School of Dentistry
FACULTY OF MEDICINE AND HEALTH

UNIVERSITY OF LEEDS

Anti-inflammatory effects of cannabidiol to modulate induced inflammation on gingival-keratinocytes

S. Kumar[1], J. Tahmassebi[2], F. Javid[3], El. M. Raif[1]

[1]Oral Biology division, School of Dentistry, and [2] Department of paediatric dentistry, School of Dentistry, University of Leeds,
[3] *School of Applied Science, University of Huddersfield*.

INTRODUCTION

Periodontitis is an infectious disease characterised by chronic inflammation of the periodontium, which could eventually lead to alveolar bone loss and subsequently tooth loss (Figure 1). Various existing treatment options for chronic periodontal problems are discussed widely to be replaced by selective natural plant products, to reduce the side effects of synthetic anti-inflammatory agents. Cannabidiol, a natural plant alkaloid used as anti-inflammatory agent in various diseases.

Aim: Primarily to explore the suitability of cannabinoids to prevent the breach of healthy periodontium and its maintenance during inflammation.

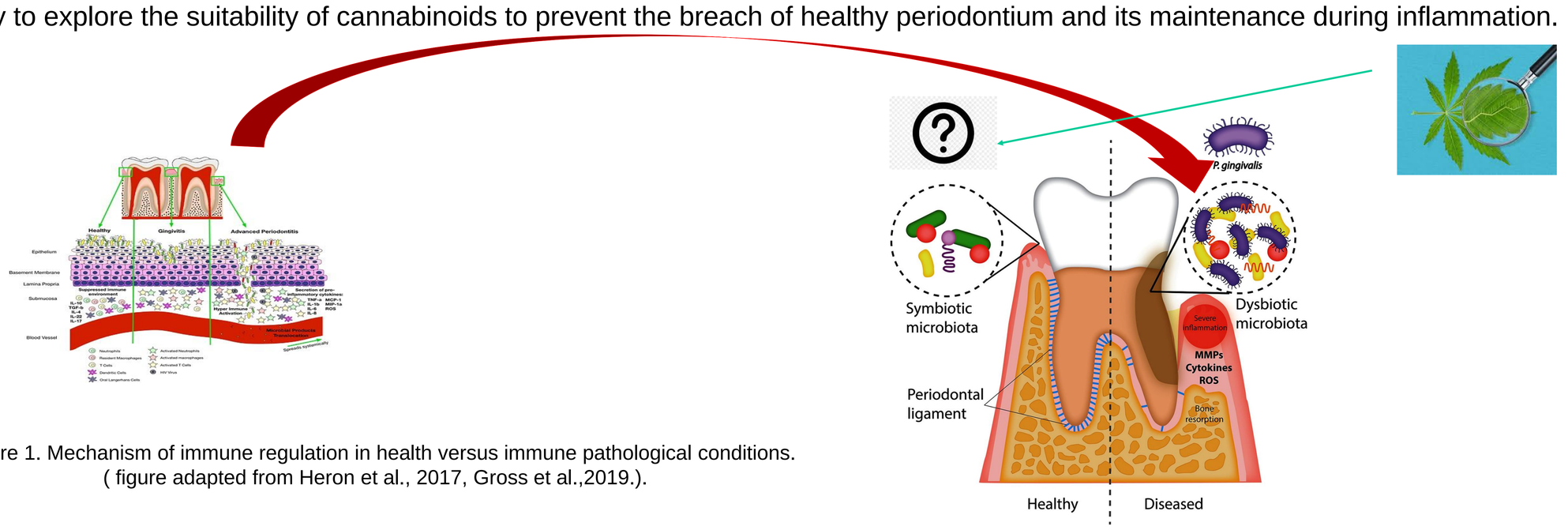

Figure 1. Mechanism of immune regulation in health versus immune pathological conditions.
(figure adapted from Heron et al., 2017, Gross et al.,2019.).

MATERIALS AND METHODS

Cytotoxicity of flagellin and different concentrations of CBD was evaluated on Telomerase Inhibited Gingival Keratinocytes (TIG-K) cells using Alamar blue assay. The effect of CBD on flagellin induced inflammation in TIG-K cells was examined by monitoring the expression of Interleukin-8 at m-RNA and protein levels using real-time PCR and ELISA, respectively.

RESULTS

Flagellin (1 µg/ml) did not affect TIG-K cells viability. CBD at 100 µM significantly decreased the viability of TIG-K cells, however, CBD at concentration10 µM and below did not show any toxicity (Figure 2).

Flagellin substantially increased the IL-8 expression relative to the control, both at m-RNA level (350 times of the control) (Figure 3) and protein level (500 times of control) (Figure 4 & 5). Whereas, the pre-treatment of TIG-K cells with CBD for 1 hour, significantly attenuated the effect of flagellin on IL-8 expression by 325 times for m-RNA and 60-70 % for protein.

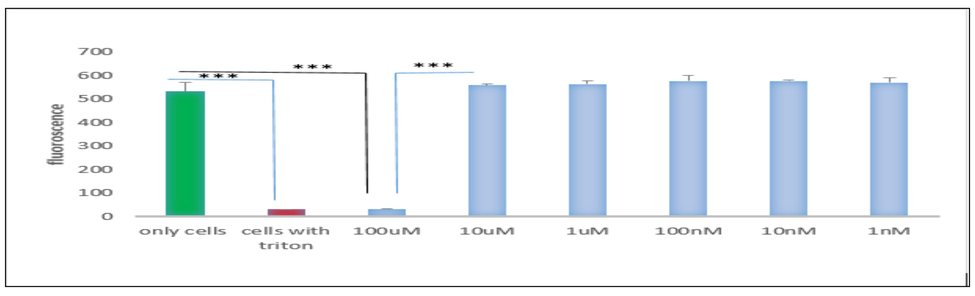

Figure 2: Cell viability with various concentrations of CBD.

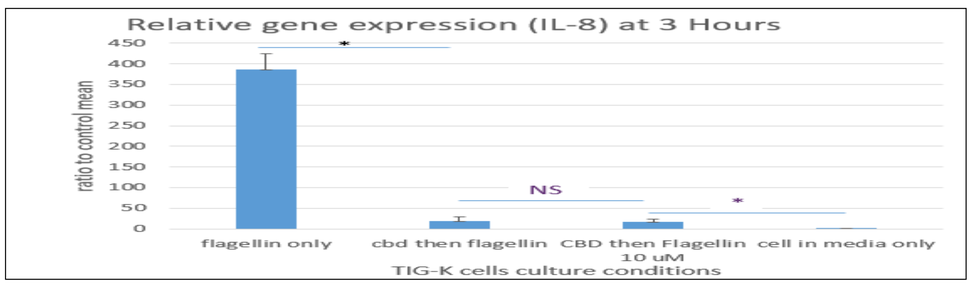

Figure 3: Relative expression of IL-8 as compared to GAPDH at 3 Hours.

Error bars: represent the standard deviation .

* NS: no significance, (***) significance used p<0.001, n=3.

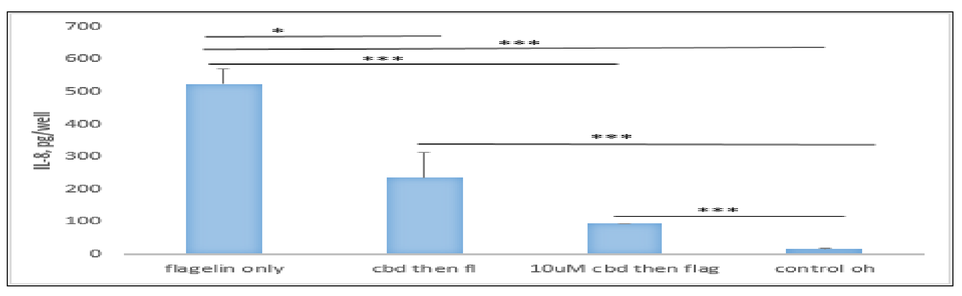

Figure 4: Effect of CBD at 1µM and 10µM on the TIG-K cell culture for three hours

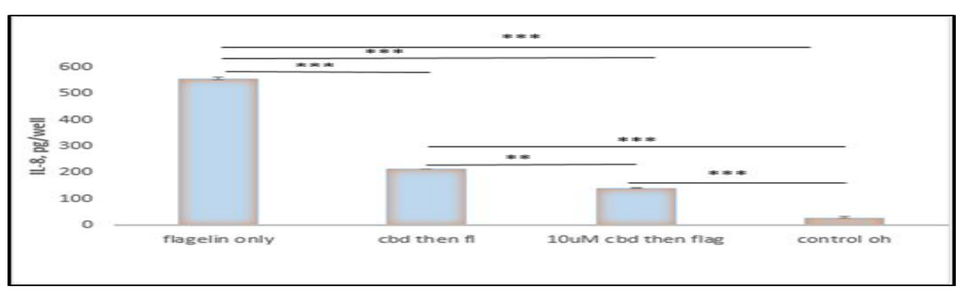

Figure 5: Effect of CBD at 1µM and 10µM on the TIG-K cell culture for 24 hours.

CONCLUSION AND FUTURE WORK

In conclusion, the pre-treatment with CBD markedly attenuates the expression of IL-8 stimulated with obnoxious stimulus flagellin. Hence, it might be a useful therapeutic drug against the periodontal inflammation and its systemic impact.

Future work involves:

- Investigating the role of cannabinoids on expression of various inflammatory mediators by TIG-K cells and periodontal cells.
- Identify the effect of cannabinoids on expression of osteogenic and osteoclastogenic markers during inflammation.
- Understand weather anti-inflammatory properties of cannabinoids could be harnessed as a first line treatment for chronic periodontal diseases .