HS Brand
AJM Ligtenberg
CP Bots
AV Nieuw Amerongen

Secretion rate and buffer capacity of whole saliva depend on the weight of the mechanical stimulus

Authors' affiliations:
HS Brand, AJM Ligtenberg, CP Bots, AV Nieuw Amerongen, Department of Oral Biochemistry, Academic Centre for Dentistry (ACTA), van der Boechorststraat 7, 1081 BT Amsterdam, The Netherlands

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Low secretion rate and low buffer capacity of saliva are considered to be important endogenous risk factors for dental caries. Analysis of these parameters has been recommended to identify individuals with increased risk of caries (1, 2), although the predictive value has been disputed because of the multifactorial character of caries development (3).

In clinical saliva tests, chewing on either paraffin or Parafilm® (American National Can, Greenwich, CT, USA) have been used extensively as tasteless saliva-stimulating agents. However, these stimuli show considerable variation in size between the various experiments reported. Paraffin has been used as a stimulus in a range from 0.8 to 10.0 g (4–8), and Parafilm® ranging from 0.3 to 1.0 g (9, 10). Therefore, we determined whether the weight of the chewing object affects the secretion rate and buffer capacity of whole saliva.

Eighty-eight healthy female volunteers (dental hygiene students and dental students) participated in this study, which was approved by the Medical Ethical Committee of Vrije Universiteit of Amsterdam. All subjects were instructed to refrain from smoking, eating, drinking caffeine containing beverages and toothbrushing at least 1 h prior to the experiment (10), which took place between 14.00 and 15.00 hours. The volunteers received randomly one or three pieces of 5×5 cm Parafilm® with a total weight of 0.3 and 0.9 g, respectively. Unstimulated and chewing-stimulated saliva were collected for 5 minutes and salivary flow rates were determined gravimetrically (1 g = 1 ml) (9). Salivary pH was measured with a series of pH indicator strips (4.0–7.0, 5.2–7.2 and 6.5–10.0; Merck, Darmstadt,

Table 1. **Characteristics of unstimulated saliva, and saliva produced during chewing on one or three pieces of Parafilm® (0.3 and 0.9 g, respectively). Data are expressed as mean values ± SD**

	One piece (n = 51)	Three pieces (n = 47)
Age (years)	22.7 ± 3.3	22.7 ± 4.5 n.s.
Unstimulated saliva		
Volume (ml min^{-1})	0.52 ± 0.22	0.56 ± 0.26 n.s.
pH	7.07 ± 0.43	6.96 ± 0.43 n.s.
Titrated pH	4.45 ± 0.70	4.46 ± 0.71 n.s.
Stimulated saliva		
Volume (ml min^{-1})	1.18 ± 0.52	1.80 ± 0.72 P < 0.001
pH	7.58 ± 0.43	7.82 ± 0.43 P = 0.006
Titrated pH	5.07 ± 0.95	5.76 ± 1.00 P = 0.001

Germany). Subsequently 1 ml of 0.01 M HCl was added to 1 ml saliva, mixed, and the final pH of this solution was taken as an indication of the buffer capacity (titrated pH). Data are expressed as mean ± SD and were analysed with Student's *t*-tests (SPSS version 8.0; SPSS Inc., Chicago, IL, USA).

Fifty-one subjects received one piece of Parafilm®, 47 subjects received three pieces. Both groups did not differ with regard to age, history of smoking, the use of oral contraceptives and other medication. Although limited to two different weights, our data show that in mechanically stimulated saliva the flow rate, pH and titrated pH increase significantly with the weight of the stimulus (Table 1). The larger saliva-stimulating Parafilm® agent probably results in an increased stimulation of mechanoreceptors in the periodontal ligament (11), leading to an increased secretion of parotid saliva. As the main buffer system of stimulated parotid saliva is the bicarbonate system (12), an increased secretion of HCO_3^- will lead to both a higher salivary pH and a higher buffering capacity.

We conclude that variations in buffer capacity are partly because of differences in mechanical stimulation of saliva secretion. This emphasizes the importance of standardization in saliva stimulation and collection when screening for individuals with low buffer capacity (1, 2).

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HS Brand

Department of Oral Biochemistry

Academic Centre for Dentistry (ACTA)

van der Boechorststraat 7

1081 BT Amsterdam

The Netherlands

E-mail: hs.brand@vumc.nl