INPLASY PROTOCOL

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None declared.

Effectiveness of probiotics on oral malodor (halitosis): Systematic review and meta-analysis

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Review question / Objective: **Are probiotics effective for the reduction or elimination of bad breath?**
Condition being studied: **Halitosis or oral malodor is a condition produced by the putrefaction of sulfur-containing amino acids. It affects between 30 and 50% of the population and produces social rejection, diminishing the quality of life and self-esteem. Probiotics, especially Lactobacillus species, have been proposed for the treatment of halitosis, precisely because of their ability to reduce bacterial colonization.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 03 September 2021 and was last updated on 03 September 2021 (registration number INPLASY202190009).

INTRODUCTION

Review question / Objective: **The aim of this meta-analysis was to evaluate the effectiveness of probiotics on oral halitosis.**

Rationale: **The aim of this meta-analysis was to evaluate the effectiveness of probiotics on oral halitosis.**

Condition being studied: **Halitosis or oral malodor is a condition produced by the putrefaction of sulfur-containing amino acids. It affects between 30 and 50% of the population and produces social rejection, diminishing the quality of life and self-esteem. Probiotics, especially Lactobacillus species, have been proposed**

for the treatment of halitosis, precisely because of their ability to reduce bacterial colonization.

METHODS

Search strategy: The PubMed, EMBASE and Web of Science (WOS) electronic databases were searched for findings published, in the last 15 years until July 2021. The MeSH (Medical Subject Headings) terms used in the MEDLINE (PuBMed) databases were: "Probiotics" [MeSH terms], "Halitosis" [MeSH terms], "Mouth diseases" [MeSH terms], "Oral health" [MeSH terms], "Humans" [MeSH terms]; "Randomized Clinical Trials" [MeSH terms]; the Boolean operator AND was used to refine the search. The search terms used in Embase were: "Probiotics", "Halitosis", "Randomized Clinical Trials". In WOS, the search terms were: "Probiotics", "Halitosis", "Oral health", "Randomized Clinical Trials"; the Boolean operators AND OR were used to refine the search.

Participant or population: Patients with halitosis or oral malodor (283 patients).

Intervention: Probiotic administration.

Comparator: Placebo administration.

Study designs to be included: Randomized clinical trials.

Eligibility criteria: a) Articles published in English.b) Randomized clinical studies referring to the benefits of probiotics on bad breath.c) Follow-up for at least 2 weeks.

Information sources: PudMed, EMBASE, Web Of Science.

Main outcome(s): Until July 2021, a total of 14 studies were identified and subsequently evaluated by the reviewers. After a first screening, 3 duplicate studies were eliminated. A second evalu-ation led to the elimination of 7 studies, which were considered inappropriate because they did not clearly meet the inclusion criteria. Finally, 4 studies were selected that met the inclusion criteria in full. A total of 283 participants were evaluated and the longest follow-up was 12 weeks . Three of the studies used Streptococcus salivarius (strains K12 and M18) as a probiotic and one used Weissella cibaria. The Table 1 provides an overview of the details of the RCTs.

Quality assessment / Risk of bias analysis: The methodological quality and risk of bias of each eligible trial were independently assessed using the Cochrane Collaboration tool for assessing risk of bias in randomized trials by two investigators. Any discrepancies were resolved through discussion with a third investigator.

Strategy of data synthesis: Studies that did not address the research question were eliminated, and the titles and abstracts of the selected articles were collected and entered into an Excel spreadsheet. Two reviewers independently selected the titles and abstracts. Disagreements about the inclusion of studies were resolved by discussion between the two re-viewers. Subsequently, the full texts of the selected studies were obtained for review and inclusion. The bibliographic references of each study were also reviewed as possible sources for identifying additional studies.

Subgroup analysis: The meta-analysis was performed using RevMan software (Review Manager (RevMan) [Computer program]. Version 5.4.1, The Cochrane Collaboration, 2020).

Sensitivity analysis: Not applicable.

Language: English.

Country(ies) involved: Spain.

Keywords: Probiotics; Halitosis; Oral Health; Randomized Clinical Trial.

Contributions of each author:

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