Health Risk Assessment Due To Effects Of Commonly Used Detergent Tide On Peripheral Hemogram Of Edible Fish Lethrinus Nebulosus (Lethrinidae Family) Available In Fish Market In Abha City, Assir Region, Saudi Arabia

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Abstract: Abha is the capital of Asir province in Saudi Arabia. It is situated 2,200 meters above sea level in the fertile mountains of south-western Saudi Arabia, near Asir National Park. Abha's mild climate makes it a popular tourist destination for Saudis. Some edible fishes are supplied from Jizan and Jeddah Red Sea shore and frequently used by native people of Abha City and prepared fish used in restaurant frequently by tourist people also.

Effects of 96 h LC50 (50 gm/ml) of a common detergent ‘Tide’ on the blood parameters of Lethrinus nebulosus (Local name Shaoor mehseny) belongs to Lethrinidae family were studied. The species grows to about 86 cm in length. There was significant degrees TEC (4.12-2.92X10^6/mm^3), Hb content (14.4-12.0g/100ml), PCV(36.0-30.0%), THC (19.0-16.8X10^3/mm^3) and in (TLC 11.5-10.2X10^3/mm^3) but significant increase was noticed in ESR (1.4-2.2mm/h) and in coagulation time (49.5-58.0sec)among leucocytes, lymphocytes increased significantly the changes may be taken as an index of the effect (toxic?) of tide detergent for the fish.

Key words: Tide detergent, Fish, health risk assessment

Introduction

Abha is the capital of Asir province in Saudi Arabia. It is situated 2,200 meters above sea level in the fertile mountains of south-western Saudi Arabia, near Asir National Park. Abha's mild climate makes it a popular tourist destination for Saudis and non-Saudis. Some edible fishes are supplied from Jizan and Jeddah Red Sea shore and frequently used by native people of Abha City and prepared fish used in restaurant frequently by tourist people also.

Although few works have appeared on the effects of different types of chemicals, like pesticides and heavy metals1-6 on blood in fishes effecting the public health but none has reported about the effects of commonly used detergents ‘Tide’ if any on the peripheral hemogram of any edible fish available in fish market in Abha.

The Saudi government has promoted Abha as a tourist destination. The city hosts events to attract visitors to the city and its surroundings, including the summer Abha festival, sporting events, shows, exhibitions which attract the visitors.

Because the fishes provide healthy source of energy, high quality proteins, vitamins and a high range of other important nutrients (Pieniak, Z., Verbeke, W. and Scholderer, J.) (2010) (Olmedo, P., Pla, A., Hernandez, A.F., Barbier, F., Ayouni, L. and Gil, F.) (2013) fish have been acknowledged as an integral component of well-balanced diet. Besides those nutritional benefits, fishes are a significant source of omega-3 polyunsaturated fatty acids which lower the risks of coronary heart disease and contribute to neurodevelopment in children (Olmedo, P., Pla, A., Hernandez, A.F., Barbier, F., Ayouni, L. and Gil, F.) (2013) (Swanson, D., Block, R. and Mousa, S.A.) (2012). On the other side, heavy metals are potentially accumulated in marine components including water, sediment and biota, and subsequently transferred to human beings through the food chain accordingly, the balance between potentials and risks due to ingestion of chemical contaminants has received a great attention (Domingo, J.L., Bocio, A., Falco, G. and Llobet, J.M.) (2007) (Copat, C., Arena, G., Fiore, M., Ledda, C., Fallico, R., Sciacca, S. and Ferrante, M.) (2013) Subsequent uptake in the food chain by aquatic organisms and humans put public health at risk. Pollution by heavy metals could cause neurophysiological disturbances and carcinogenesis, besides genetic alteration of cells (mutation) and morphological abnormalities. Furthermore, enzymatic and hormonal activities, in addition to growth rate and increase mortality, could also be affected by detergent pollution (Bubb, J. M. and Lester, J.N.) (1991)
Material and Methods

The fish Lethrinus nebulosus (Local name Shaoor) which is frequently used by the native people in Abha and Jizan are collected in live condition upon request to the fisherman and shopkeeper in fish market for the experimental use with all the precautionary measurement for blood sampling purposes.

The fish Shaoor (Wt.30.0±1.2gm:Length=13.6±0.8cm; Total number=20) were acclimatized in tap water for ten days under natural photoperiod and ambient temperature(22.0±0.50°C) in 100ml glass aquaria in the laboratory. In each aquarium only 5 fishes were kept and such a 4 aquaria were used for control and other for treatment. Only healthy fishes of both sexes were used. Caudal blood formed the source of material.

Blood films were prepared for differential counts and other blood parameters were determined after the methods of blood sampling. The results were subjected to statistical analysis by students’- test. (P<0.05 significant)

Results and Discussion

Changes in blood parameters due to exposure in ‘Tide’ have been recorded in Table - 1 Static bioassay indicated 50mg/l 96h LC50 for this fish. Blood parameters like TEC and related parameters have been found to increase in fishes exposed to folithion 50 as well as in copper and zinc sulphate but decreased values were obtained in treatment with malathion3, sumithion2 and herbicide5.

In Shaoor fish there was a significant decrease in Hb level and in CT along with increased THC due to 48h LC50 exposure in thimet, elsan and baznan6.In the present investigation with Tide detergent; exposed fish Shaoor there was erythropenia, leucopenia and thrombocytopenia along with hypo-coagulability of the blood and significant increase in ESR and lymphocytes (probably to combat with the damages of the internal tissues)

<table>
<thead>
<tr>
<th>Blood parameters</th>
<th>Control(Water)</th>
<th>Experiment (Tide)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEC(X106/mm3)</td>
<td>4.12</td>
<td>2.92*</td>
</tr>
<tr>
<td>Hb(g/100ml)</td>
<td>14.40</td>
<td>12.00*</td>
</tr>
<tr>
<td>PCV (%)</td>
<td>36.0</td>
<td>36.0*</td>
</tr>
<tr>
<td>ESR(mm/h)</td>
<td>1.4</td>
<td>2.2*</td>
</tr>
<tr>
<td>TLC(X103/mm3)</td>
<td>11.5</td>
<td>10.2*</td>
</tr>
<tr>
<td>Total Differential counts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>87.0</td>
<td>95.0*</td>
</tr>
</tbody>
</table>
Health risk assessment

In order to estimate the potential risks by detergent to human health in fish various methods have been proposed. Among those methods is the target hazard Quotient (THQ) method (Agusa, T., Kunto, T., Sudaryanto, A., Monirith, I., Kan-Atireklap, S., Iwata, H., Ismail, A., Sanguansin, J., Muchtar, M., Tan, T.S and Tanabe, S. (2007) (Khan, S., Cao, Q., Zheng, Y. M., Huang, Y. Z. and Zhu, Y. G.) (2008) that provides indications of the human health risk level due to exposure to the pollutants. THQ is calculated using the following equation:

$$\text{THQ} = \frac{(\text{EF} \times \text{ED} \times \text{FIR} \times \text{C})}{\text{RFD} \times \text{WAB} \times \text{TA}} \times 10^{-2}$$

EF is the exposure frequency in days/year. This means how many days per week people eat fish within a year. It is estimated that in the current study some residents in the southern region of Saudi Arabia eat fish once a week while others three times a week. Accordingly, EF equals 52 and 156 days/year, respectively. ED is the exposure duration that is equivalent to average life time. A recent report from the United Nations estimated that the average life time in Saudi Arabia is 74 years. FIR is the fish ingestion rate. FAO reported that people eat 160 g/day/person of fish (FAO Food and Agriculture Organization. Food Security Statistics.)(2005) However it is estimated that the FIR in Saudi Arabia is 200 g/day/person. C is the detergent concentration in in fish muscle, i.e. edible fish part. In the current study, the highest detergent concentration was adopted within the fish. RFD is the oral reference dose. WAB is the average body weight. Based on numerous local Saudis studies, the reference wt.is 60 kg, which is similar to some studies carried out elsewhere (Lim, T.O., Ding, Zaki, M., Suleiman, a.b, Fatimah, S., Siti, S, Tahir, A. and Maimunah, A. H.) (2000) TA is the average exposure time for non-carcinogens (365 days/year x ED).

The result of the calculation of THQ showed a kind of risk from detergent for those who eat this fish three times a week while it is safe for consumers who eat once a week.

Conclusions

The present study shows a primary study on the levels of detergent in fish captured from red sea shore, Saudi Arabia. The study reported elevated levels of detergents in the fish. Accordingly, it is recommended to continue the study in the marine environment of Red Sea shore. Further species and further marine samples, i.e. seawater and sediment, should be considered. It is also recommended to study the speciation of different types of detergents that would reveal possible toxicity due to flow of detergents in sea shore. This expected pollution from household drainage are preferable examined near different regions of sea shore in Saudi Arabia.

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References


