[3814.262] Gingival Inflammation Is Associated With Altered Tissue Microstructure in Frontolimbic Regions and Memory Performance in Otherwise Healthy Preadolescents

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BACKGROUND: Many risk factors for adult neuropsychiatric disease are established earlier in development. Cytokines, involved in host-defense, are also expressed in the central nervous system. Animal models have shown effects of proinflammatory cytokines (e.g., TNF-α, IL-1β) on limbic functions, including learning and memory. Gingivitis is associated with long periods of bacterial-induced low-level inflammation, mediated by an elevated expression of proinflammatory cytokines.
OBJECTIVE: To determine whether gingival inflammation is associated with altered frontolimbic microstructure and/or function.
DESIGN/METHODS: 40 preadolescent twins (ages 9-13) underwent neuropsychological exams (including memory) and MRI on a 1.5T Philips Achieva (MPRAGE, DTI and MR Spectroscopy) as part of a study on neurodevelopment and oral health. All participants also underwent dental exams and provided saliva samples. MRIs were processed using BrainSuite (brainsuite.org), yielding anatomical segmentation, with cerebral metabolites (MRS) quantitated using LCModel (Provencher). Cytokine levels were quantitated from saliva using MST (Meso Scale Diagnostics). MRI and behavioral data were correlated with cytokine levels and gingival inflammation using a mixed-effects linear model implemented in IDL (Exelis).
RESULTS: We found relations among gingival inflammation, TNF-α, hippocampal volume and memory performance as well as relations among TNF-α, IL-1B and tissue microstructure (ADC) in orbitofrontal and limbic regions.

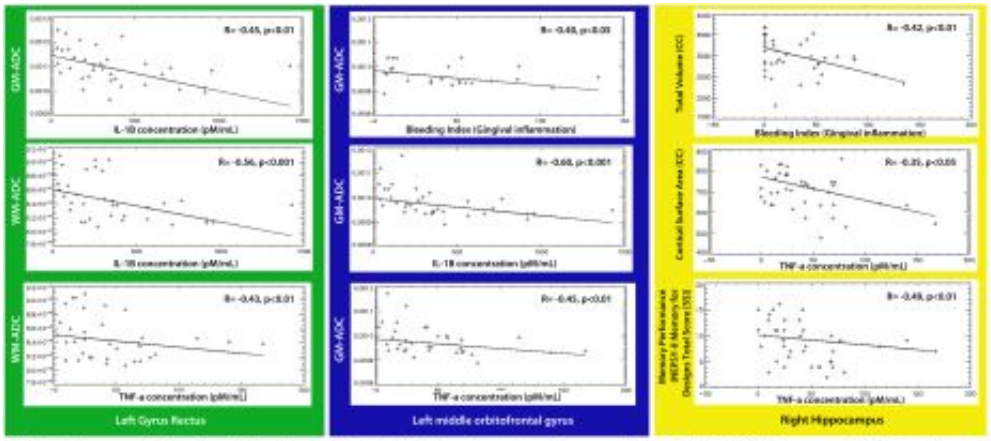

Fig.1. Associations among inflammation, proinflammatory cytokine/fronto-limbic tissue microstructure and memory performance. IL-1B and TNF-alpha were associated with tissue microstructure (ADC, calculated from DTI data) in medial frontal regions (gyrus rectus, green panel, left; middle orbitofrontal gyrus, blue panel, middle). Bleeding (an index of gingival inflammation) was associated with microstructure in a medial orbitofrontal region (middle panel, top) and total volume of the right hippocampus (yellow panel, right, top row). Likewise, TNF-alpha concentration was associated with cortical surface area in the hippocampus as well as memory performance (yellow panel, right). GM= grey matter; WM=white matter; CC=cubic centimeters; SS=scaled score)

Finally, we found a relation between gingival inflammation and myo-inositol (a marker of neuroinflammation) in the anterior cingulate region, dependent on IL-1β levels ($p < 0.05$).
CONCLUSIONS: Gingival inflammation is associated with alterations in frontolimbic networks and diminished neurocognitive functioning in otherwise healthy preadolescents.

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