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PCB CONCENTRATIONS IN SQUID, BLOOD COCKLE, SNAIL, MUSSEL AND PORK IN SOUTH-EASTERN PROVINCES OF SOUTH VIETNAM

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Abstract

This paper is an excerpt from the report of the national project entitled " Study, assess the existing contamination status of toxic substances (pesticides, heavy metals, nitrate, PCBs, borax, urea, aflatoxin) and harmful microorganisms (*Vibrio cholera*, *Salmonella* spp, *Clostridium perfingens* and *Escherichia coli*) in prime agricultural commodities (vegetables, meat, fish, bivalves, etc..) of some south-eastern provinces of south Vietnam". This paper describes the concentrations of PCBs in squid, blood cockle, snail, mussel, and pork. PCB concentrations in them are lower than stipulated standard (FDA) (calculated based on 7 available congeners).

Key words: *polychlorinated biphenyls (PCBs), blood cockle, squid, snail, mussel, pork*

Introduction

Polychlorinated biphenyls (PCBs) are a group of 209 congeners, which received a lot of attentions from all around the world since the time Swedish scientist first detected them accidentally when they studied DDT. About 130 congeners can be detected in commercial products. PCBs were manufactured by several companies of different countries between 1930 and 1977, in which, Monsanto produced 93% of the world total under the tradename Aroclor (1, 2).

PCBs have less acute toxicity and more chronic toxicity with long-lasting existence in the environment with the effect of bioaccumulation in the food chain that harm the public health and other living organisms in the nature.

Vietnam started using PCBs since long time ago and there were no concerns among administrators, scientists and the public until recent years. With the financial support from Ho Chi Minh City government through the Department of Science, Technology and Environment, and later by the Ministry of Science, Technology and Environment the study on PCBs together with other contaminants was conducted from 1999 until now. In our previous report (3), the PCBs concentrations in surface and well waters, crops and sediments were described. In this paper, the concentrations of PCBs in squid, blood cockle, snail, mussel and pork were determined.

Methodology

Samples were collected and stored in cold containers, bring back to laboratory and store in freezer until analysis.
Analytical procedure for PCBs based on Official Methods of Analysis of AOAC International:

Samples → PCB Extraction → Extract → GC analysis → Calculation of results

For aquatic product samples : AOAC - Chapter 10, pp 12-12A
For foodstuff samples: AOAC - Chapter 10, pp 1-10

Results and Discussion

26 squid samples collected from Binh Thuan, Ba Ria Vung Tau provinces and from wholesale market in Ho Chi Minh city were analyzed. PCB were detected in 6 samples within the range from 0.34 to 2.5 ppb (μg/kg), mainly PCB 138 and PCB 180 (Table 1).

Table 1: PCB concentration (ppb) in squid (*Loligo* sp)

Type of sample	Name of province	No. of analyzed samples	No. of detected samples	%	Concentration range	No. of samples exceed standard
Squid	Binh Thuan	14	01	7.14	0-2.5	0
	Ba Ria–Vung Tau	07	02	28.6	0-1.6	0
	Ho Chi Minh	05	03	40.0	0-2.8	0

Blood oyster are aquatic creature living on water body bottom sediment with high potential of PCB contamination but in this survey, only 1 sample containing PCB was detected (0.34 – 2.8 ppb (μg/kg)) among 26 analyzed samples collected in Ho Chi Minh city market, where large amount of blood oyster is consumed everyday.

Snails living in rice fields, canals, marshes that can be used as food for human and animal. Only 1 samples with PCB were detected (1.24 ppb) among 29 analyzed samples collected in Ho Chi Minh city market (Table 2).

Table 2: PCB concentration (ppb) in blood cockle (*Anadara granosa*) and snail

Type of sample	Name of province	No. of analyzed samples	No. of detected samples	%	Concentration range	No. of samples exceed standard
Blood cockle	Ho Chi Minh	30	02	6.7	0-1.9	0
Snail	Ho Chi Minh	29	01	3.5	0-1.2	0

Among 30 mussel samples collected in Ho Chi Minh city market, no sample was detected containing PCB. Clams are being farmed industrially in Ho Chi Minh city suburban, samples from nature need to be analyzed in the future.

Among 15 pork samples collected in Ho Chi Minh city market, no sample was detected containing PCB. Possibly, these pork samples come from industrial farms which use less amount of vegetables originating from likely contaminated areas (canals, fields. marsh, etc...) that produce aquatic plants (Table 3).

Table 3: PCB concentration (ppb) in mussel (*Meretrix* sp) and pork samples

Type of sample	Name of province	No. of analyzed samples	No. of detected samples	%	Concentration range	No. of samples exceed standard
Mussel	Ho Chi Minh	30	0	0	0	0
Pork	Ho Chi Minh	15	0	0	0	0

In 127 analyzed samples, PCB were detected in 9 samples. Samples with concentrations from 0.34 to 2.8 accounts for 6.3% in which squid with 19.2%, blood cockle 6.7% and snail 3.5%. Mussel and pork samples were negative. PCB 138 and PCB 180 are main detected congeners (Table 4 and Figure 1).

Table 4: Combined analytical results

No	Type of sample	No. of analyzed samples	No. of detected samples	%	Concentration range
1	Squid	26	5	19.2	0-2.8
2	Blood cockle	30	2	6.7	0-2.0
3	Snail	29	1	3.5	0-1.2
4	Mussel	30	0	0	0
5	Pork	15	0	0	0
	Total	127	9		7.1

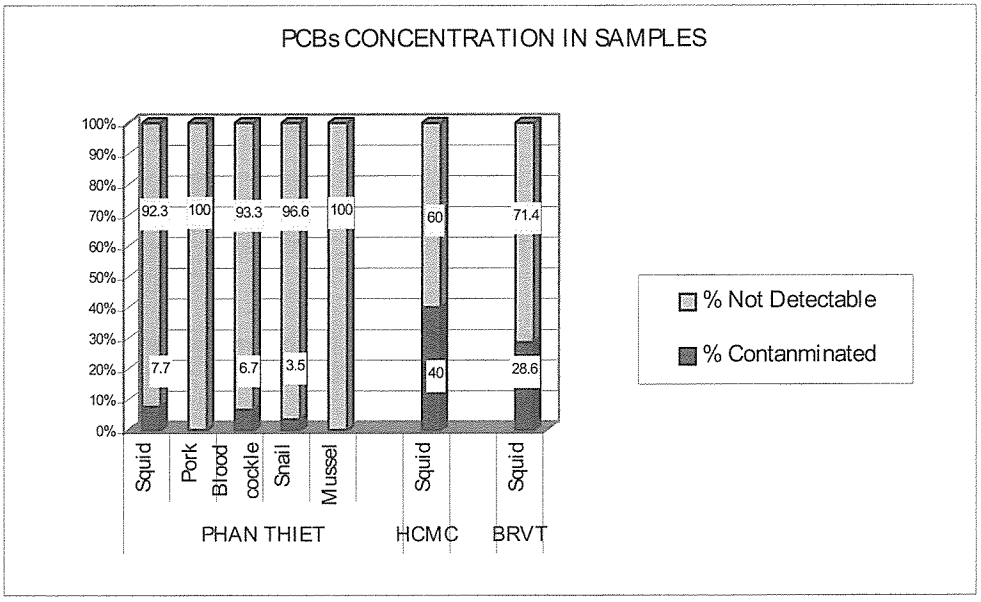

Figure 1: PCB concentrations in various samples

FDA (The Food and Drug Administration of the USA) stipulates PCB concentrations in foodstuff, egg, milk, fish and meat from 0.2 to 3 mg/kg (ppm). PCB detected in samples of this study was much lower than FDA regulation. The total concentration, however, may be higher because only PCB 18, PCB 28, PCB 52, PCB 101, PCB 138, PCB 152 and PCB 180 were analyzed.

It can be concluded from this study that PCB concentrations in squid, blood cockle, snail, clam and pork in south-eastern provinces of south Vietnam are lower than stipulated standard (calculated based on 7 available congeners). The next survey conducted on wider range of PCB congeners is essential to obtain more exact data that can be used for public health purpose.

Reference

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