

Favorite yet a Carcinogenic and Neuro-Reactive Monomer “Acrylamide”: Formation in Food, Consumption and Health Impacts



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Abstract

Acrylamide is a monomer which is associated with asparagine especially when proteins react to carbohydrate during Maillard reaction. The issue of this carcinogen was highlighted by Swedish Nation Food Administration SNFA and the cause progressed by European food industries, especially spiked the high treatment to high saccharon foods. Experiments replicated to find end products of trio effects of high saccharides, free protein subunits the aminoacids and high temperature, revealing formation of acrylamide in research institutes and snack food industries. Mini review highlights formation, consumption, and health impacts of acrylamide.

Keywords: Acrylamide; Carcinogen; Processed Foods; Sugars; Maillard Reaction

Abbreviations: Swedish Nation Food Administration (SNFA); Food Standards Agency (FSA); Scientific Committee on Food (SCF)

Introduction

Acrylamide is a cancer causing precursor and neurodegenerative monomer formed during processing of high saccharon foods, completion of reaction (Maillard reaction) requires presence of free amino acids especially asparagine [1-4]. Acrylamide's presence in food was established as threatening news by Swedish Nation Food Administration [5], which was proven correct by Food Standards Agency (FSA) as a bad health impacting agent [6]. Replications of studies and efficacies were conducted to assure the hazards in health by acrylamide hence it was declared a health issue, mentioned by Scientific Committee on Food [7].

Formation of acrylamide

Perception received after experiments declared that saccharides rich edible foods produced more acrylamide, when reacted with asparagine, it also established that in presence of more water i.e. during heat process of boiling in water didn't produced acrylamide even in richest source of carbohydrates the potatoes [8,9].

Detection Methods

Over the years different methods have been developed to detect acrylamide in cooked meals and uncooked edible as well as non-edible commodities, but efficiency of detection is inverse i.e. decreases with improvement of food matrices and degree of saccharides processing. Analytical approaches include gas chromatography, high performance liquid chromatography [10], liquid chromatography mass spectrometry [11,12], proton transfer reaction mass spectrometry [13] and gas chromatography mass spectrometry after derivitization [14,15]. It was established by Clarke and co-technologists that liquid chromatography mass spectrometry is better as it gives precise results and eradicates the hassle of derivitization [16].

Foods with acrylamide

Weisshaar and Gutsche mentioned crisp bread, potato crisps, chocolate bar, processed cereals, [9] corn starch, biscuits, ginger

bread and foods containing rising agent ammonium hydrogen carbonate [17] and light roasted coffee beans [18]. Foods that are processed at higher temperatures yield dark colored food products which contain huge amount of acrylamide [19].

Factors influencing acrylamide formation

Replication of matrices i.e. potato chips revealed that cultivar, harvesting conditions, soil, composition of potato (sugars and protein sub-units) [2], processing conditions i.e. frying temperature, pH, time and potatoes's seasonal variations are the factors responsible to influence ratio of acrylamide produced [20], and could be managed in safe limits considering no bad affect to taste as Maillard reaction produces sensory characteristics of product [21].

Health impacts

Acrylamide causes impairments leading carcinogenesis [22] and [23] and neurotoxication [24]. Glycidamide is metabolite of acrylamide, which reacts to DNA and impacts as genotoxicity [25].

Quick fix

Eat balanced diet with servings of fruit, vegetables, whole grain cereals and pulses, dairy and meat, limit intake of high processed foods and fried items [26]. Processing of frying at more than 180-190 °C while baking at more than 250 °C, both should be avoid [27].

Conclusion

Acrylamide induces cancers and neural toxicity on consumption at regularity in high amounts through foods, which can be reduced by following dietary and food processing guidelines formulated by Food and Drug Association as well as World Health Organization. Food rich in saccharides should be prepared at temperature not more than 120 °C. More cross sectional studies are required to understand the health impacts.

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