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Detection of Formalin in Fish Samples Collected from Dhaka City, Bangladesh

***Riaz Uddin, Moin Ibna Wahid, Tasbira Jesmeen, Naz Hasan Huda, Kumar Bishwajit Sutradhar**
Department of Pharmacy, Stamford University Bangladesh, 51, Siddeswari Road, Dhaka-1217, Bangladesh.

Original Research Article

ABSTRACT

Fish is an important food stuff and source of protein all over the world. In Bangladesh fisheries sector contributes a lot in case of earning foreign currency and meeting domestic need of animal protein. To meet the domestic need Bangladesh imports fish and fish products from neighboring countries. But it is evident from several studies that fish items in Bangladesh contain formalin which is a highly hazardous and carcinogenic chemical. An attempt was taken to detect the extent of formalin use in fish available in Dhaka city. From five different local markets five species of fishes were collected and presence of formalin was detected using the "formalin detection kit in fish" developed by Bangladesh Council of Scientific and Industrial Research (BCSIR). The study indicates that 70% Rui fish is formalin contaminated and almost 50% of fish samples contain formalin.

Key words: Formaldehyde, BCSIR, Formalin detection kit, Carcinogen, Fisheries, Livestock.

INTRODUCTION

The role of fisheries and livestock sectors in the development of agro-based economy of Bangladesh is very important and promising. They contribute around 8% to national income, which also is 32% of the total agricultural income. About 90% of animal protein in our diet comes from fish and livestock (MoFL, 2011). The fisheries sector contributes 5.10%, of the country's export earnings, 4.91% of its GDP and provides 63% of the national animal protein consumption. Fish and fishery products are the country's third largest export commodity contributing 5.10% of its exchange earnings, in 2002–2003 Bangladesh earned US\$ 324 million of which shrimp alone contributed 72% of the total by quantity and 89% by value (FAO, 2011). It is claimed that the total fish production has

increased significantly over the last few decades (DoF, 2009) but it is not sufficient to meet up the growing demand of the country (Yeasmin *et al.*, 2010a). As a result imported fishes from neighboring countries enter in the domestic market and it was reported that more than 80 metric ton of fish and fishery products enter into Bangladesh every day through the Teknaf border from Myanmar (Kibria, 2007). Available reports suggest that formalin is sometimes added or sprayed to the fishes by the fish traders while transporting to domestic marketing chain to prevent spoilage and increase shelf life (Yeasmin *et al.*, 2010a). Studies conducted at different markets in Dhaka city (Hossain *et al.*, 2008; Haque and Mohsin, 2009) and Mymensingh Sadar (Yeasmin *et al.*, 2010a) rationalizes the incidence of adding formaldehyde/formalin to fishes especially imported from neighboring countries.

Formaldehyde is the simplest member of aldehyde family but a very reactive chemical, where the gaseous form is known as formaldehyde and the liquid form as formalin

*Corresponding Author

Riaz Uddin
Lecturer, Department of Pharmacy
Stamford University Bangladesh
51, Siddeswari Road
Dhaka-1217, Bangladesh
E-mail: kp_ruddin@yahoo.com
Contact No.: +880 1749995653

(Noordiana *et al.*, 2011). Formalin is a solution of 37% (w/w) of formaldehyde (H-CHO) in water which is used as a preservative in medical laboratories, as an embalm fluid and as a sterilizer. Formalin is also used in treatment against fish diseases caused by protozoa and fungi. Food and Drug Administration of the United States approved formalin for use in aquaculture as parasiticides and fungicides. It is, however, not approved for usage in aquaculture in Europe and Japan because of its association with cancer and tumor development. Use of formalin in food for human consumption is also banned in Bangladesh (Yeasmin *et al.*, 2010b). Recently, International Agency for Research on Cancer (IARC, 2004) has classified formaldehyde as a Group 1 carcinogenic to humans. According to the United States Environmental Protection Agency (EPA), maximum daily dose reference (RfD) for formaldehyde is 0.2 µg/kg body weight per day (Wang *et al.*, 2007; Noordiana *et al.*, 2011). Even those who spray or inject formalin over a long period of time will likely suffer health complications such as blindness, asthma and even lung cancer (Hossain, 2011).

MATERIALS AND METHODS

Fish sample collection

Fish samples were collected from different markets in Dhaka city. The markets include Jatrabari Bazar, Karwan Bazar, and different super shops at Dhanmondi, Maghbazar and Kazipara. Fish samples include Rui (*Labeo rohita*), Catla (*Catla catla*), Mrigal (*Cirrhina mrigala*), Ilish (*Hilsa ilisa*) and Sarputi (*Puntius sarana*).



Figure 1. Formalin Detection Kit for Fish® developed by BCSIR.

Table 1. Distribution of fishes being tested.

Fish Market	Fish Species	Quantity Tested (pcs.)
Jatrabari Bazar	Rui (<i>Labeo rohita</i>)	4
	Catla (<i>Catla catla</i>)	4
	Mrigal (<i>Cirrhina mrigala</i>)	4
	Ilish (<i>Hilsa ilisa</i>)	4
	Sharputi (<i>Puntius sarana</i>)	4
Kawran Bazar	Rui (<i>Labeo rohita</i>)	4
	Catla (<i>Catla catla</i>)	4
	Mrigal (<i>Cirrhina mrigala</i>)	4
	Ilish (<i>Hilsa ilisa</i>)	4
	Sharputi (<i>Puntius sarana</i>)	4
Super Shop, Dhanmondi	Rui (<i>Labeo rohita</i>)	4
	Catla (<i>Catla catla</i>)	4
	Mrigal (<i>Cirrhina mrigala</i>)	4
	Ilish (<i>Hilsa ilisa</i>)	4
	Sharputi (<i>Puntius sarana</i>)	4
Super Shop, Moghbazar	Rui (<i>Labeo rohita</i>)	4
	Catla (<i>Catla catla</i>)	4
	Mrigal (<i>Cirrhina mrigala</i>)	4
	Ilish (<i>Hilsa ilisa</i>)	4
	Sharputi (<i>Puntius sarana</i>)	4
Super Shop, Kazipara	Rui (<i>Labeo rohita</i>)	4
	Catla (<i>Catla catla</i>)	4
	Mrigal (<i>Cirrhina mrigala</i>)	4
	Ilish (<i>Hilsa ilisa</i>)	4
	Sharputi (<i>Puntius sarana</i>)	4
Total Number of Samples =		100

Qualitative detection of formalin using Formalin Detection Kit for Fish®

Qualitative detection of formalin was performed by the formalin detection kit for fish® developed by Bangladesh Council of Scientific and Industrial Research (BCSIR). This kit contains three different solutions labeled as solution 1, 2 and 3. First, the samples (cut fish parts) were washed with small quantity of water and a portion of washed out water was taken in a test tube using a dropper incorporated in the kit. 15 drops of solution 1 was added in the test-tube containing washed out water. After well stirring, the solution was allowed react for 30 second. 15 drops of solution 2 was added in the same test-tube. After waiting for 30 seconds, solution 3 was added, change in color pink or red indicated the presence of formalin whereas unchanged color indicated the sample is free from formalin.

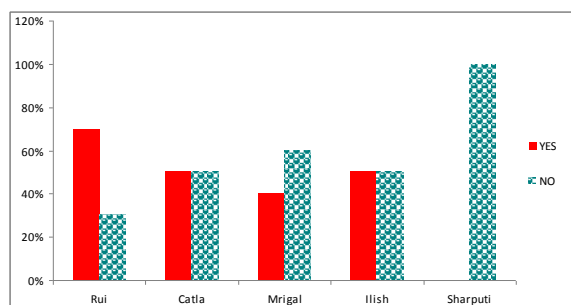


Figure 2. Fish species-wise presence of formalin.

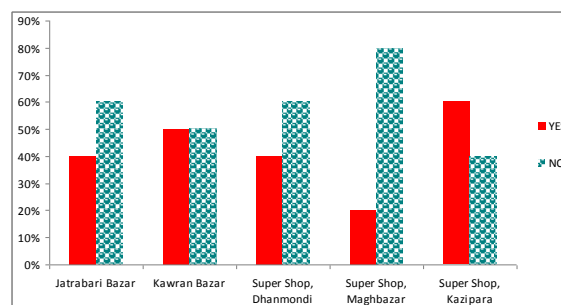


Figure 3. Market wise presence of formalin in fish samples.

RESULT AND DISCUSSION

A total of 100 fishes were tested for the experiment (Table 1) among which Rui was found to be mostly affected by formalin (70%, Figure 2). Relatively small fish Sharputi contained 0% formalin. The super shop at Moghbazar was found to trade less formalin treated fishes (20% formalin treated fishes were found, Figure 3).

In 2011, the National Toxicology Program, an interagency program of the Department of Health and Human Services, named formaldehyde as a known human carcinogen in its 12th Report on Carcinogens (National Toxicology Program, 2011). Though it is harmful and potential source of health hazard to human some fish traders are engaged in treating fish with formalin.

It was observed in a study conducted in Dhaka city (Haque and Mohsin, 2009) that almost 5% shops of total consumable fishes contain formalin treated fishes those are sold in fish markets. They found this intensity to vary market to market and species to species. They found that Rui fish was highly affected by formalin whereas Karwan Bazar represented highest number of formalin treated fish. In this current study mainly big fish species were investigated which indicated a high percentage of presence of formalin in fish.

CONCLUSION

It is assumed that formalin is added to the fish, especially those come from bordering countries by the local fish traders to keep the fish fresh for

a long time. But as it is a carcinogenic chemical and has got the ability to produce serious health hazards like cancers of the lung, nasopharynx, oropharynx and nasal passage to the population regulatory bodies should take necessary steps to minimize and stop formalin treatment of the fish. The current study involves a small number of samples to detect formalin in fish in local market in Dhaka city. But it gives us a comprehensive picture to understand the extent and magnitude of the scenario.

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