

From Persistent Dental Plaque to Pathways: Early Oral Inflammation and Systemic Immune Risk in Children

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Background: The immunological consequences of dental plaque accumulation in children remain poorly understood during a critical period of immune development. We hypothesize that persistent plaque accumulation and the continuous release of microbial immunostimulators, such as lipopolysaccharide (LPS; endotoxin), promote not only local pro-inflammatory responses and gingival inflammation but also the reprogramming of immune molecular pathways associated with chronic systemic inflammatory diseases, thereby shaping early-life oral-systemic immune crosstalk.

Methods

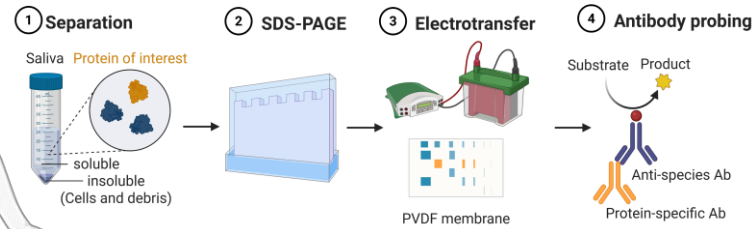
We quantified the endotoxin level of saliva samples from children (n= 40) displaying varying dental plaque index and DMFT, and BOP%: <10 & >30

Spearman correlation

	Endotoxin	Plaque%	BOP%	DMFT	HMGB1	S100A8	PTX3
Endotoxin	1.00	0.27	0.22	-0.05	0.70 <i>a</i>	0.74 <i>a</i>	0.67
Plaque%	0.27	1.00	0.61 <i>a</i>	0.29	-0.08	0.12	0.14
BOP%	0.22	0.61 <i>a</i>	1.00	0.04	-0.07	0.04	0.10
DMFT	-0.05	0.29	0.04	1.00	-0.49 <i>b</i>	-0.32	-0.08
HMGB1	0.70 <i>a</i>	-0.08	-0.07	-0.49 <i>b</i>	1.00	0.82 <i>a</i>	0.57 <i>b</i>
S100A8	0.74 <i>a</i>	0.12	0.04	-0.32	0.82 <i>a</i>	1.00	0.53 <i>b</i>
PTX3	0.67 <i>a</i>	0.14	0.10	-0.08	0.57 <i>b</i>	0.53 <i>b</i>	1.00

a: p < 0.001 *b*: p < 0.01

Pathway analysis (Method: Western blot)

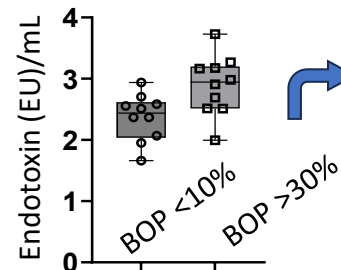


27 key immune regulatory nodes spanning inflammatory, tolerance, and trained immunity pathways were assessed

Endotoxin quantification (Method: The LAL assay)

Results

Lognormal Welch's t-test
p = 0.0197



❖ Children with generalized gingival inflammation exhibit elevated salivary endotoxin activity.

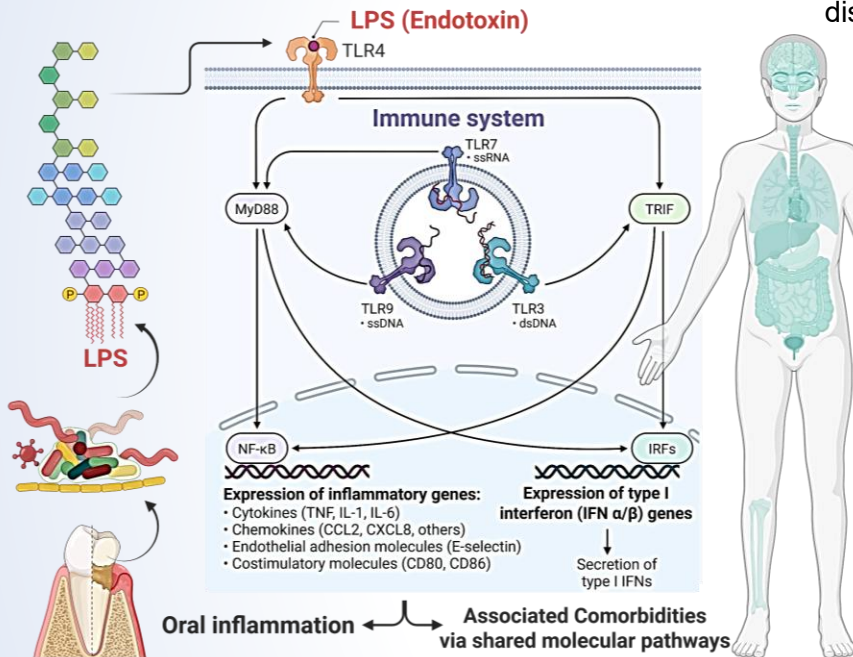
❖ These patterns support early-life immune reprogramming, shifting toward trained immunity-like, pro-inflammatory states.

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Endotoxins or LPS macromolecules are key structural components of Gram-negative bacteria and potent immunostimulatory molecules. Sustained exposure to endotoxins potentially contributes to immune reprogramming and chronic inflammatory states at the molecular level.