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Editorial Open Access

Nutritional Shifts during Food Processing

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Editorial

Food processing is a multi-operational and multifaceted phenomenon to transform raw material from agriculture, animal husbandry or marine life into the edible product that has nutritional significance and also the commercial value. It tends to ensures safe, diverse, sufficient and nourishing food supply. It alters the natural state of food by heating, cooling, freezing, drying, milling, canning, peeling, cutting, mixing, or addition of salt, sugar, fat, spices, and vinegar or food additives. Each cooking process distinctively brings changes in appearance, taste, aroma, flavour and nutritional components.

Several thousand years ago hunter-gatherers ate fire-kissed foods and those were more varied and nutritious. Indian text shared making of jaggery by boiling and cooling of sugar cane juice. Tedious and time consuming traditional methods were replaced by labour saving devices. Further food technology has swirled in confirming the consumer demands and establishing the food industry. As a result Nova classified processed foods emerged in a big way for consumers to enjoy convenient and lip smacking foods all time. Food industry, at the same time, is blamed for dramatic escalation of obesity, diabetes and other inflammatory and immune diseases around the globe. Rethinking and recreating for reversing the health paradigm need support of nutritionists, food technologist, food manufacturers and marketers.

All knows that refining process in flour and oil strips away many valuable nutrients like fiber, micronutrients and certain bioactive substances from them. Continued use of refined foods alters the metabolic behavior of the body leading to metabolic syndrome. Then every piece of dietary advice entails inclusion of complex carbohydrates, fiber, vitamins and minerals in the diet containing cereals, whole pulses, dairy, meat, fruits and vegetables.

During food processing there is inactivation of enzymes, natural toxins and food-borne pathogens making the food flavourful, nutritious and digestible and also shelf stable. It also augments the antioxidant capacity and functional properties of food and minimizes the undesired pattern in food products.

The undesirable consequences are enzymatic and non- enzymatic browning; loss of certain essential nutrients such as vitamin A, C, folic acid, thiamine, essential amino acids particularly lysine and formation of carcinogenic compounds like acrylamides, acrolein, heterocyclic amines. All undesirable effects do not occur in all foods simultaneously but deteriorate the food quality and warrant the gastronomic and health issues [1].

Thermal processing results in dextrinization and gelatinization of starch and denaturation of proteins and oxidation of fat. These chemical reactions support digestion and utilization of food in the healthy body. Gelatinization tends to raise the postprandial glucose responses or glycemic index (GI) of food which may not be acceptable by diabetics. Boiling and cooling of starch foods like rice or potato undergo retrogradation, develop resistant starch thus have lower glycemic index.

Gelatinization temperature; ratio between amylose and amylopectin and presence of polyphenols and enzyme inhibitors alter the sugar and lipid profile in the body. Composition of food matrix, temperature and exposure time are crucial in nutritional shifts and chemical reactions in the food. Cooking entails browning by Maillard reaction that takes place between reducing sugar and protein and extends taste and antioxidant capacity at low temperature.

Maillard reaction products (MRPs) also form during roasting, frying, baking or grilling at high temperature and also result in production of Advanced Glycation End products (AGE products) and heterocyclic amines (HCA). During deep frying polymerization of fat occurs and acrolein produces. MRPs, AGEs, acrolein and HCA, all are damaging to body cells, tissue and DNA thus considered carcinogenic. Dietary intake of them particularly AGE products may contribute to the progression of diabetes (T2DM), cardiovascular diseases and obesity although the mechanism of involvement is not clear. Ingestion of AGE products can be reduced by moist heat cooking food at low temperatures for short period of time or less browning or by addition of polyphenols under acidic medium and high humidity [2].

Practice of slow cooking at low temperature is popular for roasting of grains in some parts of the world including India. It helps to preserve the nutritive value, minimize the loss of heat labile compounds and low or zero formation of carcinogenic AGE products. Further non-thermal procedures like germination and fermentation beneficially improve the nutritional quality of food by increasing the vitamin C content and improving the bioavailability of zinc, calcium and iron and balancing the gut flora.

Traditional drying methods also require low temperatures (29 to 40°C) and 24 to 60 hours to complete the process depending upon the original moisture content. Thus varying the temperature, time, humidity, light, acidity and processing technique can favourably or unfavourably shift the nutritional or health aspects of food, e.g. UHT (ultra-heat treatment) for pasteurization of milk under controlled condition is given and processing of milk requires attention, especially for the infants, as milk is the sole source of nutrients for them [3].

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