

# 3D cellular visualization of CD11c<sup>+</sup> immune cells in dentin-pulp complex of optically cleared tooth

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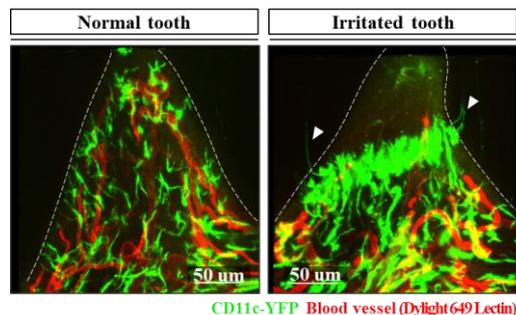
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## ABSTRACT

Odontoblast is one of the most prominent cells in tooth, lining up at the dentin-pulp interface and extending long processes in dentinal tubules. The main role of odontoblast is dentin formation by deposition of mineral matrix components. Recently, it has been suggested that odontoblasts might act as first-line defence recognizing pathogens and initiating innate immune response by secreting inflammatory cytokines and chemokine in pulp, facilitating effective immune response [1]. However, immune modulation in tooth has not yet been well investigated and current understanding of underlying molecular and cellular mechanisms in interaction of immune cells and odontoblasts is very limited. There are diverse and heterogeneous population of immune cells in healthy pulp, and it has been reported that the CD11c<sup>+</sup> pulpal dendritic cells might have a role of sensing pathogens and inducing TLR-mediated signalling, functioning as sentinel cell in pathological condition [2]. To further explore dynamic roles of CD11c<sup>+</sup> cells in pupal inflammation and resolution, in this study, we analyzed pulpitis induced tooth of CD11c-YFP transgenic mouse. For 3D cellular-level visualization of intact tooth, a newly optimized tooth optical clearing method based on modified Murray's clear [3] was utilized. In normal tooth, we identified a few CD11c<sup>+</sup> cells extending their cytoplasmic processes into dentinal tubules with



**Figure 1.** Z-projection image of pulp horn of maxillary molar. Dotted lines represent dentin-pulp interface. Arrowheads mark long cytoplasmic processes of CD11c<sup>+</sup> odontoblast-like cells extended to dentinal tubules. Scale bar, 50  $\mu$ m.

odontoblast-like morphology. In irritated tooth with mechanical burring and acid treatment without pulp exposure, we observed significantly increased number of CD11c<sup>+</sup> cells with odontoblast-like morphology. It suggests that CD11c<sup>+</sup> cells near the odontoblastic layer might be able to transform their morphology into odontoblast-like cells by extending their cellular processes into dentinal tubules potentially as defensive cells. At the pupal space near the irritated dentin-pulp interface, CD11c<sup>+</sup> cells were recruited and aggregated to be closely located with each other as shown in Fig. 1, presumably forming a protective barrier. In summary, 3D visualization of CD11c<sup>+</sup> pulpal cells in optically cleared tooth after giving external stimuli revealed their dynamic responses such as barrier formation in pulp or surveillance of dentinal tubule.

## REFERENCES

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