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Adsorption of oral pathogenic microbes by small crystal hydroxyapatite

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Objectives: Small crystal hydroxyapatite (scfHA) has been shown to adsorb cariogenic bacteria in the oral cavity. By radioisotopic liquid scintillation counting, we evaluated its capacity to adsorb microbes associated with caries, periodontitis, and oral opportunistic infection, both individually and in two-species solutions, and examined the effect on this adsorption of both saliva and the bacteria-adsorbing salivary agglutinin peptide SRCRP2 (scavenger receptor cystein-rich domain peptide 2).

Method: (1) Human saliva-treated scfHA (s-scfHA), SRCRP2-treated scfHA (SRCRP2-scfHA) and non-treated scfHA were each added to suspensions of ^{3}H-labeled streptococci {*S. mutans*, *S. sobrinus*, *S. sanguis*, *S. mitis*, *S. salivarius*, *S .anginosus* (OD=1.0, 550nm) respectively} and the solutions shaken for 90 minutes at 37 degrees. After rinsing with PBS, radioactivity for each substance was measured and the rate of bacterial adsorption was calculated. The same assay was repeated for scfHA and s-scfHA using (2) suspensions of *P. gingivalis*, *A. actinomycetemcomitans* and *C. albicans* respectively, and (3) mixed suspensions containing ^{3}H-labeled *C. albicans* (7.4CFU log/ml) and either *S. mutans* (7.1CFU log/ml), *S. sanguis* (7.1CFU log/ml) or *S. mitis* (7.4CFU log/ml).

Results: No significant difference in streptococci adsorption was found between scfHA and SRCRP2-scfHA, except for *S. mutans* (adsorption rate by scfHA: 62.3±1.0%, SRCRP2-scfHA: 69.1±1.7%), indicating that scfHA alone is a strong adsorptive agent for all streptococci. Saliva coating significantly reduced the adsorptive capacity of scfHA for both streptococci and periodontopathic bacteria, but not for *C. albicans* (adsorption rate by scfHA: 58.4±10.5%, s-scfHA: 52.6±10.2%). Results for two-species solutions showed that *C. albicans* adsorption to scfHA was not significantly decreased by coexistence with *S. mutans*, *S. sanguis* or *S. mitis*.

Conclusion: scfHA may be a powerful agent for removing oral pathogenic microbes, especially if a drug-retainer system that avoids the influence of saliva is used on the tooth surface.

Table. Adsorption rate of periodontal and opportunistic microbes to HA

			Rate of Adsorption (%)	
	Strain	Log CFU/ml	HA	s-HA
P.gingivalis	ATCC33277	9.5	86.1±6.8	72.5±9.4
	W83	9.6	81.9±10.1	24.7±4.4
A.actinomycetem comitans	ATCC25922	8.6	65.4±4.2	54.7±2.4
	Y4	8.4	39.1±4.5	24.3±4.5
C.albicans	SC5314	7.4	54.9±7.5	51.7±7.3