Poster #1

High-Throughput Detection of Polycyclic Aromatic Hydrocarbons Using a Yeast-Based Aryl Hydrocarbon Receptor Signaling Assay

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Polycyclic aromatic hydrocarbons (PAHs) are environmental pollutants that arise naturally and come from human activities. Exposure to PAHs at sufficient levels causes toxic effects, including endocrine disruption. These toxic effects are transcriptionally mediated by the Ah (aryl hydrocarbon) receptor. Sixteen environmentally-relevant PAHs were tested individually and as mixtures in a yeast-based Ah receptor signaling assay. We classified these 16 PAHs into four groups (inactive, weakly active, moderately active, and strongly active) based on their activation of human Ah receptor signaling. Indeno(1,2,3-cd)pyrene, chrysene, benz(a)anthracene, benzo(a)pyrene, benzo(j)fluoranthene, and benzo(k)fluoranthene were the most active PAHs in our assay. Mixtures of these PAHs showed additive and synergistic effects in the Ah receptor assay. Receptor independent effects between different PAHs may give rise to the synergistic effects caused by some mixtures. Environmental samples from the New Orleans area that were analyzed for PAH composition and quantity by gas chromatography/mass spectroscopy were tested in this bioassay. Significant relationships were found when the analytically measured levels of total PAHs, active PAHs, and benzo(a)pyrene were correlated with the dilutions of the environmental samples that gave EC_{25} signaling levels in the Ah receptor assay. Some environmental samples gave anomalous results in the Ah receptor assay. Samples with unexpectedly high signaling could contain additional Ah receptor ligands (PCBs, dioxins), and no inhibitors were found in samples with anomalously low activity. The Ah receptor signaling assay is a simple, rapid, and inexpensive tool to for preliminary screening of samples that contain PAHs and other chemicals with affinity for the Ah receptor.

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