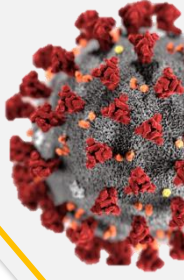




DISINFECTATION BOX/ CHAMBER/ TUNNEL /BOOTH / PARTITION/ GATE ON THE TRANSMISSION OF COVID-19

***Based on available evidence up to
27 April 2020***



INTRODUCTION

Disinfection is broadly defined as a procedure, the results of which is transient, that eliminates many or all pathogenic microorganisms, except bacterial spores, and/or deactivates undesirable viruses on inanimate objects. Germs include living microorganisms, such as bacteria, fungi, and/or viruses, which can cause infections or diseases. Depending on the achieved amount and type of germ destruction, disinfection is further categorized into high, intermediate and low-level disinfection. Disinfection is essential for ensuring that hosts do not transmit infectious pathogens to other people. Deficiencies in disinfection procedures according to scientifically based guidelines increases the risk associated with (i) breach of host barriers (ii) person-to-person transmission, and (iii) transmission of environmental pathogens.¹ The activity of germicides against microorganisms depends on these factors; intrinsic qualities of the organism, the chemical and external physical environment.² Factors that affect the efficacy of disinfection and sterilization include prior cleaning of the object; organic and inorganic load present; type and level of germ contamination; concentration of and exposure time to the germicide; physical nature of the object (e.g., crevices, hinges and lumen); presence of biofilms; temperature and pH of the disinfection process; and in some cases, relative humidity.¹

Recently, industries have made various claims on the effectiveness of using disinfection delivered in a particular confined space such as box/ chamber/ tunnel /booth / partition/ gate to reduce the transmission of COVID-19. The disinfection procedure is usually by automated dispersion of disinfectant on individuals when he or she passes through the disinfection box/ chamber/ tunnel /booth / partition/ gate. These devices would possibly be activated by infra-red or motion sensors embedded in the device. Different types of sprayers are being used to disperse the disinfectant. The spraying process takes between 20 to 30 seconds for each round of disinfection.

Industries claimed modularity in the design of these devices eases transportation, installation and removal at the entrance of high risk areas such as hospitals, airports, train stations, bus stations,

supermarkets, factories, schools, and other crowded areas. However, the World Health Organization (WHO) do not recommend spraying the external part of the body using chemicals such as alcohol or chlorine, does not kill the virus inside the body. Spraying such substances can be harmful to mucous membrane of individuals.³ There have been mixed opinions on the use of disinfection devices at hospitals, markets, industrial complexes and administrative buildings in countries across the globe.

Disinfectants being used in the device vary as well as the cost between products, ranging approximately between RM1000 to RM7000, as in Annex 1. Hence, this Rapid Evidence Review was conducted to provide brief information on the safety and effectiveness of disinfection box/ chamber/ tunnel /booth / partition/ gate based on a request from the Director of Medical Development Division, Ministry of Health Malaysia following proposal by a company to introduce the technology to Ministry of Health Malaysia.

EVIDENCE ON EFFECTIVENESS AND SAFETY

Systematic search was conducted from scientific databases such as Medline, EBM Reviews, EMBASE via OVID, PubMed and from the general search engines [Google Scholar and US Food and Drug Administration (US FDA)] on (i) effectiveness of disinfection devices such as box/ chamber/ tunnel /booth / partition/ gate (ii) safety of disinfection devices such as box/ chamber/ tunnel /booth / partition/ gate (iii) SARS-CoV destruction method (iv) disinfectants for ARS Co-V-2.

There was no retrievable scientific evidence on the effectiveness of disinfection devices such as box/ chamber/ tunnel /booth / partition/ gate in reducing the COVID-19 transmission. This is regardless of the chemicals (disinfectants) used and the mode of delivery of disinfectants to the body surface.

Systematic search on SARS-CoV and MERS-CoV revealed that coronavirus is sensitive to ultraviolet and heat. Exposure to 56 degrees Celsius for 30 minutes and lipid solvents such as ether, 75% ethanol, chlorine-containing disinfectant, peracetic and chloroform can effectively inactivate the virus.⁴ Chlorhexidine has not been effective in inactivating the virus.⁴ The US CDC guidelines recommend the use of the United States Environmental Protection Agency (USEPA) registered disinfectant to clean and disinfect facilities.⁵ The USEPA has listed out disinfectants that can be used against SARS-CoV-2. Among them are thymol, quaternary ammonium, Isopropanol, ethanol, L-lactic acid, glutaraldehyde, hydrogen peroxide, phenolic, sodium hypochlorite, sodium chlorite, sodium dichloroisocyanurate dehydrate, hypochlorous acid, citric acid, silver,

peroxyoctanoic acid, peroxyacetic acid, peracetic acid and octanoic acid. According to the USEPA, these products are for use on surfaces, not humans.⁶ Most of the products listed are suitable for hard nonporous surfaces e.g. glass and metal.^{6,7}

Clothings are considered as porous surfaces / materials⁷ and US CDC recommends to launder / wash the items using the warmest appropriate water setting and dry it completely.⁶ Otherwise, products that are suitable for porous materials and listed in EPA-registered for use against SARS-CoV-2 list can be used.⁵ However, of the products that are listed, (last update: 23 April 2020) quaternary ammonium needs five to ten minutes of contact time (to be used as laundry presoak) to be effective in deactivating human coronavirus.⁶ Most of the spraying process in / at the disinfection box / chamber / tunnel / booth / partition / gate takes approximately 20 to 30 seconds for each round of disinfection which is not enough to deactivate coronavirus.

The World Health Organization (WHO) does not recommend spraying the external part of the body with alcohol or chlorine as it does not kill the virus inside the body of an infected person and can be harmful to mucous membranes (i.e. eyes, mouth).³

CONCLUSION

There was no retrievable scientific evidence from the scientific databases on the effectiveness and safety of disinfection box/ chamber/ tunnel /booth / partition/ gate on humans to reduce transmission of COVID-19.

The effectiveness of disinfection box/ chamber/ tunnel/ booth/ partition/ gate in reducing the COVID-19 transmission, in addition to, and not replacing existing strategies and control measures (such as hand washing and social distancing) to combat the spread of coronavirus, is still uncertain.

Spraying the external part of the body with alcohol or chlorine does not kill the virus inside the body of an infected person and can be harmful to mucous membranes (i.e. eyes, mouth). The contact time of 20 to 30 seconds of spraying in / at the disinfection box / chamber / tunnel / booth / partition / gate is insufficient to deactivate coronavirus.

Hence, the use of disinfection box/ chamber/ tunnel/ booth/ partition/ gate in reducing the COVID-19 transmission may not be recommended given the lack of scientific evidence and unclear risk-benefit profile.

****Characteristics of disinfection box / chamber / tunnel / booth / partition / gate are listed in Annex 1***

REFERENCE

1. Centers for Disease Control and Prevention. Introduction, Methods, Definition of Terms. Guideline for Disinfection and Sterilization in Healthcare Facilities. Infection Control. Disinfection and Sterilization. CDC. 2016. Available at <https://www.cdc.gov/infectioncontrol/guidelines/disinfection/introduction.html> (accessed online on 27 April 2020)
2. Centers for Disease Control and Prevention. Factors Affecting the Efficacy of Disinfection and Sterilization. Guideline for Disinfection and Sterilization in Healthcare Facilities. Infection Control. Disinfection and Sterilization. CDC. 2016. Available at <https://www.cdc.gov/infectioncontrol/guidelines/disinfection/efficacy.html> (accessed online on 27 April 2020)
3. World Health Organization. Coronavirus disease (COVID-19) advice for the public: Myth busters. Available at <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-busters>
4. National Health Commission & State Administration of Traditional Chinese Medicine. Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 7). Available at http://www.kankyokansen.org/uploads/uploads/files/jsipc/protocol_V7.pdf (accessed online on 7 April 2020)
5. Centers for Disease Control and Prevention. Disinfection & Sterilization Guidelines. Guidelines library. Infection Control. 2019. Available at <https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html> (accessed online on 27 April 2020).
6. United States Environment Protection Agency (USEPA). Disinfectants for use against SARS-Co-V. Available at <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2> (accessed online on 6 April 2020)
7. National Pesticide Information Center. Using Disinfectants to Control the COVID-19 Virus (NPIC). Available at <http://npic.orst.edu/ingred/ptype/amicrob/covid19.pdf> (accessed online on 7 April 2020)

Based on available evidence up to 27th April 2020.

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Disclaimer: This rapid assessment was prepared to provide urgent evidence-based input during COVID-19 pandemic. The report is prepared based on information available at the time of research and a limited literature. It is not a definitive statement on the safety, effectiveness or cost effectiveness of the health technology covered. Additionally, other relevant scientific findings may have been reported since completion of this report.

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CHARACTERISTICS OF DISINFECTION BOX/ CHAMBER/ TUNNEL/ PARTITION/ GATE (AS OF 27 APRIL 2020)

No.	Product	Company / Organisation	Origin/ Country	Physical specification	Disinfectant Used	Product Cost
1	Ikarus (Body disinfection chamber)	Plast Grup	Turkey	The chamber is equipped with: <ul style="list-style-type: none"> • an antibacterial and corrosion-resistant composite body • 60-degree swivel base • fingerprint reading • self-cleaning with ultraviolet • a camera • body temperature detection with thermal camera, 	Not available (Claimed can disinfect 500 people with 100 liters of disinfectant)	\$10,000 (lira)
https://www.aa.com.tr/en/latest-on-coronavirus-outbreak/turkish-firm-pioneers-disinfection-against-covid-19/1776693						
2	Human Sterilizer Box	hiSehat	Indonesia	<u>Chamber size:</u> 1.2m x 1.2m x 2.2m <ul style="list-style-type: none"> • A walk through chamber • Auto spraying of disinfectant • Around 5 seconds 	Hypochlorous acid (HoCl) without alcohol Water, HoCl free chlorine of 210ppm, pH 5.5-6.9	Not available

					Note: Chlorine and chlorine compounds is registered as disinfectants that can be used against SARS - CoV2 (for use on surface) ^{1,2}	
3	Disinfection Tunnel	Not available	South-Western Chinese City Of Chongqing	Tunnel is equipped with infrared detectors	Not available	Not available
4	Mobile Sterilization Chamber	The Institute of Occupational Health and Environment (Ministry of Health), in collaboration with the Hanoi University of Technology	Vietnam	<u>Chamber size:</u> One meter wide and two meters tall, movable <u>Wet chamber</u> <ul style="list-style-type: none"> ● Step in and stand still for 15 to 20 seconds ● An infrared sensor that automatically activates the spraying ● 360-degree fog mist sprayer 	Ionized saline solution (Anolyte) Note: Chlorine and chlorine compounds is registered as disinfectants that can be used against SARS - CoV2 (for use on surface) ^{1,2}	Not available

				<u>Dry chamber</u> <ul style="list-style-type: none"> • Around 30 seconds 	Heat (temperature was not mention) and ozone	
5	Personnel Sanitization Enclosure	The Vehicle Research and Development Establishment, a Defence Research and Development Organization (DRDO) laboratory at Ahmednagar in Maharashtra	India	<ul style="list-style-type: none"> • A walk-through enclosure • Portable • Equipped with sanitizer and soap dispenser • Automatic mist spray of disinfectant • Stop automatically • Duration: 25 seconds • 700-litre capacity tank 	Mist of sodium chloride CAUTION: Personnel undergoing disinfection will need to keep their eyes closed while inside the chamber. Note: Chlorine and chlorine compounds is registered as disinfectants that can be used against SARS - CoV2 (for use on surface) ^{1,2}	Not available
6	Disinfection Chamber	Trichy Corporation	Tamil Nadu, India	<u>Chamber size:</u> Eight feet long and four feet wide Build from: spare metal bars and mist spray nozzles	Not available	Not available

				<p>Has 2,000-litre capacity water tank</p> <ul style="list-style-type: none"> • A walk through chamber • Hands raised for 3-5 seconds 		
7	<p>Disinfection Chamber</p> <p>(Prototype)</p>	BHEL Tiruchy	India	<p><u>Chamber size:</u> 12-foot-long chamber</p> <p>A lightweight structure built with a tubular mild-steel frame fitted with a disinfectant storage tank, a pumping system and precision spray nozzles</p>	Not available	Not available
8	Disinfection Chamber	Not available	Indonesia	<ul style="list-style-type: none"> • A walk through chamber • Spraying of disinfectant in the chamber • 10-15 seconds <p>The Ministry of Health Indonesia do not recommend using disinfection chambers or spraying disinfectant directly on human bodies as it can harm the skin, eyes and mouth, and could lead to irritation.</p>	Not available	Not available

9	Disinfection Tunnel	Young Indians with Confederation of Indian Industry (CII)	Tiruppur, Tamil Nadu, India	<ul style="list-style-type: none"> • A walk through tunnel • Overhead sprayers sprinkle the disinfectant 	<p>Diluted 1% Sodium Hypochlorite</p> <p>Dilution rate: one part per million (ppm)</p> <p>Note:</p> <p>Chlorine and chlorine compounds is registered as disinfectants that can be used against SARS - CoV2 (for use on surface)^{1,2}</p>	Rs90,000
10	Mobile Disinfectant Chamber (MDC)	Rural Industry Entrepreneur Organisation	Penang, Malaysia	<ul style="list-style-type: none"> • Automatic system with sensors to activate and deactivate the disinfectant sprays • Duration: not mention 	Not available	RM 4,000
11	Virus Buster Nano Spray	Zull Design Autotronic in collaboration with <i>Persatuan Pengguna Islam Malaysia (PPIM)</i>	Malaysia	<p>Chamber size: 2.2m (length) x 1.2m (width) x 2.0m (height)</p> <ul style="list-style-type: none"> • A walk through chamber • Automatic detection (infrared) • 14 nozzles to spray 	<p>Chlorhexidine digluconate 0.12% W/V</p> <p>(Alcohol free mouthwash)</p> <p>Note:</p>	Not available

				<p>disinfectant</p> <ul style="list-style-type: none"> Capacity: 50 gallons/tank 	<ol style="list-style-type: none"> Chlorhexidine has not been effective in inactivating the coronavirus.³ Bathing with chlorhexidine may cause mild skin reactions.^{4,5} 	
12	Disinfectant box	TXMR Sdn Bhd	Malaysia	Disinfection box/cabin is equipped with indicator light, e-stop, sensor detection, mist nozzle, spill tray and foot leveling	<p>Ionic copper and purified water</p> <p>Note:</p> <p>No retrieved evidence on effectiveness of ionic copper as disinfectant for SARS-CoV-2 in reducing transmission of COVID-19</p>	Not available
13	COS-QUAT	GUMIpRO Solutions	Malaysia	<ul style="list-style-type: none"> A mixture of liquid quaternary ammonium compound – to disinfect, 	A mixture of liquid quaternary ammonium	Not available

				<p>sanitize and deodorize</p> <ul style="list-style-type: none"> Widely used in breweries, dairy, beverage, confectionery, bakeries and other food processing plants for sanitizing. Effective in controlling mold and mildew. Not recommended to mix with anionic detergents <p>Hazards: causes eye and skin irritation</p>	<p>compound</p> <p>Note: Ammonium quaternary compound (QAC) is registered as disinfectants that can be used against SARS - CoV2 (for use on surface)^{1,2}</p>	
14	Sterilization Chamber	Kolej Universiti TATI (UC TATI), Terengganu	Malaysia	<ul style="list-style-type: none"> A walk through chamber Automatic spraying of disinfectant Within 3 seconds 	Not available	RM 1,000
15	Automated Disinfection Chamber	University Technology Malaysia (UTM) -produced for the Johor Bahru City Council (MBJB)	Malaysia	<ul style="list-style-type: none"> Motion sensor technology and fluid mechanics Portable 	Not available	Not available
16	Disinfectant Tunnel	Universiti Malaysia Perlis (UniMAP)	Malaysia	<u>Chamber size:</u> 1.8 metre (6 ft)-wide, 2.7 metre (9 ft)-long and 2.4 metre (8 ft)-tall	Not available	RM6,000
17	Disinfection Tunnel	Sabah Police <ul style="list-style-type: none"> To be used in 	Malaysia	Not available	Not available	Project cost (all

		all the district headquarters (IPDs) and the contingent headquarters (IPK) in Sabah				sites): RM70,000
18	Automatic Disinfectant Tunnel	School of Electrical and Electronic Engineering (PPKEE), Universiti Sains Malaysia (USM)	Malaysia	The tunnel is equipped with: <ul style="list-style-type: none"> • a touchless temperature detector • no-touch soap dispenser and a hand dryer • sonar detectors 	Not available	RM1,500
19	Personal Spray Booth	Premier Diagnostics Sdn Bhd. Shah Alam, Selangor (Distributor)	Thailand (manufacturer)	Features: <ul style="list-style-type: none"> - 10 litre tank (storage) - 720 sprays per tank - 12 spray nozzles - Sprays :3-5 seconds pulse - Foot switch operation - Auto sensors/operation lights - Fire retardant material - 12v DC pump - Weight : 20kg - Dimension: 2.05(h) x 1.25(w) x 0.85(d) 	Most disinfection liquid	Not available

				- Installation: plug and go		
20	Sanitize Chamber (Model CVD 901)	MTAB Resource Sdn. Bhd., Putrajaya	Gadang Works Sdn. Bhd (Manufacturer) Accredited by Standards Malaysia, Certified by TUV NORD ISO9001.2015	Components: <ul style="list-style-type: none"> - Metal & PVC Structure - Mist nozzle, plastic flexible tube - High pressure water pump - Sanitize liquid storage container - Motion sensor 	Chlodio chlorine dioxide Note: Chlorine and chlorine compounds is registered as disinfectants that can be used against SARS - CoV2 (for use on surface) ^{1,2}	Not available
21	Disinfection chamber (spray room)	SNME Sdn Bhd, Cheras, Selangor	Malaysia	<ul style="list-style-type: none"> - Material acrylic and hollow powder coating - Perspex plate with vinyl decal finish - Transparent PVC vertical blind (optional) - Expruded acrylic perspex - Acrylic box for hand sanitizer 	Not available	RM5000

REFERENCES:

1. US Environment Protection Agency.2020. Disinfectants for used against SARS-CoV2.Available at <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2> (accessed online on 6 April 2020)
2. Dept of Health Gov of Western Australia 2020. COVID-19 environmental cleaning for non-healthcare setting. Available at <https://ww2.health.wa.gov.au/~media/Files/Corporate/general%20documents/Infectious%20diseases/PDF/Coronavirus/COVID19-Environmental-Cleaning-for-workplaces.pdf> (accessed online on 7 April 2020)
3. National Health Commission & State Administration of Traditional Chinese Medicine. Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 7). Available at http://www.kankyokansen.org/uploads/uploads/files/jsipc/protocol_V7.pdf (accessed online on 7 April 2020)
4. Lewis SR, Schofield-Robinson OJ, Rhodes S, et al. [Chlorhexidine bathing of the critically ill for the prevention of hospital-acquired infection](#). Cochrane Database of Systematic Reviews 2019; (8): CD012248.
5. [Lim KS](#), [Kam PC](#). Chlorhexidine-pharmacology and clinical applications. [Anaesth Intensive Care](#). 2008;36(4):502-512.