

# Japan's approval of detergents for SARS-CoV-2 and its potential as a hand sanitizer

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During the SARS-CoV outbreak in 2003, Japan's National Institute for Infectious Diseases (NIID) showed, on their website, that SARS-CoV, an enveloped virus, could be deactivated by a 200-fold dilution of a neutral detergent <sup>1</sup>. Based on these findings, our clinic began using a 200-fold diluted solution of kitchen detergent in early March to wipe down materials and soak instruments as well as the hands of patients and staff for the purpose of SARS-CoV-2 disinfection. Our tweet on April 10, 2020 regarding this gained 6 million views in Japan <sup>2</sup>. There have been no experimental studies confirming the deactivation effect of detergents on SARS-CoV or SARS-CoV-2. On April 15, the Ministry of Economy, Trade and Industry (METI) of Japan announced that they would test the disinfecting effects of detergents on SARS-CoV-2. On April 21, our clinic was interviewed by METI. The final results were publicly announced on June 26, 2020 <sup>3</sup>. To date, no English reviews of this Japan's public presentation <sup>4</sup> exist.

Validation studies using SARS-CoV-2 (JPN/TY/WK-521) and VeroE6/TMPRSS2 cells were conducted at five institutes in Japan, including NIID and Kitasato University (KU) <sup>4</sup>. At NIID, the surfactant was mixed with the virus for periods between 20 seconds and 5 minutes. After removing the surfactant with resin, they evaluated the antiviral value using the TCID50 method. An infectious titer reduction rate of over 99.99% was obtained confirming the disinfection efficiency. At KU, VeroE6/TMPRSS2 cells were incubated for an hour with the surfactant and virus. After observing its cytopathic effect (CPE) for three days, the RNA titer was measured using qRT-PCR in the culture supernatant. Only when no CPE was observed in all wells and no increase in RNA titer was observed, was it judged as having a disinfection effect. NIID finally judged and published the following 9 surfactants, that were determined as possessing a disinfection effect at either the NIID or KU or both, as effective disinfectants for SARS-CoV-2 under the following conditions:

- ž Sodium linear alkylbenzene sulfonate; 20 seconds with 0.1% at NIID, 5 minutes with 0.1% at KU.
- ž Alkyl glycoside; 20 seconds with 0.05% at NIID, 1 minute with 0.1% at KU.
- ž Alkylamine oxide; 20 seconds with 0.05% at NIID, 1 minute with 0.05% at KU.
- ž Benzalkonium chloride; 2 minutes with 0.05% at NIID, 1 minute with 0.05% at KU.
- ž Benzethonium chloride; 1 minute with 0.05% at NIID, 5 minutes with 0.05% at KU.
- ž Dialkyldimethyl ammonium chloride; 40 seconds with 0.01% at NIID, 5 minutes with 0.01% at KU.
- ž Polyoxyethylene alkyl ether; 5 min with 0.2% at NIID, (not effective in 5 min with 0.1% at KU).
- ž Pure-soap component: 1 minute with 0.24% potassium salts of fatty acids at NIID, (not effective at 5 minutes with 0.12% at NIID and at 5 min with 0.1% at KU).
- ž Pure-soap component: 1 minute with 0.22% sodium of fatty acids at NIID, (not effective at 5 minutes with 0.11% at NIID and at 10 minutes with 0.1% at KU).

However, the use of detergent for hand sanitizers was discouraged by NIID <sup>3</sup>. From early March 2020 to the present (July 15 2020), we applied a 200-fold dilution of kitchen detergent (Charmy V Quick; LION corp., Japan), which contains 30% surfactant (alkylamine oxide, sodium alpha-olefin sulfonate, polyoxyethylene fatty acid alkanolamide, and polyoxyethylene alkyl ether), to the hands of at least 500 patients, and five members of medical staff as a SARS-CoV-2 disinfectant. The hands of patients and medical staff were not rinsed for approximately 15 minutes and 1 hour after application, respectively. The only adverse effects observed were mild hand sores in all the staff. Ethanol as hand sanitizer also causes hand sores. Dishwashing with bare hands using undiluted neutral kitchen detergent has been widely practiced around the world. In some European countries, it is common not to rinse the detergent completely when washing dishes and bathing. Given these practices, toxicity is unlikely to be an issue if a thin layer of detergent is left on the hands for a couple of hours; however, further verification is necessary.

Ethanol dries and loses its disinfection property rapidly, whereas detergents do not easily dry out on skin and cloth, enabling longer contact with the virus. Furthermore, detergents remain on the skin after it dries, and may melt and become effective when wet droplets adhere. This can be expected on the skin as well as in other materials including face masks and clothing. Detergents are inexpensive and are unlikely to be in short supply. Studies confirming the prolonged effectiveness of dried detergents on surfaces and the toxicity of the above methods are necessary.

## References

1. National Institute for Infectious Diseases, SARS ni kansuru shoudoku (3teiban) [Disinfection on SARS (3rd Ed.)]. <http://idsc.nih.go.jp/disease/sars/sars03w/index.html>. Published December 18, 2003.
2. @blanc0981. (2020, April 10). Toindeha Ikkagetsukan, 200bainiusumetanodaidokorosenzai de Sutaffu, kanatani tewonurashite, arainagasazuniitemorattemasuga, Hitorimotearenadono Shinkokunaut-taehana. Kaimenkasseizainosugoi tenha kansoshitemonokori, sonoatonaniwosawattemo sonohifuni kotein-gusareta kaimenkasseizaide koronawokorosukanoseigataka. [We have our staff and patients wet their hands with 200 times diluted kitchen detergent for a month without rinsing it off. Not a single person has complained of serious complaints such as rough hands. The great thing about surfactants is that they stay on after they dry, and whatever you touch afterwards is likely to kill the corona with the surfactant coated on that skin.] [Twitter post]. Retrieved from <https://twitter.com/blanc0981/status/1248415995527483394?s=20>
3. Surfactants and Hypochlorous Acid Solution for Removal of Coronavirus from Surfaces (Final Announcement). [https://www.meti.go.jp/english/press/2020/0626\\_004.html](https://www.meti.go.jp/english/press/2020/0626_004.html) Published June 26, 2020. Accessed July 15, 2020.
4. Shingatacoronairusunitaisuru daigaeshoudokuhounoyuukouseihyouka (Saishuuhoukoku) [Evaluation of the Effectiveness of Alternative Disinfection Methods for New Coronavirus (Final Report)]. <https://www.nite.go.jp/data/000111315.pdf> Published June 29, 2020. Accessed July 15, 2020.