

Reduction of Polychlorinated Biphenyl (PCB) Concentrations in Carp (*Cyprinus carpio*) Fillets through Skin Removal

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The method by which a fish sample is prepared for analysis may greatly affect the data generated by the analysis and the conclusions derived from that data. The objective of this investigation was to determine the effect of skin removal on the polychlorinated biphenyl concentration in fish fillets intended for human consumption.

METHODS

One hundred and fifteen carp were collected from areas of the Upper Mississippi River which have and do not have documented PCB contamination. The carp were composited into 8 samples of three size classes. Thirty-six carp were in the 0.0-2.5 lb class. Forty-three carp were in the 2.5-5.0 lb class. Thirty-six carp were in the 5.0+ lb size range. After collection the fish were wrapped in aluminum foil, frozen, and transported to the sample preparation laboratory. All fish were stored at the laboratory until the entire group could be prepared at the same time by the same individual. At the time of sample preparation the fish were thawed and prepared according to the U.S. Food and Drug Administration (USFDA) method for edible portion. This method requires the head, scales, fins, gut and tail be removed and discarded (USFDA 1977). The skin is not removed for determining compliance with USFDA tolerance levels. The fillet consists of all flesh and skin from the head of the fish to the tail and from the top of the back to the belly on both sides of the fish. The fillet was divided in half along the backbone and all inedible bones were removed from both halves. There was no predetermined selection of either the right or left fillet half for skin removal.

All fillets in a size class sample were composited, ground to the consistency of hamburger, and sent to the analytical laboratory. All samples were analyzed for PCBs by the Minnesota Department of Health utilizing USFDA procedures and methods.

RESULTS AND DISCUSSION

Removal of the skin from USFDA edible portions significantly reduced the PCB concentration and lipid content of the sample. (Table 1). Overall reduction was 26% and 30% for PCBs and lipids, respectively (Table 2). Removal of the skin in the largest size class, 5.0+ lb had the least effect on PCB and lipid removal. The Wisconsin Department of Natural Resources

Table 1. PCB (mg/kg) and Lipid (%) Levels in Mississippi River Carp by Size Class

Size (1b) Class	WITHOUT SKIN			WITH SKIN								
	0.0 - 2.5	2.5 - 5.0	5.0+	0.0 - 2.5	2.5 - 5.0	5.0+						
Samples	PCB	LIPID	PCB	LIPID	PCB	LIPID						
1	>0.03	1.5	>0.03	2.0	0.06	3.5	0.03	2.0	0.03	2.5	0.04	3.5
2	1.29	1.0	0.46	2.0	0.55	3.5	0.47	3.0	1.22	1.5	0.28	2.5
3	0.41	0.75	0.22	0.5	3.00	7.0	0.58	1.5	0.32	1.5	3.96	7.5
4	0.39	1.5	3.65	3.5	0.92	3.3	0.50	2.0	3.03	4.0	1.17	4.0
5	1.83	1.5	3.50	2.0	10.6	4.5	3.68	2.0	6.94	4.0	12.31	5.5
6	0.43	1.5	2.56	3.8	5.69	6.0	0.46	1.5	4.06	5.5	6.72	7.5
7	0.18	2.3	1.10	4.6	2.60	6.6	0.41	3.6	1.44	5.9	4.17	9.2
8	0.13	1.8	0.66	1.6	0.84	2.5	0.26	3.3	1.21	7.0	1.25	3.5
\bar{x}	0.59	1.5	1.5	2.5	3.0	4.6	0.80	2.4	2.3	4.0	3.7	5.4

investigated the effect of skin removal on PCB concentrations and lipids in carp fillets, and found that removal of the skin reduced PCB concentrations by 25% and lipid concentrations by 20%. (WISCONSIN DEPARTMENT OF NATURAL RESOURCES 1976). This compares very closely to the values obtained in this study.

Table 2. Percent Removal of PCB and Lipid From Carp Fillets Due to Skin Removal

Size Class, lb	PCB Removal, %	Lipid Removal, %
0.0 - 2.5	26	36
2.5 - 5.0	33	38
5.0+	19	15
TOTAL:	26	30

PCBs are lipid soluble and partition readily into body tissues of fish. YOSHIDA et al. (1973) observed elevated levels of PCBs in the skin of carp. It was also noted dark muscle of carp had higher PCB levels due to a higher lipid content than in white muscle. Any process which removes lipid from a fish sample is likely to alter the PCB concentration in the fish.

It is essential that the method of sample preparation be reported in detail when decisions regarding human health are to be made based on fish tissue analysis. When USFDA tolerance levels are utilized to determine suitability of fish for human consumption, a 26% error due to skin removal could allow fish unsuitable for human consumption being reported as safe to eat. Skin removal prior to consumption of the fish is one way of reducing the amount of PCB consumed. All people consuming fish from PCB contaminated water bodies should be advised to remove the skin from the fish prior to consumption.

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REFERENCES

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