

## Bisphenol A and the related alkylphenol contaminants in crustaceans and their potential bioeffects

Yuegang Zuo <sup>\*1</sup>, Zhuo Zhu <sup>1</sup>, Mohammed Alshantiti <sup>1</sup>,  
Joseph Michael <sup>1</sup> and Yiwei Deng <sup>\*2</sup>

<sup>1</sup> Department of Chemistry and Biochemistry, University of Massachusetts Dartmouth,  
University of Massachusetts Graduate School of Marine Sciences and Technology,  
285 Old Westport Road, North Dartmouth, MA 02747, USA

<sup>2</sup> Department of Natural Sciences, University of Michigan, Dearborn, MI 48128, USA

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**Abstract.** Bisphenol A is widely used in plastic and other industrial consumer products. Release of bisphenol A and its analogues into the aquatic environment during manufacture, use and disposal has been a great scientific and public concern due to their toxicity and endocrine disrupting effects on aquatic wildlife and even human beings. More recent studies have shown that these alkylphenols may affect the molting processes and survival of crustacean species such as American lobster, crab and shrimp. In this study, we have developed gas chromatography with flame ionization detection (GC-FID) and gas chromatography-mass spectrometric (GC-MS) methods for the determination of bisphenol A and its analogues in shrimp *Macrobrachium rosenbergii*, blue crab *Callinectes sapidus* and American lobster *Homarus americanus* samples. Bisphenol A, 2,4-bis-(dimethylbenzyl)phenol and 4-cumylphenol were found in shrimp in the concentration ranges of 0.67–5.51, 0.36–1.61, and < LOD (the limit of detection)-1.96 ng/g (wet weight), and in crab of 0.10-0.44, 0.13-0.62, and 0.26-0.58 ng/g (wet weight), respectively. In lobster tissue samples, bisphenol A, 2-t-butyl-4-(dimethylbenzyl)phenol, 2,6-bis-(t-butyl)-4-(dimethylbenzyl)phenol, 2,4-bis-(dimethylbenzyl)phenol, 2,4-bis-(dimethylbenzyl)-6-t-butylphenol and 4-cumylphenol were determined at the concentration ranges of 4.48-7.01, 1.23-2.63, 2.71-9.10, 0.35-0.91, 0.64-3.25, and 0.44-1.00 ng/g (wet weight), respectively. At these concentration levels, BPA and its analogs may interfere the reproduction and development of crustaceans, such as larval survival, molting, metamorphosis and shell hardening.

**Keywords:** bisphenol A; alkylphenol; 4-cumylphenol; 2,4-bis-(dimethylbenzyl)phenol; 2-t-butyl-4-(dimethylbenzyl)phenol; gas chromatography-mass spectrometry; GC-FID; lobster, crab, shrimp

### 1. Introduction

Bisphenol A (BPA, 4,4'-isopropylidene diphenol) is a commercially important chemical with an estimated worldwide annual production of 5 million tons in 2010. Over 95% of all BPA produced is used as a monomer in the production of polycarbonate plastic and epoxy resins, which

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\*Corresponding author, Professor, E-mail: [yzuo@umassd.edu](mailto:yzuo@umassd.edu)

\*Corresponding author, Professor, E-mail: [dengy@umich.edu](mailto:dengy@umich.edu)



















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