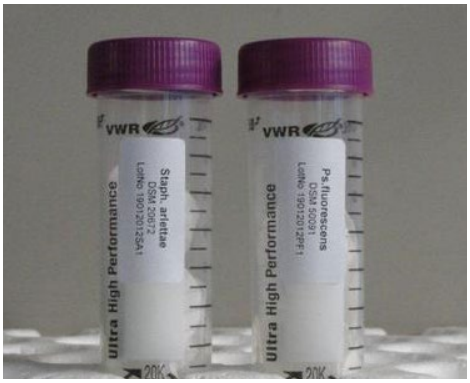
VIRUCIDAL EFFICACY

Inactivation of enveloped viruses as SARS-CoV-2 in domestic laundry processes



SARS-CoV-2

The novel human coronavirus, SARS-CoV-2 has become a global health concern in 2020, causing COVID-19, a severe respiratory tract infection in humans. Only few data are so far available for SARS-CoV-2, but representative data exists for related coronaviruses causing SARS or MERS. The novel coronavirus, SARS-CoV-2, is transmitted via droplet (coughing, sneezing) or hand- and surface contact.

Enveloped versus non-enveloped

An important aspect for the inactivation of viruses is the discrimination between enveloped and non-enveloped viruses. Non-enveloped viruses as e.g. Norovirus are in general more difficult to inactivate and require higher disinfectant concentrations and temperatures, whereas the enveloped SARS-CoV-2 is easier to inactivate in a washing process (Sidwell & Dixon, 1969; Gerba, 2001; Gerba & Kennedy, 2007; Gerhardts et al., 2009; Heinzel et al., 2010).

Textile hygiene

Textile fabrics may play a role in the spread of infectious viral diseases (Bloomfield, et al., 2008; Gerhardts et al., 2012). It is therefore crucial that a washing process reduces the virus load on textiles to a safe level.

Washing process

Several studies showed that enveloped viruses are fully inactivated at 20 to 30 °C with an active oxygen bleach containing detergent (powder detergent for white laundry) (Heinzel et al., 2010; Gerhardts et al, 2016). However, without detergent some active virus particles could be recovered after a 30 °C washing cycle and a carry-over to other laundry items could be observed (Gerhardts et al., 2016).

Recommendation for SARS-CoV-2

Even though for enveloped viruses as SARS-CoV-2 a washing temperature of 20 to 30 °C with a bleach-containing detergent seems to be sufficient, it is recommended to use ≥ 40 °C with active oxygen bleach containing powder detergent for household washing processes.

Standards

No standard is available to assess the virucidal action of either I&I or domestic laundry processes. The closest standards are those for testing disinfectants as the EN 13610 (food and industrial areas), EN 14476 (medical area) or EN 14675 (veterinary area). All standards require a virus reduction of ≥ 4 $\log_{10}$.

Testing of laundry processes

MS2-phage is a model virus for the non-enveloped Norovirus or Hepatitis A virus with comparable resistance against temperature, ozone, UV, peracetic acid and sodium hypochlorite (Allwood, Malik, Hedberg & Goyal, 2003; De Roda Husman et al., 2004; Park, Boston, Kase, Sampson & Sobsey, 2007; Shin & Sobsey, 2003; Morin et al, 2015).
Since SARS-CoV-2 is enveloped a lower persistence is expected as for MS2-phage in a washing process. A full inactivation of MS2-phage would indicate also an inactivation of SARS-CoV-2.

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HyWa-Check Biomonitors

Alternatively, also HyWa-Check biomonitors No. 503 (Staphylococcus arlettae) or No. 504 (Enterococcus faecium) can be used to test the efficiency of a washing process. Enveloped viruses are expected to have an equal to lower resistance towards temperature, surfactants and bleach as bacteria (Bloomfield et al., 2013). The HyWa-Check biomonitors No. 503 and 504 contain gram-positive bacteria with a relatively high tolerance towards temperature and bleach. An inactivation of Enterococcus faecium or Staphylococcus arlettae is therefore an indicator for a washing process sufficiently effective against enveloped viruses as SARSCoV-2.

Swissatest

Please contact our hygiene department for further informations on virucidal efficacy testing of I&I or household laundry processes. Swissatest provides either the possibility to test the virucidal action with MS2 phage or with HyWa-Check biomonitors. Please be aware that delivery time of HyWa-Check biomonitors is 3–4 weeks.

Contact

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