

VISCOELASTIC PROPERTIES OF SALIVA FROM DIFFERENT GLANDS

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The major functions of saliva are to protect hard and soft oral tissues from wear, dehydration, demineralisation, chemical insult and microbial imbalance¹. It is particular salivary glycoproteins such as mucins and proline-rich proteins that have structural features that correlate to the protective function of masticatory lubrication. Mucins, of both high-molecular weight (MUC5B) and low-molecular weight (MUC7), are secreted from the submandibular-sublingual salivary glands while the proline-rich glycoproteins emanate from the parotid glands. Saliva is a dilute viscoelastic polymer solution with very low shear modulus and is therefore difficult to characterize experimentally. The saliva is present only in small volumes thus further limiting the experimental techniques available.

Small amplitude oscillatory shear with a narrow gap parallel plate system was used to be able to measure the viscoelastic properties of such a dilute system as saliva. The technique has been thoroughly described by Davies and Stokes² and utilizes the high strains and strain rates produced in narrow gaps. Davie and Stokes have also demonstrated its applicability for saliva viscoelasticity³. The method utilizes a parallel plate system with narrow gaps down to 5 µm. However, in order to obtain meaningful measurements numerous gap errors have to be accounted for. The most prominent error is the unavoidable misalignment of the parallel plates which produces an underestimation in the measurements at gaps less than a few tenths of a millimetre. The advantages of this new technique as compared to previous measurements using oscillating capillary flow⁴ and resonant oscillation^{5,6} are a wide selection of frequencies and a well defined strain.

Unstimulated saliva as well as stimulated saliva from the submandibular-sublingual glands (HSMSL) and the right side parotid gland (HPS) of two healthy female individuals was collected using custom made collectors. Mechanical spectrums of the saliva were recorded immediately after collection and after a short period of resting to determine the effect of stimulation on the viscoelastic properties. The gap error was determined and the data corrected.

References

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