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Review article

Impact of Food Nutrient in the IBD Management and Prevention

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ABSTRACT

Inflammatory bowel disease (IBD) is a chronic, multifactorial and inflammatory disease taking place in the colon tract. Inflammatory bowel diseases (IBD), after disease arrival, usually progress in two cyclically repeated phases, namely inflammatory flare and remission, with possible nutritional status impairment. The incidence of inflammatory bowel disease (IBD) is steadily rise paralleling the increase of westernized diets, characterized by high protein and fat as well as excessive sugar intake, with less vegetables and fibre. Some evidence, either from epidemiological, clinical, and experimental studies indicates that the quantity and the quality of dietary protein consumption may differently influence the IBD according to the disease phases. Environmental factors are essential components of the pathogenesis of inflammatory bowel disease (IBD) and primarily responsible for its growing incidence around the globe. Environmental factors, which include smoking, diet, drugs, geographical and social status, stress, microbial agents, intestinal permeability and appendectomy.

Keywords: Inflammatory bowel disease, Food Nutrients, Diet, Environmental Factor.

INTRODUCTION

Several areas of existing investigate focus on the influence and effects of dietary habits on human health, mainly in Western countries, where largest extent of so called “junk food” consumers reside. The “western diet”, mainly sophisticated carbohydrates, simple sugars and saturated fats which are allied to various metabolic disorders. The purpose of this review is to exemplify how dietary habits can influence the composition of the intestinal microbiota leading to dysbiosis and inflammatory bowel disease (IBD). After disease onset, the alternation of inflammation and remission episodes characterizes the progression of inflammatory bowel diseases (IBD). The two main subtypes of IBD, Crohn’s disease (CD), and ulcerative colitis (UC), which both remain of unclear etiology, are characterized by alterations of the intestinal mucosa homeostasis resulting from inappropriate and exacerbated immune response to intestinal luminal antigens. [1,2] After a brief overview of the gut anatomy and the role of the microbiota in healthy gut, this review depicts how the food nutrient and environmental factor showing impact in the IBD Management and Prevention. Even though IBD patients frequently ask clinicians for the best dietary practices to avoid relapse and to allow healing, the most favorable dietary composition in terms of macronutrients, vitamins, and minerals, as well as the impact of these compounds on the intestinal mucosa are still largely unknown. It is worth noting that the nutritional impact of diet may differ between CD and UC patients. [3] The pattern and severity of malnutrition being dependent on the duration, the activity, and the anatomical extent of the disease. [4, 5] In fact, malnutrition is more commonly observed in CD patients because the small bowel may be

Affected, thus causing nutrient mal absorption and possible nutritional deficiencies [6].

In compare to UC, which affects exclusively the colon and rectum. In UC patients, nutritional deficiencies may be likely linked to a reduced oral intake and increased energy requirement due to inflammation.[7] However, the effects of primary nutritional therapy in both CD and UC patients remain largely unknown and need further research.

Nutritional therapy is commonly classified notably by the nitrogen source derived from the amino acid or protein component of the formula. The analysis of the literature, which is based mainly on the results obtained in experimental models but on a limited amount of human studies, reveals that the quality and quantity of dietary proteins are parameters which may have a different functional output depending on the stage of the disease, possibly influencing its course. This lack of robust results obtained from clinical studies resulted in the absence of clear recommendations by the scientific and clinical instances for patients with a recent diagnosis of IBD until recently [8], leading to different nutritional management depending on the clinician involved. [9]

Latent Influence of Dietary Proteins on Inflammatory Bowel Disease Onset

Along with many environmental factors involved in IBD etiology, diet has been recommended to represent an important one in the IBD pathogenesis, notably by altering gut microbiota composition and activity and by participating in mucosal immune system activation. It thus appears that specific dietary patterns may likely be associated with a risk of IBD in adults [10, 11] exclusively, amid the diverse sources of animal proteins; a high utilization of meat or fish but not eggs or dairy products has been allied with IBD risk, Due to the complexity of the diet and then to the difficulty of collecting strong dietary data, it is possible that the effects of protein intake on IBD risk observed in only two epidemiological studies.[12,13] However, despite the small number of studies on the high-protein (HP) diet effect in an IBD context, HP intake might influence IBD onset considering its action on intestinal homeostasis, particularly on colonic microbiota and mucosa. These results suggest that, in addition to quantity, the source of dietary proteins may modulate the risk of developing an IBD.

Effect of High-Protein Diets on Microbiota Composition and Activity

Although the digestion of dietary and endogenous proteins is an efficient process with the digestibility of dietary proteins being often higher than 90% parts of luminal proteins may escape digestion in the small intestine and be transferred into the large intestine. In fact, the amount of luminal proteins increases according to the quantity of dietary proteins consumed, representing in humans between 6 and 18 g reaching the colon. [14, 15] These nitrogenous substrates are then available for the microbiota activity in the large intestine lumen. Due to differences in AA composition and protein digestibility (animal proteins being generally more digestible than plant protein, protein sources also influence the quantity and nature of AA delivered in the colon. [16, 17]

Effect of High-Protein Diet on Colonic Mucosa

A number of observations have been made in animal models pertaining to the effects of HP diet eating for colonic mucosa health. Even if the definite molecular mechanisms allied with such effects are not fully deciphered, there are strong evidences from in vivo and in vitro studies that some bacterial metabolites derived from AA are active towards intestinal epithelial cells.(IEC) [18]Certainly, amid the assortment of bacterial metabolites produced from improved AA degradation, some of them, when present in excess, appear beneficial (butyrate, indole) or detrimental (ammonium, hydrogen sulfide, p-cresol) for the colonic mucosa, especially in terms of IEC renewal, colonocyte membrane characteristics, and intestinal barrier function.

Potential Role of Dietary Protein Intake and Amino Acid Supplementation in Remission

During an inflammatory flare, IBD patients are at high risk of a nutrient depletion, particularly children that may experience such depletion up to the remission phase.[19] Latest guidelines from the European Society for Clinical Nutrition and Metabolism (ESPEN) advise to increase the protein requirement in active IBD to 1.2–1.5 g/kg body weight/day in adults relative to that recommended in the general population (0.83 g/kg body weight/day).[8] However, it is appeal noting that the amount of protein desirable in the relapsing-remitting course, remarkably in the period of MH remains to be determined and might be above the recommended daily allowance for proteins. In fact, because of the different symptomatology between CD and UC, protein needs during the remission phase may also differ, but new studies are required to document this aspect. The differences between the few studies that have evaluated the efficiency of dietary protein supplementation (composition of the diet, delivery route, duration, MH criteria) during UC remission periods, [20, and 21] lead to different approaches between clinicians. The body of recommendations is usually to follow

a diversified and a well-balanced diet. Still, it is pretty common to see IBD patients avoiding some foods as a way to decrease relapse risk. [22]

Effect of Amino Acid Supplementation on Intestinal Inflammation Resolution

In the rat model of colitis treated with Dextran Sodium Sulfate (DSS), supplementations with threonine, serine, proline, and cysteine or with threonine and cysteine only, promote mucin synthesis and increased mucin secretion, thus favoring colonic protection and repair [23]

A further study performed in the same model has shown that the combination of threonine, methionine and glutamate supplementation ameliorates colonic (Mucosal Healing) MH but not inflammatory status Even though the mechanisms of action by which the three AA accelerate the colonic (Mucosal Healing) MH remain unclear, it can be presumed, as already discussed above, that these AA may serve as building blocks for macromolecule synthesis in the wounded mucosal area, as energy substrates for anabolic pathways, and as precursors for bioactive metabolites.[24]

CONCLUSION

The use of dietary proteins and AA supplementation to control inflammation and promote (Mucosal Healing) MH. Protein intake, according to the protein source, might indeed influence intestinal health through two mechanisms; (i) modulation of the quantity and nature of AA absorbed and supplied to intestinal tissues through the bloodstream and (ii) modulation of the quantity and nature of undigested proteins delivered to the large intestine. Although epidemiological evidence indicates that the consumption of a diet with high animal protein content is associated with an increased risk of IBD, the mechanisms which would explain such an association remain elusive. In contrast, supplementation of the diet with selected AA may have beneficial effects. In addition, little is known of the role of proteins originating from plants for IBD therapy and associated potential benefits, since most of the studies have been performed with animal proteins. Finally, the complete MH and its induction via nutritional therapy with a correct amount of chosen dietary proteins or supplemental AA remains a field of possibilities.

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