The High Performance Liquid Chromatography (HPLC) Analysis of Polycyclic Aromatic Hydrocarbons (PAHs) in Oysters from the intertidal and subtidal zones of Chinhae Bay, Korea

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Abstract

Estuarine and coastal environments are apt to be affected by various kinds of pollutants. Of all things, oil pollution have recently received the greatest public attention internationally because of the direct damage to fisheries, and the harmful effects on marine lives such as seabirds, marine mammals, seaweeds and so on. Spilled oil slick will destroy beaches, recreational areas as well as marine ecosystem, and decrease the size of the populations of flora and fauna, and further, modify their habitats, delay or prevent recolonization. It hazards significantly to humans ingesting oil contaminated food.

Crude oil is an extremely complex mixture of hydrocarbons ranging in molecular weight from 16 (methane) to possibly 100,000. In addition to carbon and hydrogen, these hydrocarbons may also contain small quantities

of oxygen, sulfur, and nitrogen and trace amounts of metals. The number of individual compounds making up what is called petroleum is in the hundreds of thousands, and may approach 1 million discrete compounds. The three principal classes of hydrocarbons found in crude oil are alkanes (paraffins), cycloalkanes (naphthenes) and aromatics.

Of aromatic hydrocarbons, PAHs which consist of hydrogen and carbon arranged in the form of two or more fused benzene rings in linear, angular, or cluster arrangements with unsubstituted groups possibly attached to one or more rings, are now being of public concern, because they are potentially carcinogenic, mutagenic and teratogenic to aquatic organisms and humans from consuming contaminated food.

PAHs are also widespread in aquatic environment and enter marine environment via several route, domestic and industrial effluents, oil spill, incomplete combustion of fossil fuels, forest and brush fires, terrestial contributions and natural sources such as biosynthesis by plant and microorganisms. However, oil spill and incomplete combustion of fossil fuels are major sources of PAHs. They typically adsorb to fine particulate material suspended in estuarine waters and sediment seafloor.

The purpose of this study is focused on the determination of PAH content in oysters (*Crassostrea gigas*) living in the intertidal and subtidal zones of Chinhae bay in Korea, with developing the methodology of HPLC analysis of PAHs in oysters in coastal areas of Korea.

This study presents preliminary data for the PAH levels in oysters from Chinhae bay and the data will be utilized for assessing of oil pollution (especially for the PAHs) in Chinhae bay and will be compared with those in other studies world-wide.

PAHs were analyzed by High Performance Liquid Chromatography (HPLC) with uv/vis and fluorescence detectors. 15 PAHs were analyzed in oysters, and they are Naphthalene (NPTHL), Acenapthylene (ANCPL), Acenapthene (ACNPN), Fluorene (FLURN), Phenanthrene (PHEN), Anthracene (ANTHR), Fluoranthene (FLRTH), Pyrene (PYR), Benz(a)anthracene (BaA), Chrysene (CHRY), Benzo(b)fluoranthene (BbF), Benzo(k)fluoranthene (BkF), Benz(a)pyrene (BaP), Dibenz(a,h)anthracene (DahA), and Ideno(1,2,3,-cd)pyrene (I123cdP).

ACNPN was detected in highest concentration in oysters. The PAH content in oysters ranged from <0.05 to 992 ppb (mean 69.8 $\pm$ 9.85 ppb). Most PAH compounds in predominant (ACNPN, NPTHL, ANCPL and BaA)

and second dominant group (FLRTH, BbF, ANTHR, PHEN and BkF) from the intertidal showed almost equal or slightly higher concentrations than those from the subtidal.

Chinhae bay seems to be a heavily polluted area by PAHs, and further study about seasonal variations of PAHs in oysters as well as the PAH levels in various kinds of marine organisms would be needed for monitoring the area regarding PAH contamination.