

Origin of Salivary Metabolites and their Role in Taste Perception

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Introduction

Commensal microflora may impact eating behaviour, possibly by altering taste receptors [1]. This study aims to determine the oral microbial contributions to salivary metabolite composition and the influence of metabolite composition on taste perception using proton nuclear magnetic resonance spectroscopy (¹H-NMR).

Materials and Methods

Experiment 1: Whole-mouth saliva (WMS) and glandular saliva directly from the parotid gland (PS) were collected from healthy volunteers (n=11) and underwent ¹H-NMR as described previously and metabolite concentrations quantified [2]. Salivary bacterial load was calculated by microbial culture.

Experiment 2: WMS was collected from volunteers (n=15), before tasting sucrose (0.25 M) and caffeine (8 mM) solutions, for which participants rated their perception of sweet and bitter. ¹H-NMR of WMS was performed and differences in metabolite concentration between low and high perceivers assessed.

Results

Metabolites found to discriminate low vs. high taste perceivers are listed below (Table). Except for lactate and formate, the other metabolites were absent from PS and correlated strongly with WMS bacterial load, suggesting they are bacterial metabolites.

Table: Concentrations of metabolites in whole mouth saliva that differed between low and high perceivers of taste. [Values are means; NS = not significant.]

Taste Solution	Discriminatory metabolites (low taster mean (mM); high taster mean (mM), p-value)	Presence in WMS vs. PS (WMS mean (mM); PS mean (mM), p-value)	Correlation with WMS bacterial load (Pearson's r; p-value)
Sucrose (0.25 M)	Lactate (1.84; 0.12), p < 0.05	(0.13; 0.13), NS	NS
	Succinate (0.20; 0.07), p < 0.05	(0.24; 0.00), p < 0.001	0.81; p < 0.003
	Glycine (0.19; 0.08), p < 0.05	(0.26; 0.00), p < 0.05	0.82; p < 0.002
	Butyrate (0.27; 0.18), p < 0.05	(0.29; 0.00), p < 0.01	0.70; p < 0.02
	Propionate (0.94; 0.38), p < 0.05	(0.90; 0.00), p < 0.01	0.83; p < 0.002
	Formate (0.12; 0.03), p < 0.05	(0.07; 0.04), p < 0.05	NS
Caffeine (8 mM)	Propionate (0.90; 0.34), p < 0.01	(0.90; 0.00), p < 0.001	0.83; p < 0.002

Conclusion

The WMS metabolic composition is dominated by metabolic products from oral bacteria. Several salivary metabolites appear to be associated with diminished taste perception, particularly for sweet substances. Enhanced understanding of the effects of microbial metabolites on the taste that is perceived by the individual has implications for dietary choice, nutrition and health.

References: [1] Alcock *et al.*, Bioessays. (2014). [2] Gardner A, *et al.*, J. Prot. Res. (2018).