spread through faeces, dies in less than a minute when exposed to the chlorine concentrations used in a pool. Chlorine takes much longer to kill gastrointestinal parasites like *Cryptosporidium* and *Giardia*, which are a threat in swimming pools. This is why such tactics as filtration, superchlorination and secondary disinfection are used.

Swimming pool disinfectants

In a pool setting chlorine comes in four forms.

1. **Sodium hypochlorite** is a chemical compound with the formulae NaOCl or NaClO. It may also be viewed as the sodium salt of hydrochloric acid. Sodium hypochlorite solutions are clear, greenish to yellow liquids with an odour of chlorine. Swimming pool grade sodium hypochlorite solution has a chlorine concentration of between 10 and 14% weight for weight.
2. **Calcium hypochlorite** is an inorganic compound with the formulae $\text{Ca}(\text{ClO})_2$. It is a relatively stable, usually white solid. It smells strongly of chlorine, owing to its slow decomposition in moist air. There are various compositions, each with different concentration of calcium hypochlorite, but up to 78% available chlorine.
3. **Household bleach** is a water solution of sodium hypochlorite. Common household laundry bleach (unthickened), used to whiten and disinfect laundry, is typically 5% chlorine. As a surface disinfectant, chlorine bleach is approved for use in safe food production. It is also used to help prevent the spread of infections in homes, hospitals, nursing homes, schools and day care facilities.
4. **Sodium dichloroisocyanurate (dichlor)** is the sodium salt of a chlorinated hydroxytriazine and in its dihydrate form is used as a source of free available chlorine (as hypochlorous acid) for the disinfection of water. It is widely used as a stable source of chlorine for the disinfection of swimming pools and in the food industry. It is a colourless, water-soluble solid.

