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REVIEW

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Disinfection of corona virus in histopathology laboratories

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Abstract

Severe acute respiratory syndrome (SARS CoV-2/COVID-19) is a highly contagious and deadly disease caused by a virus belonging to the coronaviridae family. Researchers working in histopathology laboratories, dealing with morbid samples, are particularly vulnerable to infection unless they have very strong immunity. Hence, a proper precautionary protocol is required for the safety of the laboratory staff. The current review highlights the biological and physical agents that can be used to inactivate the virus and disinfect the surrounding environment in the laboratory.

KEYWORDS

COVID-19, disinfection, histopathology, SARS CoV, SARS CoV-2

1 | BACKGROUND

Zoonotic and infectious diseases involve multiple causative agents such as viruses, parasites and bacteria present among humans and animals that can be transferred to healthy humans involved in procedures for controlling and treating their ailments (Zhu et al., 2019). Severe acute respiratory syndrome, also termed SARS-CoV, was first reported in Asia in the year 2003 (Centers for Disease Control and Prevention, 2017). During 2003 and 2004, SARS-CoV was diagnosed in laboratory workers in Taiwan, Singapore and Beijing (China) who worked with this virus (Lim et al., 2004; Rachael, 2004; World Health Organization [WHO], 2003, 2006). There could have been many more symptomatic and asymptomatic cases of such laboratory-acquired infections, but they were seldom reported by the researchers. Severe acute respiratory syndrome (SARS CoV-2/COVID-19) is a highly communicable and lethal virus (WHO, 2020). Since genetic drift and shift are major characteristics of coronaviruses, scientists named this virus Severe Acute Respiratory Syndrome Coronavirus-2 (abbreviated to SARS-CoV-2) on the grounds of its similarity to Severe Acute Respiratory Syndrome Coronavirus-1 (abbreviated to SARS-CoV). The zoonotic and remarkably infectious coronavirus named COVID-19 was initially recognized in Wuhan City in the People's Republic of China in a man with a history of contact with seafood (Perlman, 2020).

2 | IMPORTANCE OF LABORATORY DISINFECTION

Scientists working in histopathology laboratories, handling morbid samples, can be infected with this dangerous virus and are more likely to be susceptible to it regardless of well-functioning immune systems. Hence, an intense precautionary protocol is required in the laboratory. This review focuses on physical and biological agents that can be used to inactivate the virus. In histopathology laboratories, additional efforts must be adopted to render the virus inactive during tissue processing (Darnell, Subbarao, Feinstone, & Taylor, 2004). For researchers such as histopathologists who deal with morbid tissue samples, inactivation of the coronavirus has proved one of the greatest challenges of the present day.

3 | DISINFECTION OF THE LABORATORY

Suspected as well as infected coronavirus samples should be collected and submitted to the histopathological laboratories as per WHO guidelines (Gorbalenya et al., 2020; Guarner, 2020). As this virus has been reported to be 75–80% similar to SARS-CoV and it is transmitted mainly via inanimate objects and large droplets, it has become widespread in the

environment. Hence, laboratories dealing with this coronavirus ought to be properly clean and disinfected by using biological disinfectants such as alcohol, specifically ethanol, on the surfaces (Perlman, 2020). For this purpose, 0.1% sodium hypochlorite, 62–71% ethanol, and 0.5% hydrogen peroxide have been reported to disinfect inanimate objects in the laboratory within 1 min (Kampf, Todt, Pfaender, & Steinmann, 2020). It has also been reported that 0.02% chlorhexidine digluconate or 0.05–0.2% benzalkonium chloride are not as effective as the abovementioned disinfecting agents (Kampf et al., 2020).

4 | INACTIVATION OF THE VIRUS

Because of the extremely contagious and infectious nature of this virus, a broad range of biological disinfecting agents should be considered for its inactivation (Henwood, 2019). Ethanol is a broader spectrum and stronger viricidal agent than propanol; 80% ethanol is highly effective against the enveloped viruses within 30 s (Kampf, 2018). Moreover, routine histological processing including the heating of samples in liquid paraffin inactivates the virus in processed morbid samples (Ali et al., 2017; Henwood, 2018). Additionally, the virus can be inactivated by heat treatment at 56°C for 90 min, 67°C for 60 min, or 75°C for 30 min (Duan et al., 2003). It can also be inactivated by preserving the sample in formalin for a period of 24 hr or incubating for 24–48 hr in glutaraldehyde (Henwood, 2020). Furthermore, whenever ultraviolet radiation has been applied to a culture for about 60 min, the infectivity of a coronavirus has been minimized to a very low level (Duan et al., 2003).

5 | CONCLUSIONS

Inactivation of the SARS-CoV and SARS-CoV2 can be achieved in histopathological laboratories by one of the following methods, or a combination of them:

1. Ethanol 60–70% or more, as in tissue processing protocols.
2. 0.1% sodium hypochlorite or 0.5% hydrogen peroxide for 1 min.
3. 0.02% chlorhexidine digluconate or 0.05–0.2% benzalkonium chloride, though these are less effective on inanimate surfaces.
4. Application of ultraviolet radiation to a culture for about 60 min, which can reduce the infectivity of coronavirus to a very low level.
5. Preservation of the morbid tissues in formalin for 24 hr or in glutaraldehyde for 24–48 hr.
6. During histological tissue processing, heating of the tissue at different temperatures for a given time.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

All the authors were involved in writing, critical revision, and final approval of the article.

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