Effect of dentin on macrophage responses to lipopolysaccharide

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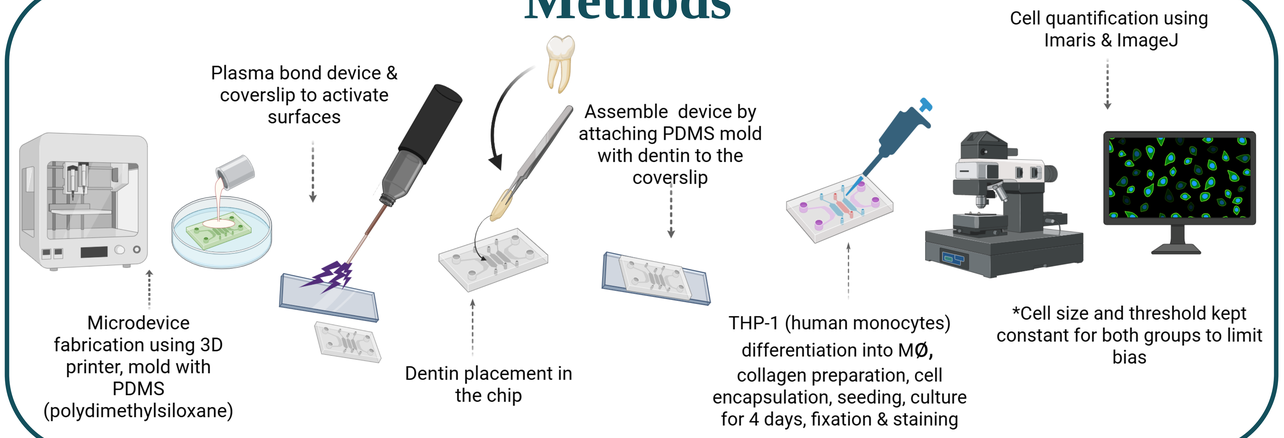
Introduction

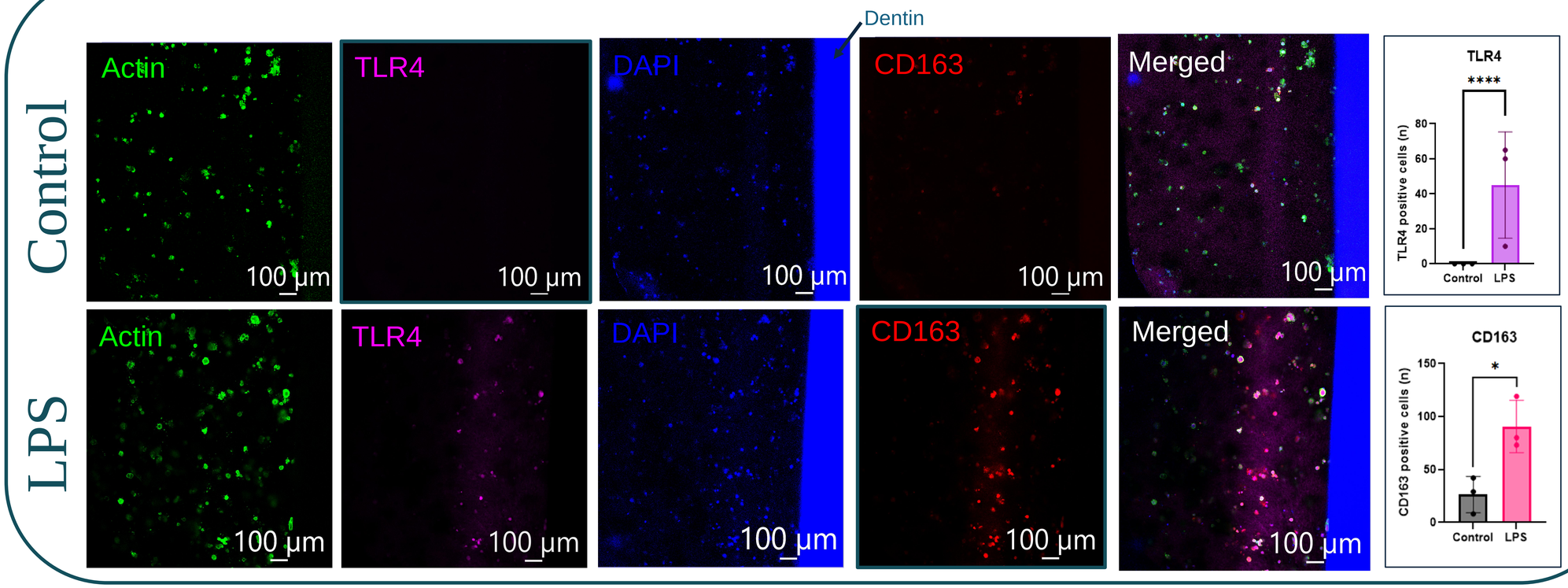
- Lipopolysaccharide (LPS) – a potent endotoxin from gram-negative bacteria, causes inflammation in endodontic infections.
  - LPS persists in the root canal even after standard disinfection using sodium hypochlorite (NaOCI), potentially disrupting regenerative procedures
  - Activates Toll-like receptor 4 (TLR4) on macrophages, inducing M1 (pro-inflammatory) polarization
- Dentin releases bioactive molecules like transforming growth factor β (TGF-β), which promote M2 (pro-regenerative) polarization
- Prolonged/repeated LPS exposure → LPS tolerance, making macrophages non-responsive and impairing regeneration
- This study investigates how residual LPS in dentin affects macrophage polarization toward the M2 phenotype

Our hypothesis is that LPS induces low expression of the M2 marker CD163 and high expression of TLR4.

Methods



Results



Future

Future Experiments:

- Investigate M1 polarization, proliferation markers, MØ secretome, & gene expression.
- Determine the presence of soluble dentin matrix molecules, such as transforming growth factor β, to correlate with M2 polarization.
- Conduct in vivo studies

Recognition

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Conclusion

We observed that the LPS-treated group had a greater clusters of macrophages compared to the control, suggesting cell proliferation. The increased expression of CD163 and TLR4 indicates a state of LPS tolerance and M2 polarization, suggesting that macrophages may become unresponsive due to repeated exposures to LPS, leading to a compromised immune environment for tissue regeneration.

- LPS tolerance is well described in immune contexts, but the impact on tissue regeneration in dental pulp remains unexplored.
- LPS tolerance may affect regenerative outcomes by impacting immune cells and signaling pathways.
- Understanding this mechanism may help develop immune-regulatory approaches to improve dental pulp regeneration outcomes, as well as immune responses to other infectious and inflammatory diseases.