1% hydrogen peroxide review: Efficacy against viruses

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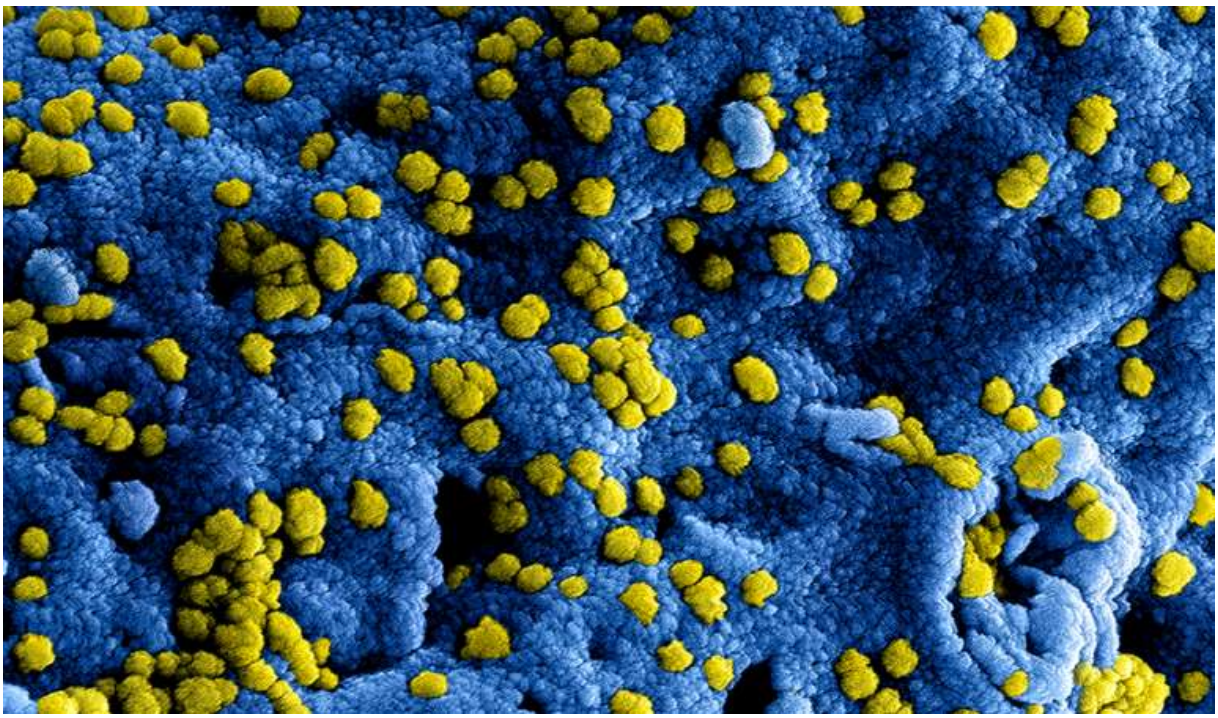

Star International, Star house, Turbine Business Park, Turbine Road, Birkenhead, Merseyside CH41 9BA

T: +44 (0) 1244 504 500 E: enquiries@star-international.co.uk www.star-international.co.uk

Current world virus problems

Viruses are infectious agents that cause many diseases. They distinguish from other micro-organisms (e.g. bacteria, fungi) by being microscopically small and needing a host cell to reproduce. Viruses can spread in many ways and can infect all types of life forms, from animals and plants even to humans, and cause pandemics worldwide.

Some current examples:

- A novel coronavirus (SARS-CoV-2) recently emerged from China, and is now unbalancing the world by causing an pandemic. SARS-CoV-2 causes COVID-19, a severe respiratory tract infection in humans. The transmission routes include droplets, contaminated hands or surfaces.

- In the veterinary area, the outbreak of African Swine Fever (ASF) in Asia has turned into a devastating crisis worldwide in swine production. It is an hemorrhagic viral disease that can be fatal to pigs and wild boars. And for Avian Influenza (AI), also known as the bird flu, several outbreaks have been reported in Europe, Africa and Asia. Both diseases are associated with production issues and serious economic losses.

The viruses described above are enveloped viruses, meaning that they have an outer envelope composed of proteins and fatty material (lipid). It is due to this outer layer that enveloped viruses are relatively easy to eliminate by disinfectants, compared to non-enveloped viruses. Besides type, also the virus size influences how difficult viruses can be eliminated: smaller viruses are more difficult to eliminate. This is visualized in figure 1. It shows, for example, that the corona virus is relatively easy to inactivate (rank 4 out of 10, where 10 means “very difficult to eliminate”).

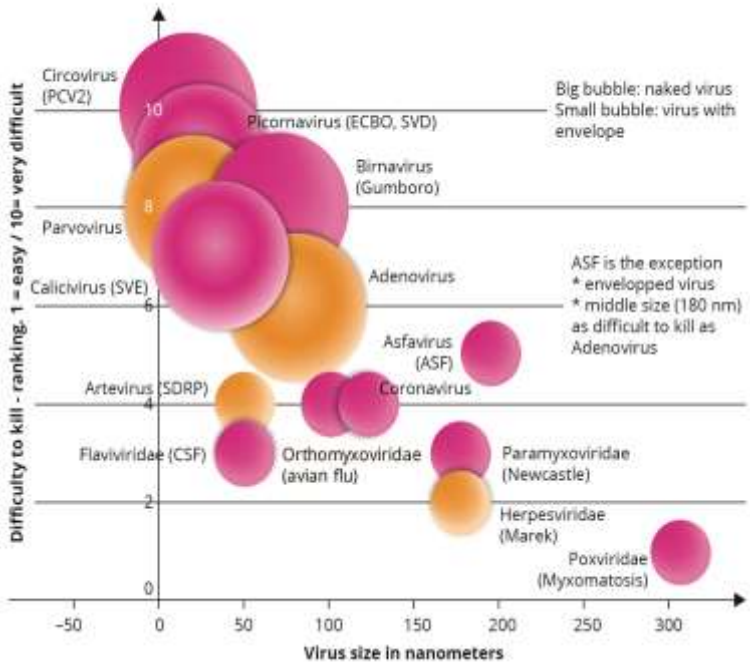

Figure 1. Classification of virus sensitivity to disinfectants (Foulon, 2019).

Virus inactivation

Hydrogen peroxide is known to be effective against viruses because of its strong oxidizing properties (Amanna et al., 2012; Mentel' et al., 1977). Often 0.5%+ hydrogen peroxide is recommended for corona virus inactivation. References that substantiate this statement include, but are not limited to:

- 0.5% hydrogen peroxide is able to inactivate corona virus within a contact time of 1 minute. The reduction of viral elimination that corresponds to this time and dosage was > log 4 (Omidbakhsh & Sattar, 2006). In other words: 99.99% is inactivation.
- A recently published review article describes the analytical results of 22 studies revealed that human corona viruses can be efficiently inactivated by surface disinfection procedures with 0.5% hydrogen peroxide within 1 minute (Kampf et al, 2020).
- In the current corona pandemic, the Dutch ministry has issued an exemption for authorized hand disinfection products without a virucidal claim: If these products contain (at least) 0.5% hydrogen peroxide they can be used professionally for hand disinfection purposes against viruses (Staatscourant, 2020).

In addition, the University of Turkey confirmed that a 1% hydrogen peroxide solution sufficiently reduced the ECBO virus, a worst-case reference virus representing the veterinary area, in 5 minute contact time. The study was performed according to the test principles of EN 14675*, representing severe farm conditions (e.g. high soiling, low temperatures, etc). The ability of the product to inactivate this resistant virus under these challenging conditions means that it will also be able to inactivate weaker viruses, like the corona virus which in practice is present under even more favorable conditions for inactivation.

> ** According to the new European Biocidal Product Regulations (BPR) a disinfectant is allowed to claim veterinary virucidal efficacy if it is able to inactivate (by ≥ log 4) the Enteric Cytopathic Bovine Orphan virus (ECBO), a worst-case reference virus representing the veterinary area, in a study according EN 14675. This European norm lays down challenging in vitro conditions (e.g. high soiling and a test temperature of 10 ^{o}C), making this test a worst-case efficacy study.*

Note that next to virus inactivation studies, hydrogen peroxide has also been successfully tested at 1% against several bacteria according to test standard EN 13697.

Recommendation

The references above indicate 0.5% hydrogen peroxide is generally seen as the 'golden standard' for corona virus inactivation and 1% hydrogen peroxide is even effective in activation of a worst-case virus under worst-case conditions. For this reason we recommend a **1% hydrogen peroxide solution** for virus inactivation purposes.

References

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