

Detection of Acrylamide Using Liquid Chromatography-Tandem Mass Spectrometry and Quantitative Risk Assessment in Selected Food from Saudi Market

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Abstract : Concerns over the presence of acrylamide in food date back to 2002, when Swedish scientists stated that, in carbohydrate-rich foods, amounts of acrylamide were formed when cooked at high temperatures. Similar findings were reported by other researchers which, consequently, caused major international efforts to investigate dietary exposure and the subsequent health complications in order to properly manage this issue. Due to this issue, in this work, we aim to determine the acrylamide level in different foods (coffee, potato chips, biscuits, and baby food) commonly consumed by the Saudi population. In a total of forty-three samples, acrylamide was detected in twenty-three samples at levels of 12.3 to 2850 µg/kg. In reference to the food groups, the highest concentration of acrylamide was found in coffee samples (<12.3-2850 µg/kg), followed by potato chips (655-1310 µg/kg), then biscuits (23.5-449 µg/kg), whereas the lowest acrylamide level was observed in baby food (<14.75 - 126 µg/kg). Most coffee, biscuits and potato chips products contain high amount of acrylamide content and also the most commonly consumed product. Saudi adults had a mean exposure of acrylamide for coffee, potato, biscuit, and cereal (0.07439, 0.04794, 0.01125, 0.003371 µg/kg-b.w/day), respectively. On the other hand, exposure to acrylamide in Saudi infants and children to the same types of food was (0.1701, 0.1096, 0.02572, 0.00771 µg/kg-b.w/day), respectively. Most groups have a percentile that exceeds the tolerable daily intake (TDI) cancer value (2.6 µg/kg-b.w/day). Overall, the MOE results show that the Saudi population is at high risk of acrylamide-related disease in all food types, and there is a chance of cancer risk in all age groups (all values <10,000). Furthermore, it was found that in non-cancer risks, the acrylamide in all tested foods was within the safe limit (>125), except for potato chips, in which there is a risk for diseases in the population. With potato and coffee as raw materials, additional studies were conducted to assess different factors, including temperature, cooking time, and additives affecting the acrylamide formation in fried potato and roasted coffee, by systematically varying processing temperatures and time values, a mitigation of acrylamide content was achieved when lowering the temperature and decreasing the cooking time. Furthermore, it was shown that the combination of the addition of chitosan and NaCl had a large impact on the formation.

Keywords : risk assessment, dietary exposure, MOA, acrylamide, hazard

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