Deactivating mycelium using high-voltage electricity

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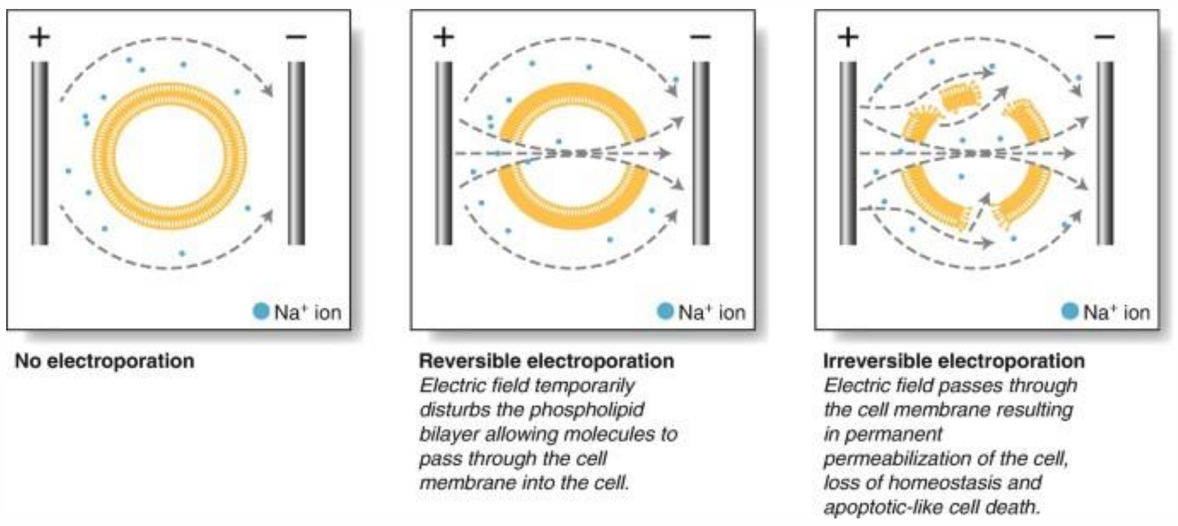
An Introduction

Mycelium-based building materials face a significant challenge: fungal deactivation requires considerable time and energy. Using high-voltage electricity offers a faster and more energy-efficient alternative. This approach can deactivate the mycelium while preserving the structural integrity of the fungal material.

The Theory

Using high-voltage electricity, cell death can occur due to electroporation (1). This would have the benefit of killing the cell while leaving the cell wall intact, allowing any mycelium bio-composite to retain its full mechanical strength



Cellular electroporation (1)

The Methods

1. A mould was designed and 3D printed to lower the chance of di-electric breakdown
2. Pure mycelium and mycelium bio-composites were grown in the laboratory
3. These samples were tested using the high voltage set-up
4. After testing, these samples were replated in the laboratory
5. Pictures were taken of the mycelial growth every few days

The Results and Conclusions

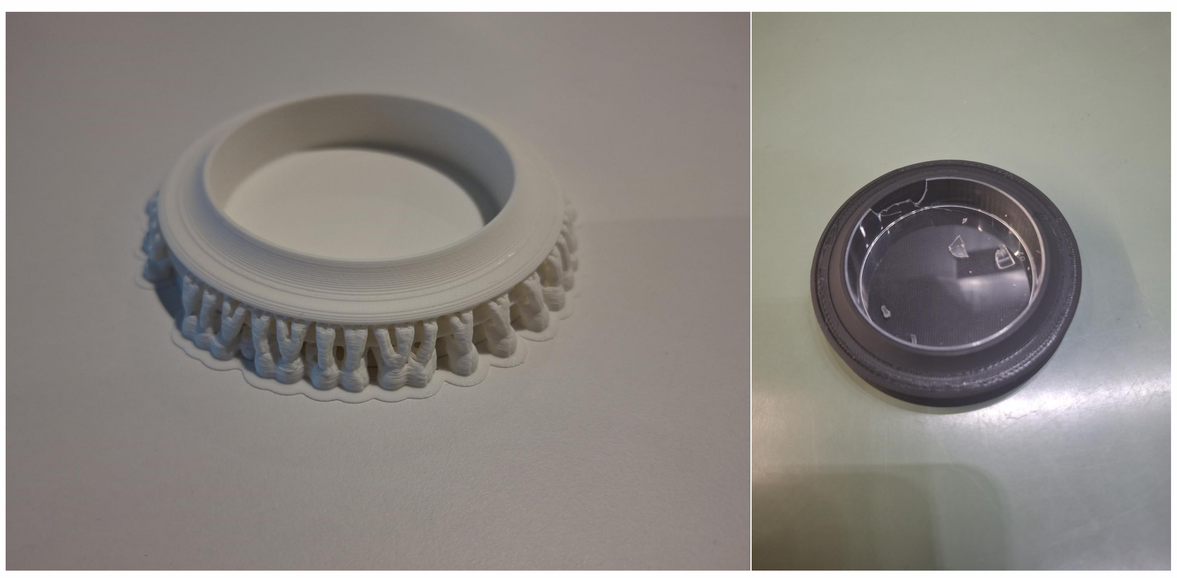
Positive Observations

- It was observed you can increase mycelium growth with electrical stimulation
- More frequent exposure has been observed to limit growth in some strains
- It was discovered that some types of treatment synergise, greatly increasing the deactivation.
- The moulds seemed effective at lowering the chance of breakdown (though not as expected)

Control sample (left) and the mixed treatment sample (right)

The Challenges

- Breakdown still occurred occasionally during testing, exploding one sample.
- Large contaminations of A. niger (black mold) occurred on the bio-composites in the first rounds of testing.
- The used high-voltage parameters used in the set-up were insufficient to deactivate the mycelium fully.



3D printed petridish holder with supports | Exploded dish holder

References

1. Lunelli, L., Cussenot, O., & de la Rosette, J. J. (2021). Irreversible Electroporation (IRE) for Prostate Cancer. Interventional Urology, 241-247