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REVISÃO

REVIEW
REVISIÓN

The use of probiotic bacteria in food targeted to lactose intolerant

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O uso de bactérias probióticas em alimentos direcionados à intolerante à lactose

El uso de bacterias probióticas en alimentos dirigidos intolerante a la lactosa

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ABSTRACT

Lactose intolerance is a condition in which the individual has a poor absorption of lactose due to the low production or absence of the lactase enzyme. When not digested, lactose is fermented by bacteria in the guts, releasing products from the microbial metabolism causing discomfort and preventing the ingestion of dairy products by intolerant people. However, alternative ways of dairy consumption by lactose intolerant have been presented, such as probiotic food containing lactose-metabolizing bacteria. Nonetheless, it is necessary to analyze published studies concerning this type of food in order to clarify the possible benefits coming from probiotic to these people. The objective of the present study was to present an integrative bibliographic review of the beneficial contribution of probiotic products to lactose intolerant individuals, as well as their performance and influence on health. A search was conducted between August and September of 2016 in the Scielo (Scientific Electronic Library Online) and the Virtual Health Library (VHL) databases, using Medline (Medical Literature Analysis and Retrieve System Online) and Lilacs (American and Caribbean in Health Sciences) and also on university websites. From thirty selected papers, seven attended the problem raised. It was possible to realize, by analyzing these works, the benefits of probiotics to lactose intolerant people, as well as the kind of products found, which can contribute to the improvement of life quality in these individuals.

KEY WORDS: Functional foods; lactase; probiotics.

RESUMO

Intolerância à lactose é uma condição na qual o indivíduo apresenta uma má absorção da lactose, devido à baixa produção ou ausência da enzima lactase. Quando não digerida, a lactose é fermentada por produtos do metabolismo microbiano de bactérias contidas no intestino, causando alguns desconfortos e impossibilitando a ingestão de laticínios por pessoas intolerantes. No entanto, formas alternativas para o consumo de laticínios por intolerantes à lactose vêm sendo apresentadas, tais como os alimentos probióticos que contém bactérias capazes de metabolizar a lactose. Entretanto, uma análise sobre os estudos publicados referentes a esses alimentos faz-se necessária para esclarecer os possíveis benefícios que os probióticos podem trazer a essas pessoas. O presente trabalho objetivou apresentar uma revisão bibliográfica integrativa, de caráter exploratório, acerca da contribuição benéfica dos produtos probióticos aos indivíduos intolerantes à lactose, bem como sua atuação e influência na saúde. Foram realizadas buscas no período de agosto a setembro de 2016 na base de dados da Scielo (Scientific Eletronic Library Online) e BVS (Biblioteca Virtual em Saúde), utilizando os buscadores Medline (Medical Literature Analysis and Retrievel System Online) e Lilacs (Literatura Latino Americana e do Caribe em Ciências da Saúde) e ainda em sites de universidades. Dos trinta trabalhos selecionados, sete trabalhos responderam ao problema levantado. A partir da análise dos estudos selecionados foi possível perceber os benefícios dos probióticos para os intolerantes à lactose e os tipos de produtos encontrados, os quais podem contribuir para a melhoria da qualidade de vida destes indivíduos.

PALAVRAS-CHAVE: Alimentos funcionais; lactase; probióticos

RESUMEM

La intolerancia a la lactosa es una condición en la cual el individuo tiene mala absorción de lactosa debido a la baja producción o ausencia de la enzima lactasa. Cuando no se digiere, la lactosa es fermentada por productos del metabolismo microbiano de bactérias contenidas en el intestino, lo que causa cierta incomodidad y hace que sea imposible para las personas intolerantes comer productos lácteos. Sin embargo, se han presentado formas alternativas de consumo de lácteos por intolerantes a la lactosa, como lós alimentos probióticos que contienen bacterias capaces de metabolizar la lactosa. Sin embargo, se necesita un análisis de los estudios publicados sobre estos alimentos para aclarar los posibles beneficios que los probióticos pueden aportar a estas personas. La presente investigaciónEl objetivo de este trabajo fue presentar una revisión exploratória de literatura integradora sobre la contribución beneficiosa de los productos probióticos a las personas intolerantes a la lactosa, así como su papel e influencia en la salud. Eran lãs búsquedas realizadas en el periodo de agosto a septiembre de 2016 en la base de datos Scielo (Scientific Electronic Library Online) y BVS (Biblioteca Virtual em Salud), utilizando los motores de búsqueda en MEDLINE (Médico Literatura Análisis y Retrievel sistema en línea) y lilás (América Ciencias de La Salud) y en sitios web de universidades. De los treinta documentos seleccionados, siete respondieron al problema planteado. A partir del análisis de los estudios seleccionados, fue posible darse cuenta de los beneficios de los probióticos para intolerantes a La lactosa y los tipos de productos encontrados, lo que puede contribuir a la mejora de La calidad de vida de estos individuos.

PALABRAS CLAVE: Alimentos funcionales; lactasa; probióticos.

INTRODUCTION

Lactose intolerance is a deficiency of the body in producing or decreasing the production of lactase, the enzyme responsible for hydrolyzing lactose into glucose and galactose.[1,2] Lactose intolerance is the most common adverse reaction to carbohydrate that affects people of all ages. When not hydrolyzed, lactose remains in the intestine and acts osmotically attracting water to the organ. Bacteria from natural intestinal microbiota ferment the non-hydrolyzed lactose, producing lactic acid, acetic acid, carbon dioxide and hydrogen gas, which may result in bloating, flatulence, abdominal pain and diarrhea. For this reason, some individuals with this deficiency prefer to avoid the consumption of milk and its derivatives, which are food rich in calcium, and its deficiency may lead to serious complications. Non-dairy consumption can trigger a calcium deficiency leading to the development of

diseases such as osteoporosis, polycystic ovarian syndrome, insulin resistance and obesity.[2]

Research has shown that so-called probiotic food can help improving the life quality of lactose intolerant individuals. Probiotic preparations are products that contain microorganisms capable of bringing benefits to the human organism, aiding in the balance of the normal microbiota.[3,4] The beneficial influence of probiotics on the intestinal microbiota include antagonistic effects, where probiotic bacteria compete by consuming nutrients in the intestine leaving them in short supply for the pathogenic bacteria.[5–9] In addition, they may have immunological effects, with stimulation of the immune system (immunostimulation and immunomodulation), antimutagenic and anticarcinogenic properties, as well as the improvement of irritable bowel syndrome. Among the probiotic bacteria, there are those of the genus *Bifidobacterium*,*Lactobacillus*, *Enterococcus* and *Streptococcus*.[3,4,10]

Countless probiotic products are released on the market to meet the need of lactose intolerants. Most of them are fermented yogurt and milk. Among the products observed in the Brazilian market, dairy products have a greater diversity when compared to other types of products, such as cereal bars and nutraceuticals. These can be found in the market as tablets, sachets or oral suspension. The difference observed between functional foods and nutraceuticals, containing probiotic strains, is that the first ones are related to nutritional aspects, also in the prevention and reduction of diseases. The latter provides medical preventive benefits in the symptoms of diseases.[11–13]

Some criteria need to be taken into account in order to bacteria being considered probiotic, such as the genus of the bacteria that have to be part of the human microbiota, the bacteria need to be resistant to gastric juice and bile, be able to adhere to the intestinal mucosa, which means to colonize , even so temporarily, the gastrointestinal tract. Moreover, it cannot be pathogenic or being associated to diseases such as infectious endocarditis or gastrointestinal diseases. It must produce antimicrobial compounds, be resistant and viable during the entire process and have stability in the final product.[14] Although probiotics have countless benefits, some individuals who use these products may have side effects, such as stomach pain, diarrhea and flatulence due to the death of the pathogens in the intestinal environment, releasing toxic cellular products. In these cases, persistent use of probiotics improves symptoms.[15–17]

Thus, a better understanding of the real benefits of probiotic products described in the literature for the lactose intolerant and the types of products found are of great importance. It may serve to aid in the comprehension of the positive influence – or not – of probiotic food inclusion in the lactose intolerants` diet. In view of the above, the present study aimed to present the beneficial contribution of probiotics to lactose intolerant individuals, as well as their performance and influence on health.

METHODOLOGY

Research type

It was performed a search among papers and books on the subject, in order to build a literature review of the integrative type.

Literary research

From the selected theme and the questions raised, we conducted searches from August to September 2016 in the Scielo (Scientific Electronic Library Online) and VHL (Virtual Health Library) databases using the Medline (Medical Literature Analysis and Retrievel System Online) and Lilacs (Latin American and Caribbean Literature in Health Sciences) and university websites, using the descriptors "lactose intolerance", "probiotics", "lactase" and "probiotic food".

Literature analysis

Questions were raised in order to define the purpose of this review, as well as hypotheses to be confirmed or denied. We selected 30 works from the past 10 years among scientific papers and books, both national and international, such as in English and Spanish, as well as undergraduate thesis articles.

From the published work, it was verified the contributions to the bibliographic review, exposing the opinion of several authors on the subject and which authors answered the problem.

This present review was was written between September and October 2016.

RESULTS AND DISCUSSION

The acceptance of milk and its derivatives by intolerant people varies according to the level of intolerance presented.[9,18,19] The main improvement factor for lactose digestibility is the presence of the bacterial lactase enzyme, which can be detected in the duodenum and terminal ileum after consumption of probiotic yogurts. The enzyme is able to perform lactose hydrolysis as well as the genus of bacteria considered probiotic, mainly in the terminal ileum, one of the main benefits that probiotics can bring to the lactose intolerant.[20–23]

As a vital function, lactic bacteria produce in the intestinal microbiota the enzyme *β*- d-galactosidase, which is responsible for the breakdown of lactose in the intestine.[18] The *β*- d-galactosidase or lactase is the enzyme responsible for hydrolyzing lactose into *β* d- galactose and *α*- d-glucose. This function is essential for lactose intolerant since they do not have the capacity to digest it, which causes gastric discomforts common in the intolerance. Due to the increased use of probiotics in food, there is a need for more information on the importance of these microorganisms to human health and in the use in the dairy industry.[3] Given this, these probiotic foods will act by metabolizing lactose, allowing the lactose intolerant to ingest dairy products without any problem. Thus, avoiding calcium deficiency that may lead to other diseases.[24]

The beneficial effects of probiotics for lactose intolerant include mechanisms of action such as increased activity of the lactase enzyme in bacterial preparations used in the manufacture of the products, as well as increased activity of the enzyme lactase that reaches the small intestine along with the fermented product.[23] Among the selected literature, seven papers answered the problem raised. Among these, three bibliographical reviews, three articles and one dissertation were presented. Table 1 presents the authors who answered the problem raised about the benefits of probiotics for lactose intolerant.

Table 1. Analyses of the past 10 years that address the benefits of probiotics to lactose intolerant individuals.

Authors	**Result**	**Institution of higher education**
Antunes et al. (2007)[20]	It exposes the main benefit of probiotics to the lactose intolerant.	Institute of Food Technology / Dairy Research and Development Center (ITAL/Tecnolat).
Brandão (2008)[25]	Indicates other types of probiotic products besides food.	Federal University of Viçosa (UFV).
Alvim (2011)[26]	Exposes three classes of probiotic products, indicating the variety of these products.	Federal University of Minas Gerais (UFMG).
Pimentel (2011)[23]	It adds other benefits of probiotics to lactose intolerant.	State University of Londrina (UEL).
Borges e Silva (2012)[12]	They affirm the variety of probiotic products found on the market	Faculty of Theology, Education and Sciences (FATEC).
Fernandes (2015)[24]	Note that ingestion of lactic acid prevents calcium deficiency.	Brazilian Medical Association / Brazilian Society of Pediatrics (AMB/SBP).
Pinto et al. (2015)[9]	Clarifies the acceptance of dairy products by lactose intolerant	Faculty of Americana (FAM).

The main benefit of probiotics is the ability of some probiotic bacteria to produce lactase capable of hydrolyzing lactose.[20] Because of this lactose hydrolysis ability, dairy products can be integrated into the lactose intolerant diet, avoiding secondary diseases.[24] Bacterial lactase thus serves as a support for lactose intolerants, so that they prevent other diseases as a result of a possible calcium deficiency, exhibiting a positive feature of probiotics.

Other benefits may be attributed to probiotics, such as a decrease in lactose concentration and a greater activity of the enzyme lactase, present in products that reach the intestine, leading to an improvement in the symptoms presented by intolerance.[9,20,24] A decrease of lactose in the products may prevent future discomfort for the intolerant, since that even small doses of this sugar in their composition may cause a problem for those intolerant people who are symptomatic even at low doses.

Among the probiotic products found in the market are yogurts and fermented milks.[12] In addition to these foods, products such as capsules and powdered preparations containing probiotic microorganisms or the enzyme lactase are also found.[25,26] Thus, it supplies the need for lactose intolerants and presents more palliative options to improve symptoms and improve their life quality. However, there is a need for greater dissemination of these products, since many lactose intolerant still do not know them and do not know how probiotics can favor their diet, still excluding dairy food. This way, it is observed that several authors have agreed on the benefits of probiotics showing them for the lactose intolerant. Likewise, the variety of probiotic products, both in the form of food and in pharmaceutical preparations is satisfactory.

About adverse reactions to food and probiotic products, some authors[15,17] point to mild discomfort in the intake of probiotics such as stomach pain, diarrhea, and flatulence due to the death of pathogenic bacteria in the gut that release toxic cellular products. However, these reactions may disappear over time and with persistent consumption of probiotics. Therefore, it is noted that this discomfort is not considered as significant considering the benefits offered by probiotics.

CONCLUSION

In the analyzed literature, it was possible to understand that food and probiotic products generally benefit the health of lactose intolerant people, as well as people who have other gastrointestinal diseases. Therefore, they help to build a healthy diet with nutritional values and without restrictions, which can also be used by people who do not have any of these diseases in order to maintain the balance and a good functioning intestinal microbiota.

There was unanimity among the authors regarding the health benefits of probiotics, such as intestinal microbiota balance and lactose hydrolysis. It was also observed that each probiotic strain has a specific function, which suggests that more research is needed to clarify the various functions that these bacteria can present, as well as their health benefits. However, although several papers report the benefits of probiotics, few authors described the importance of these products to lactose intolerant. Thus, more publications are needed on the subject.

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