

Is 0.5% hydrogen peroxide effective against SARS-CoV-2?

Dear Editor,

SARS-CoV-2 is mostly transmitted through respiratory droplets and contact routes, but the WHO also states that “airborne transmission may be possible in specific circumstances and settings in which procedures or support treatments that generate aerosols are performed” (WHO, 2020).

There are a few studies being specifically performed to investigate the susceptibility of SARS-CoV-2 to disinfectants in which substances with proven efficacy against other coronaviruses have been evaluated (Kampf, Todt, Pfaender, & Steinmann, 2020). A recent review reports that application of 0.5% hydrogen peroxide for 1 min can be used as a surface disinfectant due to its virucidal activity against human coronavirus (Kampf et al., 2020). The applicability of hydrogen peroxide as disinfectant has been widely explored in the literature, but the concentrations used are much higher than that reported (Kampf et al., 2020). High concentrations of hydrogen peroxide can counter the decrease in efficacy when the compound is degraded in water and oxygen after reacting with catalase (Rutala, Gergen, & Weber, 2008). In addition to the concentration of the hydrogen peroxide, another crucial factor is the need for high temperatures (Rutala et al., 2008).

In order to assess the literature on the virucidal effect of hydrogen peroxide for surface disinfection, we have performed an electronic search on PubMed, registered in the International Prospective Register of Systematic Reviews (PROSPERO) according to protocol number CRD42020190033, by using the following terms: “hydrogen peroxide”, “virucidal”, “disinfection”, “cleanse”, “decontaminate”, “sanitize”, “antiseptic”, “coronavirus”, “covid-19”, “sarscov 2”, “virus”, “HPV” and “MERS”. A total of 28 articles were found, and we have

excluded studies not evaluating surface cleaning or those mixing other compounds with hydrogen peroxide. Reviews, letters to the editor, personal opinions, textbook chapters, case reports and congress abstracts were also excluded. Therefore, 11 studies remained and their data are summarized in Table 1. We found only three coronaviruses inactivated by hydrogen peroxide in these studies, two in animals (PRCV and TGEV) and one in humans (SARS).

Because we have found no study using hydrogen peroxide at 0.5% as a viable substance for surface disinfection, we conducted a further reading based on the reference used by Kampf. A study published by Omidbakhsh & Sattar (Omidbakhsh & Sattar, 2006) assessed a product based on accelerated hydrogen peroxide (AHP) (Virox® Technologies Inc.) whose manufacture states the following: “a patented disinfectant synergistic blend of commonly used, safe ingredients that when combined with low levels of hydrogen peroxide dramatically increases its germicidal potency and cleaning performance” (Diversey, 2020; Ramirez & Rochon, 2002).

Therefore, the study cited by Kampf does not address the use of 0.5% hydrogen peroxide and there is no study in the literature demonstrating its efficacy as a virucidal agent for surface disinfection either. In fact, we have actually found on PubMed only one study assessing the efficacy of hydrogen peroxide on human coronavirus (SARS), reporting that the virus is inactivated by the substance in the form of vapour at a 35% concentration (Goyal, Chander, Yezli, & Otter, 2014).

Reliable information on disinfection of surfaces based on scientific evidence is fundamental so that healthcare services can provide safe settings for professionals and patients, thus contributing to the control of infections.

TABLE 1 Surface virus inactivation by hydrogen peroxide. Summary of the descriptive characteristics of the articles included

Author	Year	Characteristic of hydrogen peroxide	Concentration of hydrogen peroxide	Action time	Ventilation time	Virus inactivated
Kindermann et al. (Kindermann et al., 2020)	2020	Vapour	33.8%	11–55 min	–	BVDV, HAV, MVM, Reo III
Holmdahl et al. (Holmdahl, Odenholt, Riesbeck, Medstrand, & Widell, 2019)	2019	Vapour	860 ppm	33 min	50 min	HuNoV
Montazeri et al. (Montazeri et al., 2017)	2017	Vapour	7.5%	5 min	20 min	FCV, HuNoV
Becker et al. (Becker, Bischoff, Brill, Steinmann, & Steinmann, 2017)	2017	Solution	40%–60%	30 s–3 min	–	ADV, MNV, MVM, poliovirus, Vaccinia virus,
Baker et al. (Baker et al., 2017)	2017	Foam	4.25%	40 and 50 min	–	PEDV, PRCV
Holtkamp et al. (Holtkamp et al., 2017)	2017	Foam	4.25%	30 min	–	PEDV
Zonta et al. (Zonta, Mauroy, Farnir, & Thiry, 2016)	2016	Aerosol	7%	1 min and 30 s	60 min	FCV, MNV
Holmdahl et al. (Holmdahl et al., 2016)	2016	Vapour	30%–35%	40–50 min	15 min	FCV, MNV
Ryndock et al. (Ryndock, Robison, & Meyers, 2016)	2016	Sonicated	31.5% and 35%	2 min	–	HPV16, HPV18
Goyal et al. (Goyal et al., 2014)	2014	Vapour	35%	20 min	Approximately 2 hr	AIV, hADV–1, FCV, SARS virus, TGEV
Tuladhar et al. (Tuladhar, Terpstra, Koopmans, & Duizer, 2012)	2012	Vapour	12%	45 min	70 min	hADV–1, HuNoV, H1N1, MNV, Poliovirus, rotavirus

Abbreviations: ADV, adenovirus; BVDV, bovine viral diarrhea virus; FCV, feline calicivirus; H1N1-influenza; hADV-1, human adenovirus type1; HAV, hepatitis A virus; HPV, human papillomavirus; HuNoV, human noroviruses; MNV, Murine norovirus; MVM, Minute virus of mice; PEDV, porcine epidemic diarrhea virus; PRCV, Porcine respiratory corona virus; Reo III, respiratory enteric orphan virus type III; SARS, severe acute respiratory syndrome virus; TGEV, transmissible gastroenteritis virus.

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CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Karem López Ortega: Conceptualization; Investigation; Methodology; Project administration. **Bruna de Oliveira Rech:** Data curation; Formal analysis; Investigation; Writing–original draft; Writing–review & editing. **Andre Luiz Ferreira Costa:** Data curation; Validation; Writing–review & editing. **Mario Perez Sayáns:** Data curation; Investigation; Writing–original draft; Writing–review & editing. **Paulo Henrique Braz-Silva:** Methodology; Project administration; Writing–original draft; Writing–review & editing.

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