



REVIEW ARTICLE

## Probiotics for the treatment of upper and lower respiratory-tract infections in children: systematic review based on randomized clinical trials<sup>☆</sup>



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Received 30 January 2015; accepted 19 March 2015

Available online 6 June 2015

### KEYWORDS

Children;  
Respiratory tract  
infections;  
Probiotics

### Abstract

**Objectives:** Evaluate the effect of probiotics on the symptoms, duration of disease, and the occurrence of new episodes of upper and lower respiratory infections in healthy children.

**Sources:** In order to identify eligible randomized controlled trials, two reviewers accessed four electronic databases [MEDLINE/PubMed, Scopus (Elsevier), Web of Science, and Cochrane (Cochrane VHL)], as well as ClinicalTrials.gov until January 2015. Descriptors were determined by using the Medical Subject Headings tool, following the same search protocol.

**Summary of the findings:** Studies showed to be heterogeneous regarding strains of probiotics, the mode of administration, the time of use, and outcomes. The present review identified 11 peer-reviewed, randomized clinical trials, which analyzed a total of 2417 children up to 10 incomplete years of age. In the analysis of the studies, reduction in new episodes of disease was a favorable outcome for the use of probiotics in the treatment of respiratory infections in children. It is noteworthy that most of these studies were conducted in developed countries, with basic sanitation, health care, and strict, well-established and well-organized guidelines on the use of probiotics. Adverse effects were rarely reported, demonstrating probiotics to be safe.

<sup>☆</sup> Please cite this article as: de Araujo GV, de Oliveira Junior MH, Peixoto DM, Sarinho ES. Probiotics for the treatment of upper and lower respiratory-tract infections in children: systematic review based on randomized clinical trials. J Pediatr (Rio J). 2015;91:413–27.

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**PALAVRAS-CHAVE**

Crianças;  
Infecções do trato  
respiratório;  
Probióticos

**Conclusions:** Despite the encouraging results – reducing new episodes of respiratory infections – the authors emphasize the need for further research, especially in developing countries, where rates of respiratory infections in children are higher when compared to the high *per capita*-income countries identified in this review.

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### Probióticos no tratamento das infecções do trato respiratório superior e inferior nas crianças: revisão sistemática baseada em ensaios clínicos randomizados

#### Resumo

**Objetivos:** Avaliar o efeito do uso de probióticos na redução dos sintomas, da duração da doença e da ocorrência de novos episódios de infecções respiratórias superior e inferior em crianças saudáveis.

**Fontes de dados:** Com a finalidade de identificar ensaios clínicos randomizados elegíveis, dois revisores acessaram quatro bases de dados eletrônicas [Medline/PubMed, Scopus (Elsevier), Web of Science e Cochrane (The Cochrane Library)], além do *ClinicalTrials.gov*, até Janeiro de 2015. Foram utilizados descritores, por meio da ferramenta *Medical Subject Headings*, seguindo um mesmo protocolo de busca.

**Síntese dos dados:** Os estudos apresentaram grande heterogeneidade em relação às cepas de probióticos, à forma de administração, ao tempo de uso e aos desfechos. Identificamos 11 ensaios clínicos randomizados, revisados por pares, que analisaram um total de 2.417 crianças até 10 anos incompletos. Na análise dos estudos, redução de novos episódios de doença foi o desfecho favorável ao uso dos probióticos no tratamento das infecções respiratórias na criança. Importante salientar que essas pesquisas foram realizadas, em sua maioria, em países desenvolvidos, com condições de saneamento, de assistência à saúde e de regulamentação rigorosa ao uso de probióticos bem estabelecidos e organizados. Quanto aos efeitos adversos, pouco relatados, configuram os probióticos como seguros.

**Conclusões:** Apesar do resultado encorajador - redução de novos episódios de infecções respiratórias - destacamos a necessidade de pesquisas futuras, principalmente em países em desenvolvimento, onde as taxas de infecções respiratórias na criança são maiores quando comparadas aos dos países de elevada renda *per capita* identificados nesta revisão.

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## Introduction

Respiratory tract infections are common in children and significantly contribute to pediatric morbidity and mortality worldwide.<sup>1</sup> The economic and social impact of these infections is significant and constitutes an important challenge for public health, due to high costs concerning treatment, hospitalizations, school absenteeism, and loss of working days by parents and caregivers.<sup>2</sup>

The great variety of etiological agents, the inappropriate and large-scale use of antibiotics, increased bacterial resistance, and reduced availability of vaccines for most viruses and bacteria challenge the appearance of efficient and adequate therapies for the treatment of this disease.<sup>3</sup>

Since their introduction by Metchnikoff in 1907,<sup>4</sup> probiotics have been increasingly used to benefit the human host's immune system.<sup>5</sup> Defined by the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) as "live microorganisms that, when administered in adequate amounts as part of food, confer beneficial effects to the host through his intestinal flora,"<sup>6</sup> probiotics have found widespread use in the respiratory, gastrointestinal, and urogenital tracts; in allergic and autoimmune diseases; and in cancer.<sup>7-11</sup>

Recent systematic reviews and meta-analyses have reported a positive, albeit modest, effect of probiotics in respiratory tract infection prevention,<sup>12-17</sup> but only one meta-analysis evaluated the effectiveness of probiotics on the duration of respiratory diseases in children and adults, restricted to the randomized clinical trials that used only probiotics of the *Lactobacillus* and *Bifidobacterium* genus.<sup>18</sup>

Thus, the objective of this systematic review was to explore and describe clinical trials that have as primary endpoint the effect of probiotics on the reduction, duration, and occurrence of new episodes of upper and lower respiratory infections, and as a secondary outcome, the possible adverse events due to the use of these supplements in healthy children, considering different probiotic strains.

## Methods

### Research protocol

This systematic review was performed through a research protocol that was written to guide the implementation of all stages, using methodological approaches described in the Cochrane Handbook for Systematic Reviews<sup>19</sup> and reported

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