

Fundamental biodegradable membrane properties affected by human saliva interaction.

Background: Guided bone regeneration (GBR) membranes have several surface properties manufactured to induce positive responses in surgical procedures. However, saliva is a fluid constantly exhibited in the oral environment of patients needing oral regenerative treatments, therefore, saliva interaction with biomaterials for guided GBR may occur previous to, during, or in late stages of bone- and/or periodontal-related treatments.

Aim/Hypothesis: This experimental study aimed to evaluate potential modifications in the physio-chemical and biological properties of biodegradable membranes for GBR generated by the early interaction with human saliva.

Material and Methods: Three donors were selected for unstimulated saliva collection and subsequent application in the experiments. Inclusion criteria for selected saliva donors were determined as patients with healthy mouth conditions without periodontal diseases and/or systemic altered conditions. Commercial membranes for GBR were punched into discs and divided into three groups regarding their physio-chemical properties. A reproducible protocol for collecting human saliva and contaminating the membranes was designed. Following, membranes were investigated for their physio-chemical properties before and after saliva interaction; protein quantification, total DNA quantification, 16S rRNA levels, viability of two different cell lines at 1 and 7 days (HGF-1 and MC3T3-E1), and ALP activity (MC3T3-E1) were evaluated comparing the membrane groups. As-manufactured membranes and non-interacted saliva of donors were applied as controls for comparisons.

Results: Scanning electron microscopies revealed qualitatively saliva interaction with all membrane groups and morphological alterations for biodegradable membranes. Wettability characteristics showed a significant ($p < .05$) change after saliva interaction for all membrane groups. Biodegradable membranes following saliva contamination demonstrated significantly higher values of absorbed total DNA and 16S RNA quantification compared to PTFE membranes. Additionally, biodegradable membranes after saliva interaction showed reduced ($p < .05$) viability of HGF-1 and MC3T3-E1 cells at 1 day and 7 days. ALP activity (MC3T3-E1) decreased significantly after 7 days.

Conclusion and Clinical implications: Human saliva interaction affected the physical-chemical-biological properties of GBR membranes. Biodegradable membranes showed vulnerability to human saliva interaction, suggesting morphological structure and surface alteration; reduced HGF-1 and MC3T3-E1 cell viability at 1 and 7 days; and higher adherence of salivary components. Hence,

clinical protocols requiring biodegradable membranes in oral- and periodontal-related procedures may need to be refined accordingly.