ANNEX A: Ebola persistence

Ebola Virus Disease (EVD) is caused by infection with one of the species of Ebolavirus (EBOV), a genus of the family [Filoviridae](http://www.cdc.gov/vhf/virus-families/filoviridae.html), which also includes Marburgvirus (the viral cause of Marburg Haemorrhagic Fever). Both Ebolavirus and Marburgvirus can cause severe haemorrhagic (i.e. characterised by bleeding) fevers that affect multiple organ systems and are often life-threatening.

Ebola is shed during the acute stages of illness in a wide variety of bodily fluids including saliva, breast milk, stool, and tears. Human to human transmission can occur through direct contact (i.e. through broken skin or mucous membranes) with blood or body fluids, (such as saliva, sweat, faeces, vomit, breast milk, semen etc.) or through contact with objects that are contaminated with infected body fluids.

Although initially regarded to be a relatively fragile virus, recent studies have indicated that, depending on environmental conditions, the virus may be able to persist for days or weeks. Persistence has been shown to depend on the nature of the contaminated fluid and the type of surface holding that fluid.

One study using EBOV suspended in simulated body fluid on various surfaces showed that whilst the amount of recoverable virus reduced by 99.99% (4 log) in 1:14hrs on a cotton gown, on stainless steel the same reduction took over 15 days[[1]](#footnote-1). This variability of persistence dependent on material implies an important role for the design and construction of medical isolation facilities – the use of smooth, non-porous materials may create a more hostile environment for EBOV.

Recent research has also been carried out into the efficacy of various methods of disinfecting different surfaces. This has shown, in general, that “surface type has a stronger influence on disinfection efficacy than chlorine type, and rough surfaces such as heavy duty tarp can be particularly challenging to disinfect”.[[2]](#footnote-2)

Disinfection of simulated body fluid on stainless steel shows a contact time of up to 5 minutes is required to achieve sterilisation with 0.5% and 1% sodium hypochlorite or 67% ethanol solutions whereas there was no significant effect with 0.01% sodium hypochlorite[[3]](#footnote-3).

(Gallandat K. Wolfe M. & Lantagne D., 2016) recommend that “a 15-minute exposure to 0.5% chlorine – independently of chlorine type, surface type, practices and presence of organic matter – should be an efficacious measure to stop EVD transmission via fomites”

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| Conditions | Persistence | Reference |
| Sterilised wastewater, 20°C, 40% RH | 99% reduction after 1 day  99.9% reduction after 7 days | (1) |
| Corpses  (Non-human primates, 27°C, 80% RH) | ≤7 days in swab samples  3 days in tissue samples | (2) |
| Stainless steel  Virus in simulated organic load at 21.5°C, 30% RH | 90% reduction after 30 hours  99.99% reduction after 365 hours (15.2 days) | (3) |
| Cotton gown  Virus in simulated organic load at 21.5°C, 30% RH | 90% reduction after 14.4 minutes  99.99% reduction after 1 hour 14 minutes | (3) |
| Plastic gown  Virus in simulated organic load at 21.5°C, 30% RH | 90% reduction after 24 hours  99.99% reduction after 285 hours (11.9 days) | (3) |
| Steel substrate treated with 0.01% Sodium hypochlorite | No significant reduction in virus at 10 minutes contact time | (3) |
| Steel substrate treated with 0.1% Sodium hypochlorite | Partial reduction at 10 minutes contact time | (3) |
| Steel substrate treated with 0.5% Sodium hypochlorite | Partial reduction at 1 minute, full sterilisation at 5 minutes contact time | (3) |
| Steel substrate treated with 67% Ethanol | Partial reduction at 1 minute, full sterilisation at 5 minutes contact time | (3) |

References:

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1. Cook, B.W.M. et al., 2015. Evaluating environmental persistence and disinfection of the Ebola virus Makona variant. *Viruses*, 7(4), pp.1975–1986. [↑](#footnote-ref-1)
2. Gallandat K. Wolfe M. & Lantagne D., 2016 Efficacy assessment of surface

   disinfection in Ebola outbreaks. *Presentation at 7th Emergency Environmental Health Forum, Nepal* [↑](#footnote-ref-2)
3. Cook, B.W.M. et al., 2015 [↑](#footnote-ref-3)