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Rosângela dos Santos Ferreira[1]*, Rita de Cássia Avellaneda Guimarães[2], Ligia Aurélio Bezerra Maranhão Mendonça[3] and Priscila Aiko Hiane[2]

[1]Nutrition Service, University Hospital, Federal University of Mato Grosso do Sul - UFMS, MS, Brazil
[2]Post Graduate Program in Health and Development in the Central-West Region of Brazil, Federal University of Mato Grosso do Sul-UFMS, MS, Brazil
[3]Post Graduate Program in Biotechnology, Catholic University Dom Bosco, MS, Brazil

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***Corresponding author:** Rosângela dos Santos Ferreira, Nutrition Service, University Hospital, Federal University of Mato Grosso do Sul - UFMS, Zip code: 79900-000, Campo Grande, CEP: 79079-900, Campo Grande, MS, Brazil, Tel: + 55 (67) 3345-7445; Fax: + 55 (67) 3345-7400; E-mail: rosangela.ferreira@ufms.br

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Short Communication

The Impact of Functional Food on the Intestinal Microbiota in Relation to Chronic Noncommunicable Diseases

Introduction

The World Health Organization (WHO) states that obesity is characterized as a positive energy balance that favors the accumulation of fat, associated with metabolic complications related to health risks such as high cholesterol and triglyceride levels, high blood pressure, and resistance to insulin [1].

These obesity-related alterations, such as high systemic blood pressure, dyslipidemia, high fasting glycemia, and central obesity, are the main characteristics of Metabolic Syndrome (MS), according to the International Diabetes Federation. MS is defined as the combination of physiological, biochemical, clinical, and metabolic factors associated with increased cardiovascular risk and the risk of type II diabetes mellitus [2].

Dietary recommendations are used as important tools in the prevention of cardiovascular diseases and include: increased intake of fibers derived from fruit, vegetables, nuts, and whole grains, such as oatmeal; reduced consumption of products made from refined flour; substituting trans and saturated fatty acids for unsaturated and non-hydrogenated fatty acids; and increased consumption of series n-3 polyunsaturated fatty acids (PUFAs), also known as omega-3, through the consumption of linseed oil, fish, and other vegetable sources [3], and increased consumption of proteins that can be obtained from meet, but also from the consumption of vegetable sources such as textured soy protein (TSP). Moreover, studies have highlighted the role of diet by measuring intestinal microbiota during the development of obesity and MS [4]. Although the main cause of obesity is excess caloric consumption compared with expenditure, differences in intestinal microbiota ecology between humans can be an important factor that affects energy homeostasis [5]. Thus, this paper is important in demonstrating the effectiveness of foods with functional claims, when united in a single dietary compound, by measuring lipid serums and intestinal microbiota.

Results

Fibers are present in dietary components and are defined as non-digestible carbohydrates that resist digestion and absorption in the small intestine and undergo partial fermentation in the large intestine. Examples of soluble fibers include beta-glucans, which are present in high quantities in oat and barley bran and form viscous solutions and are pseudoplastic [6]. Fibers known as beta-glucans promote increased bolus viscosity and delay nutrient absorption [7]. The presence of beta glucan in the diet can reduce postprandial glycemic peaks and can significantly reduce the quantity of LDL cholesterol in blood plasma.

Linseed (*Linum usitatissimum*) oil, which is a widely consumed oilseed, stands out for its rich α-linolenic content (18:3 *cis* Δ9,12,15) [8], which confers important properties for dietary application. The use of linseed oil has received considerable attention due to the seed's functional properties, as previously mentioned, and it presents health benefits [9]. Soy (*Glycine max* L.) grain belongs to the oilseed group and is a functional food that presents important characteristics due to it containing isoflavones and lignans, which form one class of polyphenols [10]. The main phytochemicals are isoflavanes (daidzein and genistein). Soy-based products are related to atherosclerosis prevention, given that they perform an antioxidant action over lipids circulating in the plasma and also due to the presence of soluble fibers that act in reducing total and LDL cholesterol, as well as exerting an antiplatelet aggregation effect, thus reducing triglyceride levels and raising HDL cholesterol levels [11].

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For this purpose, the Bioactive Food Blend (BFB) produced from oat bran, linseed oil, and textured soy protein (TSP) was elaborated by this group [12-14], with low atherogenicity (0,20) and thrombogenicity (0,13) indices, an adequate hypercholesterolemia/hypocholesterolemia ratio (6,11), ω6:ω3 (1,05), PUFA/SFA (2,61), which leads to a product with high nutritional value aimed at controlling raised levels of total cholesterol, LDL-cholesterol, triglycerides, and glucose, and which is effective especially in controlling serum lipids and triglycerides. The BFB contained higher protein (24.27%), fat (13.37%) and fiber (7.98%) content and lower carbohydrate (50.39%) levels [13]. A patent application was filed for the proposed BFB at the Brazilian National Institute of Industrial Property (INPI - BR 10 2013 018002 5) and was published on August 8, 2015, by the Ministry for Development, Industry, and Foreign Trade.

Thus, studies have identified that dietary fibers and lipids modulate the composition of the intestinal microbiota [15,16]. In particular, variations of *Bacteroides* spp. have been associated with the intake of polyunsaturated fatty acids (PUFAs) [17].

Correlation analyses have revealed that there is a positive relationship between an abundant presence of *Bacteroides* spp. and the consumption of lipids derived from vegetable and animal sources [18]. Not only the quantity, but also the the type of fatty acid determines the impact of lipid intake on intestinal microbiota and its clinical consequences [19].

In an experimental study carried out by the Czech Republic Faculty of Medicine, a significant reduction was found in the fecal coliform count in rats fed with the *Lactobacillus plantarum* probiotic in addition to 40 g/kg of linseed oil, thus demonstrating that the combination of the probiotic element with the PUFAs present in the linseed oil displayed antimicrobial properties against pathogenic bacteria. This is due to the important role of PUFAs in enhancing probiotic effects, with them increasing in number and promoting their adhesion to the epithelium, as well as having an influence on the size of bacterial colonies [20].

Intestinal microbiota plays an important role in human health, given that it has high metabolic potential, it is located together with the intestinal mucus, and is intimately related with the underlying immune system. It is therefore associated with a wide variety of intestinal and systemic diseases, varying from inflammatory intestinal disease to metabolic syndrome and allergies [21].

It is observed that the concentration and normal spatial distribution of bacteria along the intestinal tract of humans is characterized by Escherichia spp., Bacteroides spp., Clostridium cluster spp., Lactobacillus spp., Streptococcus spp., Veillonella spp., Bifidobacterium spp. Eubacterium spp., Ruminococcus spp., Roseburia spp., at the concentration of 10^{7} - 10^{11} bacteria mL^{-1} [22].

Modulating intestinal microbiota via dietary interventions is becoming a promising strategy for verifying the cause of chronic inflammation involved in obesity and metabolic syndrome.-

Conclusion

Functional foods, besides reducing serum lipids, which, when high, cause metabolic disorders such as obesity, increased fasting glycemia, and systemic inflammations, act directly in mediating intestinal microbiota. The purpose of this paper was to show that bioactive dietary compounds, when used daily, promote important benefits, especially in serum lipoproteins, due to their hypolipidemic effect and their effect on metabolic syndrome.

References

1. WHO (2011) World Health Organization. Global status report on noncommunicable Diseases. Geneva: WHO. Link: https://goo.gl/0x6RQu
2. Kaur J (2014) A comprehensive review on metabolic syndrome. Cardiol Res Pract 2014: 943162. Link: https://goo.gl/FkTSg0
3. Mohamed S (2014) Functional foods against metabolic syndrome (obesity, diabetes, hypertension and dyslipidemia) and cardiovasular disease. Trends in Food Sci & Techn 35: 114-128. Link: https://goo.gl/GBcKQv
4. Bäckhed F1, Ding H, Wang T, Hooper LV, Koh GY, et al. (2015) The gut microbiota as an environmental factor that regulates fat storage. Proc Natl Acad Sci 101: 15718-15723. Link: https://goo.gl/VBJD70
5. Ley RE, Bäckhed F, Turnbaugh P, Lozupone CA, Knight RD, et al. (2015) Obesity alters gut microbial ecology. Proc Natl Acad Sci 102: 11070-11075. Link: https://goo.gl/HgvLme
6. LI F, Duan Y, LI Y, Tang Y, Geng M, et al. (2016) Effects of dietary n-6:n-3 PUFA ratio on fatty acid composition, free amino acid profile and gene expression of transporters in finishing pigs. British J Nutr 113: 739-748. Link: https://goo.gl/7Jbawn
7. Morita SJ (2016) Metabolism and modification of apolipoprotein b-containing lipoproteins involved in dyslipidemia and atherosclerosis. Biol Pharmac Bull 39: 1-24. Link: https://goo.gl/JuXEMG
8. Hall LM, Booker H, Siloto RMP, Jhala AJ, Weselake RJ (2016) Flax (Linum usitatissimum L.). In: Mckeon TA, Hayes DG, Hildebrand DF, Weselake RJ. 1 ed. Industrial Oil Crops. New York/Urbana: Elsevier/AOCS Press 157-184. Link: https://goo.gl/4THXSh
9. Goyal A, Sharma V, Upadhyay N, Gill S, Sihag M (2014) Flax and flaxseed oil: an ancient medicine & modern functional food. J of Food of Sci and Tech 51: 1633-1653. Link: https://goo.gl/A6bi0v
10. Hendrani AD, Adesiyun T, Quispe R, Jones SR, Stone NJ, et al. (2016) Dyslipidemia management in primary prevention of cardiovascular disease. Curr Guid Strat 8: 201-210. Link: https://goo.gl/a8R8xp
11. Kiela PR, Ghishan FK (2016) Physiology of intestinal absorption and secretion. Best Pract Res Clin Gastr 30: 145-159. Link: https://goo.gl/CAxxm7
12. Ferreira RS, Cassaro DC, Domingos H, Pontes ERJC, Aiko PH, et al. (2013) The effects of a diet formulation with oats, soybeans, and flax on lipid profiles and uricemia in patients with AIDS and dyslipidemia. Rev Soc Bras Med Trop 46: 691-697. Link: https://goo.gl/9RekKg
13. Ferreira RS, Hiane PA, Guimarães RCA, Ramos MIL, Demarque DP, et al. (2014) Physicochemical, microbiological and sensory evaluation of a bioactive food blend. Ciênc Tecn Alim 34: 609-615. Link: https://goo.gl/J8HglY
14. Dos Santos FR, Guimarães RCA, Jardim CPE, Aragão NV, Aiko HP, et al. (2016) The Effectiveness of a Bioactive Food Compound in the Lipid Control of Individuals with HIV/AIDS. Nutrients 8: 1-11. Link: https://goo.gl/uCfIOS

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15. Simões CD, Maukonen J, Kaprio J, Rissanen A, Pietiläinen KH, et al. (2013) Habitual dietary intake is associated with stool microbiota composition in monozygotic twins. J Nutr 143: 417-423. Link: https://goo.gl/JR4Ewl

16. Gary D. Wu,, Jun Chen, Christian Hoffmann, Kyle Bittinger, Ying-Yu Chen, et al. (2011) Linking long-term dietary patterns with gut microbial enterotypes. Sci 334: 105-108. Link: https://goo.gl/rfSOLU

17. Lappi J1, Salojärvi J, Kolehmainen M, Mykkänen H, Poutanen K, et al. (2013) Intake of whole-grain and fiberrich rye bread versus refined wheat bread does not differentiate intestinal microbiota composition in Finnish adults with metabolic syndrome. J Nutr 143: 648-655. Link:https://goo.gl/6mbwzB

18. Devkota S, Wang Y, Musch MW, Leone V, Fehlner-Peach H, et al. (2012) Dietary-fat-induced taurocholic acid promotes pathobiont expansion and colitis in Il10-/- mice. Nat 486: 104-108. Link: https://goo.gl/yA2cDm

19. Junjie Qin, Ruiqiang Li, Jeroen Raes, Manimozhiyan Arumugam, Kristoffer Solvsten Burgdorf, et al (2010) A human gut microbial gene catalogue established by metagenomic sequencing. Nat 464: 59-65. Link: https://goo.gl/HO84rq

20. Rostyslav VB, Mykola YS, Liudmyla ML, Alojz B, Nadiya V (2015) Boyko Probiotics and immunity: provisional role for personalized diets and disease prevention. The EPMA Journal 6: 1-11. Link: https://goo.gl/zwUMyP

21. Vos WM, Vos EA (2012) Role of the intestinal microbiome in health and disease: from correlation to causation. Nutr Rev 70: 45-56. Link: https://goo.gl/1kTcU5

22. Rivière A, Selak M, Lantin D, Leroy F, De Vuys L (2016) Bifidobacteria and Butyrate-Producing Colon Bacteria: Importance and Strategies for Their Stimulation in the Human Gut. Front. Microbiol 7: 1-21. Link: https://goo.gl/LzYE1w

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