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Fermentation and its Role in Health and Disease: A Clinical Insight from the Lens of Therapeutic Intervention Strategy

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Abstract: The importance of fermented food having medicinal value is well known, since ancient times and thus, is widely consumed worldwide. Since its discovery about centuries ago, there has been a lot of debate and research about the health benefits of fermented foods. As fermentation process enhances antioxidant activity of dietary food products such as fruits, milks, cereals, meat and fish by increasing the nutrients and vitamins. It offers health advantage, participates in various physiological activities and protects the cell against the toxic effects of free radicals which reflects its role in suppression of oxidative stress mediated disorders such as aging, hypertension, diabetes, cardiovascular disease and cancer etc. Various researches are going on to explore the hidden facts about the role of fermentation in health and diseases. However, the exact mechanism behind the involvement of fermented food contents in such events is not yet fully elucidated and needs further investigation. It's protective properties and safety profile makes it an attractive therapeutic tool. In contrast, fermentation rarely produces some toxic contaminants and metabolites of the microbes into the food base. Therefore, the present article is focused on the current aspects related to health benefits of components of fermented food intake with special reference to oxidative stress mediated diseases and to understand its importance role in maintaining health diets as well.

Keywords: Antioxidants, Anti-inflammatory, Anti-obesity, Cardiovascular disease, Diabetes.

I. Introduction

Fermented foods and health are intimately linked, has been known since ancient times. The vital importance of fermentation to health mainly due to its ability to enhance antioxidant contents has been now well recognized. Stretching back into the ancient times, beverages were widely consumed as fermented food product, later on due to technology revolution it expands into wide horizon and now it has taken turn from a household to industrial scale production, looming large and occupies a crucial space in marketplace. Fermentation process was first invented by the ancient Chinese civilization (around 7000 BC) in preparation of beer type beverage from fruits, rice and honey etc. [1]. Later on, after several centuries, it was revolutionized by the invention of Pasteur (1857) in relation to lactic acid formation caused by the micro-organism [2].

The term fermentation is derived from Latin word *fermentare*, defined as "to leaven" [3]. In general, fermentation is defined as a food produced as a result of action of variety of micro-organism, namely mycelia fungi, yeast and bacteria etc. under optimum conditions such as concentration of substrate and micro-organisms, pH, temperature and moisture condition. This process involve the release of energy from partial oxidation of carbohydrates and its related compound, which is regulated by various factors including type of micro-organisms and availability of type of sugar.

During fermentation process, antioxidant, anti-hypertensive and bioactive fermented food components are produced with help of action of micro-organisms which enhances the nutritional value of that particular food such as antioxidant activity of milk, fruits and cereals etc. [4]. Moreover, alteration in vitamin contents also support the health benefits of fermented dairy products and fruits which attract the researchers in sparkling field of fermented traditional medicines (FTMs) to focus their research to describe the benefits of fermented food products on health and well being.

Although a lot of previous studies have acknowledged the role of fermentation as a crucial food component used as a family drink and other food stuffs, the emerging evidences reflect the importance of fermentation derived components as an effective medical therapy in a wide array of conditions including cardiovascular diseases, cancer prevention and diabetes etc. The area covered in this review has been rapidly unfolding in recent years and emphasizes the potential role of fermentation in maintaining health and in prevention of free radical mediated diseases linked to oxidative stress.

II. Fermented Food and its Type

A myriad of studies have been documented in relation to fermented foods and its type. Fermented foods may vary by

food type, application of microbes and method of fermentation. In some cases, fermentation is required for the initiation of product formation and after sometime fermentation is stopped followed by inclusion of other additional processes such as sourdough bread and chocolate preparation etc. On the other hand, fermentation process continues till the end of final product formation such as vinegar, beer and cheese formation etc. Some of the common fermented foods used in India and other western countries are enlisted in Table I.

Table I: Common Fermented Foods

Sr. No.	*Fermented Food in India*	*Fermented Food in Western Countries*
1	Indian Cottage cheese	Kimchi
2	Jalebi	Bagoong
3	Fermented Soya bean- Akhuni	Kombucha
4	Dhokla	Puto
5	Cahgem Ponga	Chin Som Mok
6	Yoghurt	Furundu
7	Gochujang	Sourdough Bread
8	Idli	Kenkey

III. Fermented Dairy Product and its Importance

Fermented milk products are produced through milk fermentation by particular microbial group in which various micro organisms grow in a protocooperative relationship e.g. Yeasts and Lactic Acid Bacteria (LAB), Bifid bacteria. There are various microorganisms involved in the process of fermentation such as *Lactobacillus*, *Lactococcus*, *Streptococcus Pediococcus* and Leuconostoc genera. These are present in significant numbers and play a significant role in giving fermented milk its unusual taste, consistency, and nutritional value. Fermented milk gets its feel and flavor from its Microbial starter cultures. These cultures also have a key function in the synthesis of bioactive components. These bioactive components present in fermented dairy products impart abilities to them to act as antioxidant, anti-hypertensive, anti-diabetic, and anti-allergic as compared to their raw material [5].

IV. Fermented Fruit/Vegetables and its Importance

Fruit and vegetables are very delicate food which can rotten very easily. So since long time the process of fermentation is used all over the world to prepare such type of food products or beverages that have an extended shelf-life. The tradition of fermenting fruit and vegetable products is more widespread in Asian countries than in Western cultures, As mentioned in various old literatures there are a number of traditional fermented Asian food items: sinki, kimchi, sauerkraut, khalpi, gundruk and tempeh [6]. A study showed the benefits of fermentation in which the fermentation of tomato by Lactic Acid Bacteria showed that phenolic and flavonoid content decreased after 4-week fermentation, while lycopene and antioxidant activity increased [7].

V. Fermented Cereals and its Importance

Cereal are major part of diet, they provide almost all the nutrients like carbohydrates, proteins, dietary fiber, vitamins, and minerals. But as compared to dairy products their nutritional quality is lower or of inferior quality. Nutritional properties of cereals can be improved by fermentation process. One of the most popular cereal-based fermented foods is Bread, however many other aboriginal cereal-based fermented foods are prepared all over the world such as idli, dosa and kishk etc. [8]. Various alcoholic and non-alcoholic drinks are prepared from fermentation of different cereals: beer, boza, chichi and mahewu [9].

VI. Fermented Meat or Fish and its Importance

Fermentation has also been conventionally used to improve the dietary quality, taste and bio-preservation of fishes and meat. Along with fermentation there are various processes which are used to develop the flavor of meat such as drying, curing and ripening. By fermentation various bioactive peptides are released from the meat that has shown anti-oxidative activity [10].

VII. Conclusion

Considering the crucial role and health benefits of fermented foods, we conclude that fermentation is amazing technology which reduces hypertension, lowers plasma cholesterol enriches blood, increase appetite, promotes digestion, increases antioxidant activity in blood plasma, protects teeth against decay and bacterial action and decreases the risk of heart disease and cancer etc. Beyond all health benefits, fermentation spins a magic that keeps the family tradition alive. Therefore, daily consumption of fermented food is essential for maintaining healthy life and it should be consumed to the people of all age group. In addition, more research is needed to explore the hidden facts about the therapeutic role of fermented food products.

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