

Probiotics in oral health and disease: a systematic review

Perrine Saiz, Nuno Taveira and Ricardo Alves, Centro de Investigação Interdisciplinar Egas Moniz (CiiEM), Instituto Universitário Egas Moniz, 2829-511 Monte de Caparica, Portugal. Corresponding author: Nuno Taveira (ntaveira@egasmoniz.edu.pt)

Table S3 - Characteristics of clinical trials of probiotics in the oral ecosystem

Reference Oral condition	Parameters evaluated - Evaluation time	Study design - Groups of study	Sample size (at the end of the study)- Age or age group	Vehicle - Administration time	Probiotic strain(s) used (Dose)
Sarmiento <i>et al.</i> , 2019 Oral microbiota	Microbiological (saliva samples) and probiotic colonization - baseline, 7, 11, 14, 21, 26, and 28 days	RCT controlled - Probiotic group and Placebo group (Petit-Suisse)	39 children - 10-12 years	Petit-suisse 50g - 2 weeks (once a day, Monday to Friday in the 1 st week and Monday through Thursday in the 2 nd week)	<i>Lactobacillus casei</i>
Rungsri <i>et al.</i> , 2017 Oral microbiota	Microbiological: SM, LB salivary/ Clinical: DMFT, PI, GI/Biochemical: salivary pH - baseline, 4 (microbiological parameters only) and 8 weeks	RCT prospective, controlled, double-blind - Test group (<i>L.rhamnosus</i> SD11) and Control group (<i>L.bulgaricus</i>)	43 adults with dental carie cavited in ≤ 2 teeth, absence of periodontal disease - 20-25 years	Milk 100mL - 4 weeks (once a day)	<i>Lactobacillus rhamnosus</i> SD11 or <i>Lactobacillus bulgaricus</i> (control)
Romani Vestman <i>et al.</i> , 2015 Oral microbiota	Microbiological (saliva and biofilm samples for microbiota composition, pyrosequencing, culture, PCR) - baseline, 4, 8, 12 weeks, 1 and 6 months	RCT, placebo-controlled, double-blind - Test group (probiotic, isomalt, hydrogenated palm oil, mint and pepper flavoring, peppermint oil and sucralose) / Control group	44 adults free of caries or periodontal disease - 20-66 years	Lozenges - 12 weeks (twice a day)	<i>Lactobacillus reuteri</i> DSM 17938 and ATCC PTA 5289 (10 ⁸ CFU each)
Toiviainen <i>et al.</i> , 2015 Oral microbiota	Clinical: PI, GI/ Microbiological: SM, LB - baseline, 4 weeks	RCT controlled, double-blind - Probiotic group and Placebo group	62 adults with salivary SM scores $\geq 10^3$ CFU/mL - mean age 24 years	Lozenges - 4 weeks (4 times a day)	<i>Lactobacillus rhamnosus</i> and <i>Bifidobacterium animalis subsp. lactis</i> BB-12 (2 x 10 ⁹ cells each)
Burton <i>et al.</i> , 2013 Oral microbiota	Clinical: PI, GI/Microbiological - 1, 2, 3, 7 months	RCT controlled, double-blind - Probiotic group and Placebo group	83 children with caries experience (at least 3 restorations, 1 placed in the last 12 months), without detection of BLIS-producing <i>S.</i> <i>salivarius</i> ; 10 ⁴ CFU/ml SM - 5-10 years	Lozenges - 3 months (twice a day)	<i>Streptococcus salivarius</i> M18
Thakkar, 2013 Dental biofilm	Clinical: PI - baseline, 15 days, 3 weeks later	RCT controlled - Placebo group (colored distilled water)/ CHX group 0.12%/ Probiotic group	90 children without active caries, mild to moderate plaque score - 13-15 years	Mouthwash (1g with 10mL water) - 14 days (once a day)	<i>Lactobacillus acidophilus</i> , <i>Lactobacillus rhamnosus</i> , <i>Bifidobacterium longum</i> , <i>Saccharomyces boulardii</i> (1.25 x 10 ⁹ CFU each)
Keller & Twetman 2012 Oral microbiota and acid lactic synthesis	Microbiological: SM, LB/ Biochemical: lactic acid - baseline, 2 weeks	RCT cross-over, double-blind 4 phases: cleaning/ intervention (2 weeks) / washout (3 weeks) / intervention (2 weeks) - Probiotic group and Placebo group	18 adults with salivary moderate, high SM count; without visible open caries lesion or periodontal disease - mean age 26 years	Tablet - 2 weeks (3 times a day)	<i>Lactobacillus reuteri</i> DSM 17938 and ATCC PTA 5289 (10 ⁸ CFU each)
Martinen <i>et al.</i> , 2012 Dental biofilm and acid lactic synthesis	Microbiological: SM, LB and colonization by probiotics/ Biochemical: lactic acid (supragingival plaque sample) - baseline, 2 weeks	RCT cross-over, double-blind 4 phases: washout (3 weeks)/ 1 st probiotic (2 weeks)/ washout (5weeks)/ 2 nd probiotic (2 weeks) - Probiotic group 1: <i>L. rhamnosus</i> GG / Probiotic group 2: <i>L. reuteri</i> SD2112 and PTA 5289	13 adults with SM > 10 ⁴ CFU/mL, low DMFT scores - mean age 25.3 years	Tablet - 2 weeks (twice a day)	<i>Lactobacillus rhamnosus</i> GG or <i>Lactobacillus reuteri</i> SD2112 and PTA 5289

Keller <i>et al.</i> , 2012 Microbiota oral	Microbiological: SM (stimulated saliva samples) - baseline, 1, 6, 12 weeks	RCT, multicentric, double-blind, parallel Day 0: prophylaxis + 1% CHX varnish and 1% timol + FMD (CHX 0.2% - 2 days 2x / day) - Probiotic group and Control group	62 adults with salivary SM count > 6.10 ⁵ CFU / mL - 19-35 years	Lozenges - 6 weeks (twice a day)	<i>Lactobacillus reuteri</i> DSM 17938 and ATCC PTA 5289
--	--	--	---	----------------------------------	--