

Probiotics to Prevent or Mitigate the Common Cold

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Abstract

Upper respiratory tract infection, or the common cold, is a nonspecific term used to describe acute infections often caused by viruses. There are millions of cases of the common cold yearly in the United States. Probiotics are live microorganisms when administered in adequate amounts confer a health benefit on the host. Although the underlying mechanisms are still unclear, the application of probiotics shows promising activity in systemic immune modulations. There is now a growing body of evidence that suggests the potential benefits of probiotics in reducing the incidence and/or mitigating the symptoms associated with the common cold in otherwise healthy people of all ages.

Keywords: Probiotics, Common Cold, Upper respiratory tract infection, URTI, URI, Microbiota.

Introduction

Upper respiratory tract infection (URTI) is a nonspecific term used to describe acute infections involving the nose, para-nasal sinuses, pharynx, larynx, trachea, and bronchi. The prototype is the illness known as the common cold in addition to pharyngitis, sinusitis, and tracheobronchitis [1]. Each year in the United States (U.S.), there are millions of cases of the common cold. Adults have an average of 2-3 colds per year, and children have even more [2]. Infections of the upper respiratory tract represent the most common cause of antimicrobial use. The vast majority of such infections are of viral origin relying on symptom management and do not require treatment with antimicrobials [3]. In addition to malaise, these infections result in a significant societal burden in terms of healthcare visits and its associated costs, absenteeism from work, and reduced school attendance [4].

Microbiota refers to the entire population of microorganisms that colonizes a particular location; and includes not just bacteria, but also other microbes such as fungi, archaea, viruses, and protozoans [5]. The majority of the gut bacteria are non-pathogenic and co-habit with the enterocytes in a symbiotic relationship predominantly aiding in nutrient metabolism, drug metabolism, prevention of colonization of pathogenic microorganisms, and in intestinal barrier function [6]. Probiotics are live microorganisms which when administered in adequate amounts confer a health benefit for the host [7]. Although the underlying mechanisms are still unclear, the application of probiotics shows some promising activity involving immune modulation including the increase of T-lymphocytes and enhanced phagocytosis, increased natural killer cell activity, and increased immunoglobulin and cytokine production [8,9]. More recently, a growing body of evidence suggests the potential benefits of probiotics in reducing the incidence and/or mitigating the duration of symptoms associated with the common cold

in otherwise healthy people of all ages.

The Evidence: Benefits of Probiotics for the Common Cold

Kang, *et al.* (2013) conducted a systematic review (SR) and meta-analysis (MA) of the literature for randomized control trials (RCTs) to evaluate the effects of probiotics to prevent the common cold [10]. Ten RCTs in seven articles were included with all but one study assessed as relatively higher quality studies. These authors report that there was overall marginal or no effect of probiotics on the prevention of the common cold.

Another SR and MA conducted by King, *et al.* (2014) evaluates the effect of probiotics, more specifically *Lactobacillus* and *Bifidobacterium* strains, on the duration of URTIs in otherwise healthy children and adults [11]. In this more extensive review, twenty RCTs were included, of which twelve were considered to have a low risk of bias. In Hao, *et al.* (2015) conducted a broader SR and MA evaluating the effectiveness and safety of probiotics (any specified strain or dose), compared with placebo, in the prevention of acute URTIs in people of all ages [12]. This SR included thirteen RCTs, although MA could only be extracted from twelve studies. The major limitation of this review is that nearly all included studies, although RCTs, were deemed low quality or very low quality based on study limitations (risk of bias), indirectness of evidence, inconsistency, imprecision of effect estimates, or potential publication bias. It is important to note that each SR used different quality measuring tools to evaluate the selected studies for their review, thus there is no consistent measuring tool. Nevertheless, these systematic reviews demonstrated statistically significant outcomes that probiotic consumption reduced URTI duration by 0.8 days and 1.9 days, respectively. Moreover, the authors report that probiotic consumption reduced the incidence of URTIs by 47%, the antibiotic prescription rate by 35%, and absenteeism by 17% [11,12].

A recent SR and MA of RCTs conducted by Wang, *et al.* (2016) evaluates probiotics for the prevention and treatment of respiratory tract infections in children [13]. A total of twenty three trials were included in this review. The results of MA showed that children with probiotic consumption had fewer numbers of days of URTIs per person compared with children who had taken a placebo, and had fewer numbers of days absent from day care/school. However, there was no statistically significant difference of illness duration between probiotic intervention group and placebo group.

Overall, there is an increasing but mixed body of evidence that probiotics reduces the incident and/or duration of the symptoms associated with URTIs for the individual. When extrapolating these potential reductions to populations, the benefits could be substantial by simply including probiotics in our diets. A microsimulation study conducted in Canada by Lenoir *et al.* (2016) assesses the impact of probiotic use in terms of number of URTI episodes and days averted, and the number of antibiotic prescriptions and missed workdays averted [14]. According to this study, probiotic use saved 573,000-2.3 million URTI-days and that these reductions were associated with an avoidance of 52,000-84,000 antibiotic courses and 330,000-500,000 sick-leave days. A projection of corresponding costs reductions amounted to *Can*\$1.3-8.9 million from the healthcare payer perspective and *Can*\$61.2-99.7 million when adding productivity losses. This study reveals the possible and considerable reductions in URTI events, related health care costs, and productivity losses if probiotics could be consumed routinely at a population level in Canada. Considering that the U.S. population is about nine times larger than the Canadian population, the potential societal impact and cost savings are presumably greater [15].

Probiotics in Your Diet

More high quality studies are needed to fully evaluate which microbial strains confer greatest benefits for the host, the optimal dosage, costs, and the benefits versus harm of utilizing probiotics for the common cold. In addition, there is growing evidence of a plethora of other benefits to its consumption such as prevention of urinary tract infections, vaginal health, aid in digestive function, skin conditions like eczema, rheumatoid arthritis, aiding in allergies, oral health, aid in weight loss, and even benefits to cardiovascular health and depression [16-25]. There are many sources of probiotics delivered as capsules and supplements in the market. Although probiotics have some distinctive characteristics, they are arguably not unique enough to warrant their own regulatory pathway, largely because probiotic products are so varied and may be marketed as foods and dietary supplements [26]. In the U.S., if a probiotic is intended to diagnose, cure, mitigate, treat or prevent a human disease, it is regulated as a drug and a biological product by the U.S. Food and Drug Administration's (F.D.A.) Center for Biologics Evaluation and Research [27]. Instead of supplements, it may be less costly and possibly safer to intake probiotics from everyday food sources. Some common foods are yogurt, fermented milk (Kefir), sauerkraut, kombucha, kimchi, miso, and newer enriched products that are non-dairy based such as cereal-based products and fruit juices [28-35]. Dark chocolate itself doesn't contain probiotics, but it was found to be a very effective carrier for probiotics by assisting the commensal microbes in surviving the pH of the digestive tract [36]. Many fermented foods contain these beneficial microbes.

Conclusion

The regular consumption of probiotics may reduce the incident and/or duration of the common cold in otherwise healthy people. However,

the lack of high quality studies, mixed findings from SRs, and lack of standardization on evaluating the quality of included studies make it challenging to recommend any singular probiotic strain or dosage for the common cold. In addition, the strain, dosage, costs, and benefit versus harm needs to be further evaluated when using probiotics for common cold. There is a growing body of evidence of other benefits from conferred by probiotics including aiding in digestive function, oral health, skin conditions (e.g. eczema), mental and cardiovascular health. Thus, adequate intake of probiotics can facilitate overall health and well-being. Although there are many probiotic supplements available, they are marketed as food products or dietary supplements and are not regulated by the FDA in the United States. It is, however, easy to incorporate probiotics into your diet from every day foods like yogurt, sauerkraut, miso, and other fermented foods.

Summary of Key Points

- Each year in the United States, there are millions of cases of the common cold.
- There is growing evidence that suggests the potential benefits of probiotics for the common cold.
- The societal benefits could be substantial in terms of reducing sick leave, school absences, and unnecessary antibiotic prescriptions.
- Probiotics are easily available from common foods like yogurt, kefir, sauerkraut, etc.
- Further high quality studies are warranted evaluating which strains, the dosage, costs, benefits versus harm of utilizing probiotics for the common cold.

Disclosure of conflict of Interest

The author does not have any conflict of interest.

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