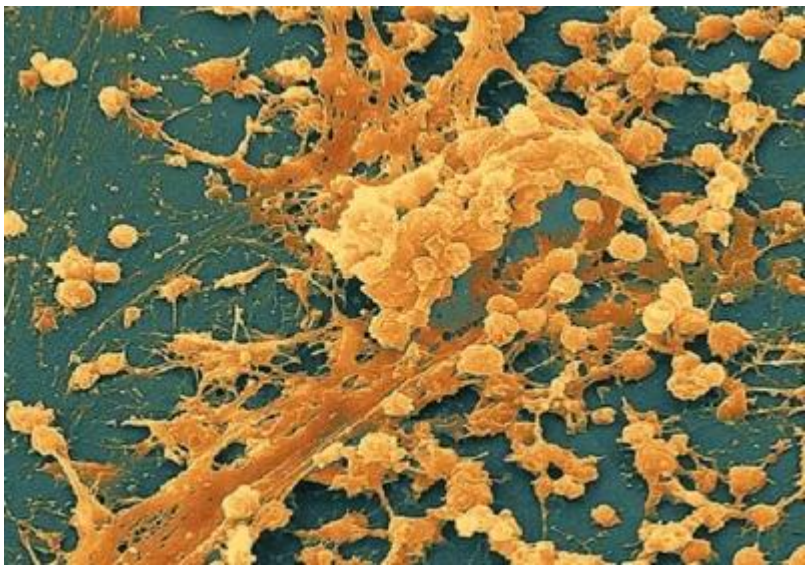
At the beginning of the COVID-19 pandemic in 2020, meat-packaging plants were among the largest epicenters of COVID-10 outbreaks. In this study, the researchers from the United States investigated the viability of the Delta variant of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), incubated with environmental biofilms from three meat packaging plants, on materials such as stainless steel, PVC, and ceramic tiles. They also examined how viral presence affected biofilm biomass.

The authors stated that the escalating number of COVID-19 cases in meat packaging plants at the onset of the COVID-19 pandemic in 2020 could be attributed to a variety of factors such as virus spread *via* HVAC systems, the shared use of equipment and workspaces among workers, and the SARS-CoV-2 ability to cohabitate with other biological organisms.

Biofilms are thin layers of microbial communities that adhere to each other on organic or inorganic surfaces. These complex colonies of microorganisms serve as protective coatings that provide a hostile environment for the growth and survival of bacterial cells. They also protect microbes from unfavorable environments, like heat, ultraviolet light, cold, and disinfectant chemicals, and increase bacterial resistance to antimicrobial agents. In meat packaging plants, environmental biofilms are commonly found on solid surfaces like tile flooring, PVC, or stainless steel.



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About the Study and *Results*

The Delta variant of the SARS-CoV-2 was incubated with- and without environmental biofilms from three meat packaging plants (marked as Plant A, B, and C) on materials usually present in meat packaging plants, like stainless steel, PVC, and ceramic tiles. The mean number of biofilm cells was represented as colony-forming units per mL (CFU/mL). The viability of SARS-CoV-2 was evaluated through a double overlay plaque assay and real-time quantitative polymerase chain reaction (rt-PCR). Rt-PCR detected SARS-CoV-2 RNA on each material tested.

The SARS-CoV-2 Delta variant was detectable and viable on all materials tested, but its viability was highly correlated with the microorganisms forming the microbial colonies in biofilms. The incubation of viruses with microorganisms forming Plant B biofilm for five days reduced the viral viability on every material tested. The incubation of viruses with microorganisms forming Plant C biofilm reduced the viral viability on stainless steel and PVC by 47 – 207-fold and viral infectivity by 146 – 375-fold, compared to the viral initial titer. This shows that the viability of the Delta variant of the SARS-CoV-2 was significantly reduced after exposure to Plant B and Plant C biofilms.

Importantly, the biovolumes of all three biofilms increased by 1.5 – 25-fold on all materials tested after incubation with viruses for five days compared to all three biofilms not incubated with viruses. According to the authors, such an increase in the biovolume of all three biofilms in response to the virus may be the bacterial defense mechanism against unfavorable environments.

Conclusion

This study has shown that the Delta variant of the SARS-CoV-2 remained viable and infectious for up to five days after incubation with and without each environmental biofilm on all surfaces tested. The viability of the SARS-CoV-2, incubated with environmental biofilms from three meat packaging plants, was significantly reduced after exposure to Plant B or Plant C biofilms. Also, viral presence affected biofilm biomass, increasing the biovolume of all three biofilms.

This study has been published on a preprint server and is currently under peer review.

Journal Reference

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