

592c Risk Assessment Modelling of Acrylamide in Potato Products Encompassing Thermal Processing and Other Process Stages

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Acrylamide is a neurotoxin and is classified as a probable carcinogen to humans by the International Agency for Research on Cancer (IARC). Worldwide concern about acrylamide occurred in 2002 when researchers in Sweden first reported that high levels ($>1000 \mu\text{g}/\text{kg}$) of the group 2a carcinogen existed in many foods which were heated to high temperatures. Highest levels of acrylamide were found in carbohydrate-rich food, such as potato chips and French fries, which had been cooked at high temperatures. Potatoes (*Solanum tuberosum*) have traditionally been a major food product in many countries, providing a stable source of food and nutrition. Because of the important role potatoes play in the human diet, this study has focused on the potential risks to humans from acrylamide in fried potato products, such as French fries and potato crisps. While there has been previously published risk assessment models on the risks of acrylamide from an overall consumption perspective, there has been no published attempt to model acrylamide formation for any food product from “farm-to-fork”. This study addresses this gap and attempts to model acrylamide formation in French fries and potato crisps using largely empirical data to model potato growth, storage, subsequent thermal processing and cooking procedures. This is achieved by means of Monte Carlo simulation techniques. The model was created in Microsoft Excel (version 2000) with the @Risk add-on package (version 4, Palisade, New York). The model used probability distributions to take account of the inherent uncertainty and variability in input parameters and was run for 10,000 iterations of the model. The mean acrylamide level in French fries was estimated to be $459 \mu\text{g}/\text{kg}$. The mean acrylamide level in fried potato crisps was $628 \mu\text{g}/\text{kg}$. A lifetime probability of cancer from consumption of these products was also constructed with a mean lifetime probability of cancer for males of $-3.93 \log$ (i.e. approximately a 1 in 10,000 lifetime probability of cancer from the consumption of French fries and potato crisps) with an equivalent mean of -4.06 for females. A sensitivity analysis revealed the parameters having the greatest impact on model predictions. The initial level of reducing sugars in the raw potato was the most important parameter while the effect of heat treatments, such as blanching and frying regime, also influenced the final risk estimate. The model highlights importance of selecting cultivars with low reducing sugar levels and the impact of various thermal regimes on acrylamide formation.