

Diet, Intestinal Microbiota and Health

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ABSTRACT

Dietary component has direct effect on the intestinal microbiota profile. Intestinal microbiota plays critical roles in the health and well being of the host. Dietary habit is largely cultural and geographical base. A better understanding of the interactions between dietary components, food matrix and the intestinal microbes, would pave way for correctly intervention to maintain our health and well being.

Key words: Intestinal microbiota, dietary sugars, complex carbohydrates, fat & fatty acids, protein, polyphenols, starvation

INTRODUCTION

Gastrointestinal microbes play important roles in the health and disease of the host. Health beneficial microbes are termed probiotics. Clinical studies have demonstrated their beneficial effects on lactose maldigestion, dental caries, diarrhea, Irritable Bowel Syndrome, Inflammatory Bowel Disease, gastrointestinal and respiratory tract infections, allergic diseases, cancers, and serum cholesterol⁽¹⁾. Thus a person's well being is to some extent determined by his intestinal microbiota profile.

Dietary components have been suggested to modulate the intestinal microbiota profile, as they provide the nutrition and microenvironment for the microbes.

I. Sugars

Adhesion of microbes on gastrointestinal surface is considered a major prerequisite for their colonization and modulation of local and systemic physiological (immunological, hormonal) activities of the host, and competitive exclusion of pathogens⁽¹⁾. The stereo-specific adhesion-receptor interaction involves carbohydrate moieties on the intestinal surface and carbohydrate-binding adhesins on the microbial cell surface^(2,3). Sugars constituents in food carbohydrate interfere with the adhesion of intestinal microbes, both probiotics and pathogens, on intestinal surface^(4,5), leading to altered intestinal microbiota profile.

II. Complex Carbohydrate

Complex carbohydrates in plants, such as oligosaccharides are termed prebiotics⁽¹⁾. They are non-digestible but fermentable, thus selectively stimulate the proliferation and/or activity of selective intestinal bacterial popu-

lation (e.g. bifidobacteria).

III. Fat and Fatty Acids

Obesity is a major health concern in developed countries. High fat diet in an animal model was found to modulate the dominant intestinal bacterial population⁽⁶⁾. *Bacteroides*-like bacteria were significantly reduced, so did *Eubacterium rectal-Clostridium coccoides* group and bifidobacteria. The polyunsaturated fatty acids component of the fat appears to be a determinant factor on the adherence of intestinal bacteria on mucosal surface and their growth^(7,8).

IV. Protein

The quantity and quality of protein constituent in food are clearly different in the Western and Eastern diets. In an animal study fed with high protein diet, marked changes in intestinal microbial population were observed. *Bifidobacterium* populations were found to reduce, whereas *Clostridium perfringens* populations increased significantly⁽⁹⁾.

V. Dietary Components

Dietary intake of polyphenols has been estimated to range between 0.15 and 1 g/day⁽¹⁰⁾. Tea phenolic components and their aromatic metabolites repressed certain human intestinal microbes (*Clostridium perfringens*, *Clostridium difficile* & *Bacteroides* spp.) but not commensal anaerobes and lactic acid bacteria^(11,12).

VI. Starvation

Under-nourishment in general leads to an abundance

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of enteric pathogens, such as Campylobacteraceae (35 folds compare to the healthy control subjects), Helicobacteriaceae (12 folds), Bacteroidaceae (4 folds)⁽¹³⁾. On the contrary, Enterobacteriaceae, Shewanellaceae, Thermotogaceae, Eubacteriaceae, Streptococcaceae, Methanosarcinaceae and Thermoprotei reduced by half.

CONCLUSIONS

Taken together, these observations suggest that dietary components exert significant effects on our intestinal microbiota profile, which may have direct effects on our health and well being. Diet is cultural and geographical based, knowledge of the interaction of diet and intestinal microbiota opens new possibility for health promotion and disease prevention.

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