IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 9, Issue 10 Ver. II (Oct. 2015), PP 10-12
www.iosrjournals.org

Toxic effect of Cigarette Smoke on Vital organs of Aquarium fish Carassius auratus auratus

Sandhya Kupekar and Shreya Patil
[1,2]Mahatma Phule Arts, Science & Commerce College, Panvel. Dist. Raigad (University Of Mumbai)

Abstract: *The present study was designed to elucidate the effect of cigarette smoke on vital organs like swim bladder and liver of Gold fish Carassius auratus auratus. The experimental fish was exposed to the smoke of two commercial cigarettes each day. At the end of second day the fish was sacrificed. The liver and swim bladder of normal and smoke exposed fish were used for histology. Nicotine of cigarette smoke dissolved in water. It might make water acidic, cloudy and kills the fish. Cigarette smoking can lead to pivotal morphological changes in animal tissue. In control fish and swim bladder liver histology was monitored. In exposed fish, liver shows hypertrophy of hepatocytes and dilation of sinusoids was monitored. The cell membrane of hepatocytes was disintegrated. Hepatic tissue showing focal necrosis. In exposed fish degeneration of swim bladder was severe with the glandular mass which was replaced by fibroblasts. Degeneration of swim bladder with severe fibrosis was observed. High concentrations of harmful chemicals caused dilation of capillaries affecting swim bladder leading to inflammation and swelling. Cigarette smoking caused oxidative stress.. Nicotine in blood causes shortage of oxygen and cause blood vessels to be narrower than normal, blocks the arteries and causes severe damages to blood vessels. Smoking has multidimensional impact on vital organs which can leads to cancer.*

Key Words: *Swim bladder, Toxicity, Histology, Liver, Nicotin*

I. Introduction:

Smoking is considered as one of the most dangerous habit of an individual. Cigarette smoke contain around 4,800 chemicals, 69 of those can cause cancer. Smoking is injurious to health but still its addiction is increasing very rapidly. Smoking in enclosed spaces could lead to high level of cigarette smoke component in the air and water. Tobacco smoke can cause discomfort to aquarium fish and could affect vital organs of fish. The International Agency for Research on Cancer (IARC) of the World Health Organization have concluded that passive smoking gives rise to high risk of cancer (IARC 1986). In some years National Research Council (NRC) also concluded that the incident of lung cancer increases. Cigarette smoke contains high level of acrolein, which is toxic to the ciliated lining of the swim bladder and other agents such as nitrogen oxides, acetaldehyde, phenols and formaldehyde, which may contribute indirectly to carcinogenicity in animals and humans. Cigarette smoking can lead to pivotal morphological changes in animal tissues and causes oxidative stress. In present study Gold Fish, Carassius auratus auratus is one of the most popular aquarium fishes exposed to cigarette smoke.

Liver is a very important organ performing vital functions like detoxification, synthesis of several compounds of blood plasma, storage of glucose in the form of glycogen. Morphological, histological and histopathological alterations in the river have been studied by various scholars (Mondal and Kulshrestha 1980; Ahmed and Srivastava 1985). According to Hinton and Laure'n (1998) exposure of liver to toxic substances causes histological changes in the liver. The swim bladder is an air filled organ in Gold fish and has a duct connecting it to the mouth. So fish can quickly exchange air with the atmosphere at the surface of water. The main function of swim bladder in fish is buoyancy and orientation of the body. Water quality problem make the swim bladder and duct more susceptible to infection (Srivastav P.N., 1955). High concentration of harmful chemicals can affect air sacs (Wood land, W.N.F., 1911). The present study was designed to elucidate the effect of cigarette smoke on vital organs of Gold fish.

II. Materials and Methods:

The experimental fish Carassius auratus auratus was exposed to smoke of two commercial cigarettes each day where the control fish not exposed to cigarette smoke. At the end of second day the fish was sacrificed liver and swim bladder were pulled out to study histological changes by routine haematoxyline-eosin method.

III. Result and Discussion:

The smoke is not good for you and definitely not for fish. Smoke reduces oxygen level in water and in the air. The smoke is dissolved in water logically it will absorb component of fish and it might make water more

acidic, cloudy and kills the fish. The fish shows drowsiness or sluggishness when exposed to smoke. Cigarette smoke leads to morphological changes in animal tissues and caused oxidative stress.

In control fish normal liver histology was monitored. Photographs show the parenchyma cells arranged to form a lattice network. Hepatocytes and sinusoids structures were normal (Plate 1.1). Histological changes are observed in experimental fish exposed to cigarette smoke. Liver shows histopathological alterations such as hypertrophy of hepatocytes and dilation of sinusoids. The cell membrane is disintegrated and nuclei were irregularly scattered and shows excentric position (Plate 1.2). Cytoplasm of cells shows severe vacuolation. The alteration in liver due to toxicity impact are often associated with a degenerative necrotic condition (Arellano et al., 1999; Olojo et al., 2005; Figueiredo – Fernandes et al., 2007). Smoke contain several carcinogenic pyrolytic products that can cause genetic mutation (Benowitz NL, 1999; Copas JB, 2000). Swim bladder of fish also shows severe degenerative changes in Gold fish. Degeneration of swim bladder was severe with glandular mass which was replaced by fibroblasts. Swim bladder shows severe fibrosis. Severe degenerative changes associated with swim bladder lesions. Cells making up the mass were replaced by fibrotic tissue. Complete degeneration of swim bladder with cellular debris, loss of epithelial layer, loss of basement membrane and fusion of nuclei was observed (Plate 2.2).

The swim bladder is large about one third of the total length of the fish. The wall of bladder is very thick. The wall has two distinct layers tunica externa and tunica interna (Corning, H.K. 1888) which is richly supplied with blood vessels (Plate 2.1). Cigarette smoke caused severe damage to liver and swim bladder of aquarium fish. Smoking is injurious to health but still its addiction is increasing very rapidly. Teen agers and students start smoking even when they know that it is nothing good but injurious to health which ultimately affects aquarium fish and fish in the aquarium die frequently because of cigarette smoke. So frequent changing of water would help to survive aquarium fish. Water in fish tank contains ammonia which turned into nitrites and nitrite turned in to nitrates is also harmful to aquarium fish.

IV. Conclusion:

Smoking has a multidimensional impact on vital organs. Cigarette remains the most consistent causative agent for developing diseases. Cigarette smoke can lead to pivotal morphological changes in animal tissue. Vital organs are severely affected by cigarette smoke. Strict regulations to control tobacco smoking can avert number of animal deaths globally and lung cancer particularly. Further studies will be necessary to determine the mechanisms responsible to histological found.

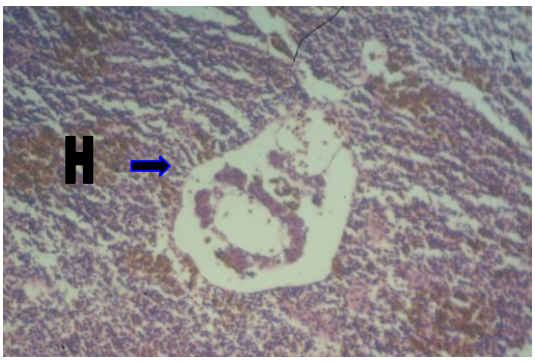


Plate 1.1 Liver- Normal

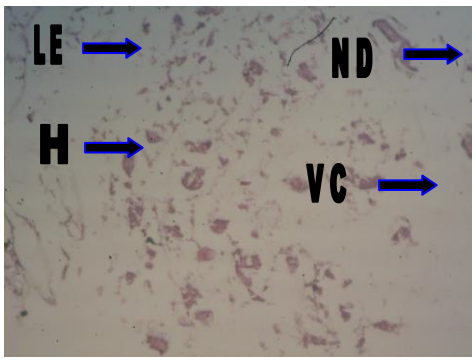
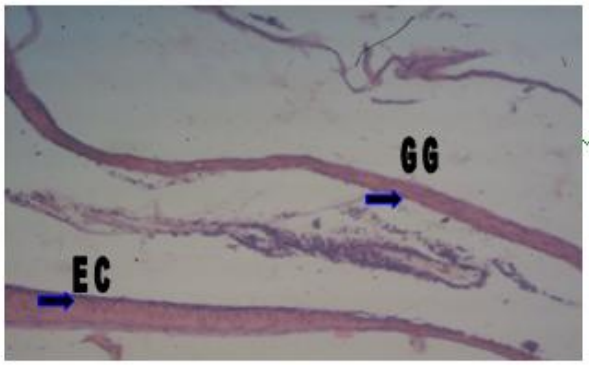


Plate 1.2 Liver – Treated

H- Hepatocytes, VC- Vacuolation of epithelial cells, ND – Necrotic debris
LS – Loss of epithelial cells



Place 2.1 Swim Bladder – Normal

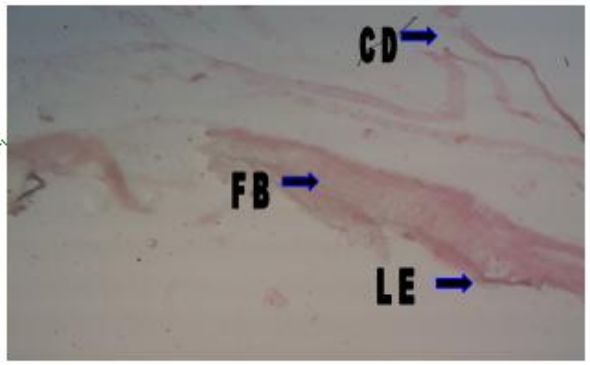


Plate 2.2 Swim Bladder – Treated

EC – Epithelial cells, GG - Gas glands, FB – Fibrosis, CD – Cellular debris
LE – Loss of epithelial layer.

Acknowledgement:

Authors are thankful to Prin. Dr.S.M. Kamble for his constant support and guidance during the work. Authors are also thankful to Dr.P.R. Pawar and Dr. Rahul Patil, Veer Wajekar College, Phunde and librarian Mr. S.S. Avachite for their support.

References:

[1]. Ahmad, G., & Srivastava, G.J., (1985). Histopathologic alterations in the liver and skin of a freshwater teleost, Heteroptustes fossilis (Block) exposed chronically to a sublethal concentration of methylene blue. Pakistan M Zool 17:239-246.
[2]. Amarican Cancer Sociaty. Censcer Facts of Figure 2012 from http://www.cancer.org/acs/groups/content@epidemiologysurveillence/documents/acsPc-031941.pdf Accessed ; Oct 2012.
[3]. Arellano, J.M., Storch, V., Sarasquete, C., (1999). Histological changes and copper accumulation in liver and gills of the Senegales sole, Solea senegalensis. Ecotoxicol. Environ. Saf. 44, 62–72.
[4]. Benowitz NL. Biomarkers of environmental tobacco smoke. Environmental Health Perspectives. 1999;107(Suppl 2):349–55. [PMC free article] [PubMed].
[5]. Copas JB, Shi JQ. Reanalysis of epidemiological evidence on lung cancer and passive smoking. British Medical Journal. 2000;320(7232):417–8. [PMC free article] [PubMed]
[6]. Corning,H.K (1888).Beitrage Zur Kenutnis der Teleostier.Morph.Jahrb., Bd.XIV.
[7]. Figueiredo-Fernandes, A., Ferreira-Cardoso, J.V., Garcia-Santos, S., Monteiro, S.M., Carrola, J., Matos, P., Fontainhas-Fernandes, A., (2007). Histopathological changes in liver and gill epithelium of Nile tilapia, Oreochromis niloticus, exposed to waterborne copper. Pesqui. Vet. Bras. 27 (3), 103– 109.
[8]. International Agency forReaserch on cancer IARC Monographs on the Evaluation Casinogenic Risks to humans,Vol 83.from http//monographs.iarc.fr/CNG/monographs/vol 83/mono 83 pdf Accessed oct 2012.
[9]. Mandal, P.K. and Kulshrestha, A.K., (1980). Histopathological changes induced by the sublethal sumithion in Clarias fasbatrachus. Linn Ind Jr Exp Bio, 118:547- 558
[10]. Olojo, E.A.A., Olurin, K.B., Mbaka, G., Oluwemimo, A.D., (2005). Histopathology of the gill and liver tissues of the African catfish, Clarias gariepinus exposed to lead. Afr. J. Biotechnol, 4 (1), 117– 122.
[11]. Rodrigues,E.L,.andE.Fanta.(1998)Liver histopatological and enzymological parameters of a fresh water teleost fish.
[12]. Srivastava P.N.(1955 Morphology and histology of the air bladderof certain Sciaenoid Fishes with the Description of new type of Ear bladder connection Zoology Dept.Allahabad University.
[13]. Woodland, W.N.F.(1911) on the structure and function of the gas gland and retia mirabilia associated with the gas bladder of some Teleostean fishes,Proc.zool.soc, Londan.
[14]. World Health Organization, WHO Report on the global tobacco epidemic 2008 from: World Health Organization from http://www.who.int.int/tobacco/mpower reportfull2008pdf Accessed:Nov 12.
[15]. Internet References:
[16]. http;//www.cdc.gov/tobacco.