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Opinion Article

# Detecting Polycyclic Aromatic Hydrocarbon in Cigarette Samples

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## ABOUT THE STUDY

To determine the amounts of 16 Polycyclic Aromatic Hydrocarbons (PAHs) in cigarette samples, a new technique was developed employing Gas Chromatography coupled to triple quadrupole Mass Spectrometry (GC-MS/MS) with clean-up by Gel Permeation Chromatography (GPC). GPC clean-up was used to purify samples of mainstream cigarette smoke obtained from cigarettes in China, producing final extracts that were cleaner than those obtained using conventional Solid Phase Extraction (SPE). With increased sensitivity and greater accuracy, GC-MS/MS with a "Pseudo" Multiple Reactive Monitoring Mode (PMRM) outperformed the traditional single quadrupole method.

Their retention durations and distinctive ions made it simple to identify trace level PAHs. The predominant PAHs in these tobacco samples were two-ring, three-ring, and four-ring PAHs, with concentrations ranging from 455.8 ng/cig to 1201.5 ng/cig in the ranges of tobacco tar between 9 mg and 12 mg. Average PAH concentrations increase by 14.4% when tar concentrations exceed 10 mg, while they decline by 28.6% when tar concentrations fall below 6 mg. These findings suggest that relatively low-tar cigarettes emit relatively little amounts of PAHs.

Whereas, in order to quantify 2,2',4,4',5,5'-hexabromobiphenyl (BB-153), 1,2-bis(2,4,6-tribromophenoxy) ethane (BTBPE), and Dechlorane Plus (DP) in human serum samples, a Gel Permeation Chromatography-Gas Chromatography-Negative Chemical Ionization-Mass Spectroscopy method (GPC-GC-NCI-MS) was created Before extracting, the plasma samples were injected with 13C12BB-153 and 13C10syn-DP as a stand-in internal standard.

Gel permeation chromatography was then used to extract and remove the serum lipid. After that, a column made of silica and sulfuric acid was used to clean the samples. BB-153, BTBPE, syn-DP, and anti-DP were identified and quantified using gas chromatography-negative chemical ionic spectrometry. Ions at m/z 627.5 and 629.5 for BB-153, 79 and 81 for BTBPE, and 652 and 654 for DP were all under observation. 13C12BB-153 and 13C10 syn-DP were recovered with 91.5% + 8.9% and 92.3% + 8.1%, respectively, in serum samples. The range of the detection thresholds for lipid was 0.6–1.2 ng g1.

The amounts of syn-DP and anti-DP were 0.7-9.2 ng g1 lipid and 0.6-2.0 ng g1 lipid, respectively. BB-153 and BTBPE were not found in all of the serum samples. To design and optimize the collection, upgrading, and transportation procedures, high molecular weight hydrocarbons mixtures such heavy oil, bitumen, and vacuum residue must be characterized. The process of characterization reveals details regarding molecular weight distributions and boiling points. The creation of a straightforward, quick, and reliable characterization approach is required to get this data. In this study, we integrate data from Simulated Distillation (SD) with Gel Permeation Chromatography (GPC) for the first time to characterize samples of very heavy hydrocarbons.

By correctly matching the SD and GPC results, the proposed characterization approach uses each sample as a reference solution for GPC calibration. In other words, it is best to avoid using a standard sample, which is typically a polymer complex and is not a good representative for oil samples. The calibration curve that links the retention duration and molecular weight is created by coupling the GPC and SD values. Regardless of the difficulty of the especially heavy sample, the entire molecular mass and normal boiling distributions can be derived using the calibration curves that were acquired for each sample and the GPC data. An established standard sample is used to validate the suggested characterization approach.

This approach is then used to determine the molecular weight distribution of different bitumen samples and fractions. The established characterization approach gives a tool for gaining a better understanding of complicated mixtures' molecular weight and boiling temperature distributions. The resolution of neutrality hydroxyl lipids according to molecular size is possible utilizing gel-permeation chromatography on Sephadex LH-20 with ethanol as an eluent. The effect of molecules, functional groups, chains lengths, and degree of unsaturation on the elution pattern is explored, as well as the impact of the eluent. The method's use in separating subclasses of hydroxyl lipids that cannot be resolved by conventional chromatographic methods is proven. Separations of 1,2- and 1,3-diglycerides from long-chain alcohols and alkyl ethanediol monoethers from cholesterol are two examples.

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