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Qualitative determination of the levels of polycyclic aromatic hydrocarbons in contaminated macromolecular compounds using Gas Chromatography-Mass Spectrometry

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Food contamination can occur due to many different groups of chemical compounds in the environment. Polycyclic Aromatic Hydrocarbons (PAHs) are a group of organic compounds, which have been classified as possible and proven carcinogenic compounds to humans by the United States Environmental Protection Agency (US-EPA). The Agency has listed 16 priority PAH compounds to be analyzed in various contact sources. PAHs contain two or more fused benzene rings and they are formed as a result of incomplete combustion of organic materials such as petroleum, plastics, rubber, oil, garbage, wood, and food residues. Human exposure to PAHs can take place through inhalation, skin contact and consumption of contaminated macromolecules such as bread. In Sri Lanka, bread is one of the major macromolecular components of people's diet and it is one of the food items, which holds the potential risk of contamination by PAHs as the bread making process involves high temperature baking with various fuel sources such as wood, gas and electricity. Therefore, it is important to investigate the influence of fuel type used to bake bread on PAH contamination of bread. In this preliminary study, samples (bread/flour) were collected from three different types of bakeries using either fire wood, gas or electricity, over a period of eight weeks at one week intervals. The presence of PAHs in bread collected from these bakeries was assessed qualitatively. Extraction and cleanup of PAHs were done using Soxhlet apparatus and silica column respectively and samples were analyzed using Gas Chromatography-Mass Spectrometry (GCMS). According to the findings, naphthalene (in 7 samples), anthracene (in 2 samples), phenanthrene (in 1 sample) and fluorene (in 2 samples) were detected in the crust of bread baked using firewood and naphthalene was detected in the crust of two samples of bread baked using a gas oven. These four PAHs present in bread crust are possible carcinogens and therefore there may be a risk of exposing bread consumers to these PAHs in Sri Lanka. No PAHs were found in bread baked in electric ovens. Moreover, no PAHs were detected in bread crumb and flour mixtures in all samples collected from all three types of bakeries. It is evident from these preliminary results that there is a relationship between the method of bread baking and PAH contamination. Work is in progress to determine PAHs in bread quantitatively.

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