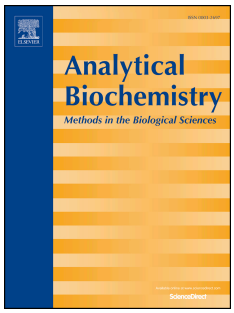
Accepted Manuscript



A carbon nanotube-enhanced real-time immuno-PCR for ultrasensitive detection of AHTN in water

Xiaohan Zhang, Huisheng Zhuang

PII: S0003-2697(17)30527-4

DOI: 10.1016/j.ab.2017.12.024

Reference: YABIO 12882

To appear in: *Analytical Biochemistry*

Received Date: 18 July 2017

Revised Date: 13 December 2017

Accepted Date: 14 December 2017

Please cite this article as: X. Zhang, H. Zhuang, A carbon nanotube-enhanced real-time immuno-PCR for ultrasensitive detection of AHTN in water, *Analytical Biochemistry* (2018), doi: 10.1016/j.ab.2017.12.024.

A carbon nanotube-enhanced real-time immuno-PCR for ultrasensitive detection of AHTN in water

Xiaohan Zhang[a], Huisheng Zhuang[a]

[a] School of Environment Science and Technology, Shanghai Jiao Tong University, Minhang District, Shanghai 200240, People's Republic of China

Corresponding author: Huisheng Zhuang, Email: huishengzhuang@126.com

Abstract: Polycyclic musks (PCMs) in the aquatic environment have become an emerging environmental issue because of their potential risk. The most commonly used method for analysis of PCMs is gas chromatography-mass spectrometer (GC-MS) with different sample extractions, which are somewhat expensive to operate, laborious and complex. In this paper, a carbon nanotube-enhanced real time immuno-PCR was developed for ultrasensitive detection of AHTN in water for the first time. The SWCNTs were used to immobilize numerous amino-DNA and polyclonal antibody to form polyclonal antibody-CNTs-DNA conjugates, which were used as a signal-amplifier in the proposed immunoassay system. This proposed carbon nanotube enhanced real time immuno-PCR assay was used to determine AHTN in water samples ranging from 5 pg/L-0.1 ng/L; using sample size as low as 10μL. This proposed carbon nanotube enhanced real time immuno-PCR is the most ultrasensitive one for determination of AHTN in water without pre-concentration or extractions; and it provide a potential way for ultra-trace AHTN detection in the aquatic environment.

Keywords: Carbon nanotubes, Real-time immuno-PCR, AHTN, Water.

1. Introduction

Polycyclic musks (PCMs), such as 7-acetyl-1,1,3,4,4,6-hexamethyl-1,2,3,4-tetrahydronaphthalene (AHTN, Tonalide), 1,3,4,6,7,8-hexahydro-4,6,6,7,8,8-hexamethylcyclopenta[γ]-2-benzopyran (HHCB, Galaxolide), 6-acetyl-1,1,2,3,3,5-hexamethylindan (AHMI, Phantolide) and 4-acetyl-1,1-dimethyl-6-tert-butylindan (ADBI, Celestolide) are widely used as fragrances in personal care products[1; 2] (perfumes, shampoo, cosmetics, etc.) and additives in food, cigarettes, and fish baits[3; 4]. Due to their extensive consumption and incomplete removal efficiencies (WWTP) [5], AHTN and other PCMs are continuously discharged into the aquatic environment[6]. Consequently, they will not only contaminate the water environment, but also be accumulated in aquatic organisms[7; 8], wildlife and human life through the food web[9; 10]. Nowadays, PCMs in water environment have become an emerging environmental issue because of their potential risk. In particular, AHTN and HHCB, as two of the most frequently used products, are the predominant PCMs [11].

The most commonly used method for analysis of PCMs is gas chromatography-mass spectrometry (GC-MS) with different sample extractions [12]. Many attempts [13] have been applied to enhance the sensitivity, such as liquid-liquid extraction (LLE)[14; 15], dispersive liquid-liquid microextraction (DLLME) [16], ultrasound-assisted DLLME (UA-DLLME) method[17], solid-phase extraction