Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages:19099-19102
Received 05 March 2021; Accepted 01 April 2021.

Influence of Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) on Behavioral Changes of Guppy Fish, *Poecilia reticulate*

Mangal Sitaram Kadam

Research and P.G. Department of Zoology, Yeshwant Mahavidyalaya, Nanded (M. S.) INDIA
Email: drmangalkadam2021@gmail.com

ABSTRACT

The aquatic pollution causes adverse effects on both human as well as aquatic organisms. The commonly used pharamacologically active substances are found in water bodies. Due to water discharge of these substances in waste water and due to improper purification of in waste water treatment plans these chemicals are found in animals which are residing in water. For present study effect of diclofenac and paracetamol is used for observation of mortality in different concentrations. Diclofenac (DCF) Is a widely used non-steroidal anti-inflammatory drug that is regularly detected in surface waters. The effect of DCF on fish growth was less clear and the NOEC can be interpreted as10 ug/L. One of the most frequently detected pharmaceuticals in environmental water samples is the anti-rheumatic drug, Diclofenac despite it's increasing environmental significance, investigations concerning the effects of this drug on the early developmental stages of aquatic species are lacking up to now. The Paracetomol effect of guppy fish is seen very clearly. Due to the paracetomol within 48 hours all fish's died and LC 50 estimate, it causes the foul smell to water and color is change.

Introduction:

The non steroidal anti-inflammatory drugs are also known as NSAIDS. They are medications with analgesic (pain reducing) anti-pyretic (fever relation) effects. Higher doses they also have anti-inflammatory effects, the reducing inflammation (swelling). It is supplied as or contained in medications under a variety of trade names. The name "diclofenac" derives from its chemical name: 2-(2,6-dichloranilino) phenyl acetic acid. Diclofenac was originally developed by Ciba-Geigy (now Novartis) in 1973. It was first introduced in the UK in 1979. In the United Kingdom, India, Brazil adds the United states, diclofenac may be supplied as either the sodium or Potassium salt; it is most often supplied as Diclofenac is available as a generic drug. It is approved in some countries or minor aches and pains and fever associated with common infections.

Non-steroidal distinguishes NSAIDs from other drugs which contain steroid, which are also anti-inflammatory. The effects of these drugs on non-target organisms is studied by Zhang et.al., 2020. The residues of diclofenac have been found in surface water. This causes harmful effects on aquatic species (Stepanova et. al., 2013)

Paracetamol toxicity is caused by excessive use or overdose of the analgesic drug paracetamol (called acetaminophen in North America). Mainly causing liver injury, paracetamol toxicity is one of the most common causes of poisoning worldwide. In the United States and the United Kingdom it is the most common cause of acute liver failure.

The guppy (*Pooecilia reticulata)*, also known as million fish and rainbow fish (Fishbase.org. 2013). They are used as a model organism in ecology, evolution and for behavioral studies (Magurran, Anne E. 2005).

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages:19099-19102
Received 05 March 2021; Accepted 01 April 2021.

Material and methods

The present research work was carried on the effect of nonsteriodal anti inflammatory drugs on the Guppy fish, *Pooecilia reticulata*. The study carried out to examine the concentration of the drug at which behavioral changes and mortality was observed. The guppy fish of an average length11 to 15 mm were used in this study. The fishes were acclimated to lab condition to for 4- 5 days prior to experiment. A total of 60 fishes were used in the present experiment. The selected drugs were dissolved in distilled water and require dilutions prepared from it. If there was turbidity, the solution was filtered using filter paper. The fishes were exposed to different concentration of the drugs. The experimental sets were prepared in four liter aquarium. The behavioral changes were compared with the control set. Each determination was done in replicate. The fishes wee feed properly by live mosquito larvae.

Results

Table : Effect of Diclofenac and Paracetamol on Guppy Fish, *Pooecilia reticulata.*

Sr. No.	**Name of Drugs**	**Concentration of Drugs**	**Exposure Period & Behaviour**			
			0-24 hrs	24-48 hrs	48-72 hrs	72-96 hrs
1.	Diclofenac	50 mg / lit	All fishes are normal	All fishes swim actively	All Fishes are normal and moving condition	All fishes are normal & moving condition
2.	Diclofenac	100 mg /lit	All fishes are normal	fishes swim normally	Fishes normally swim and voracious feeder	All fishes are live & swimming capacity decreases
3.	Diclofenac + Paracetamol	50 mg each drug / lit	All fishes are normal	All fishes live in condition	All Fishes are live and normal; water color unchanged	All fishes live
4.	Diclofenac + Paracetamol	100 mg each drug / lit	All fishes are normal	All fishes slow in moving	All Fishes are dead water color changed in turbid faint brown	
5.	Diclofenac + Paracetamol	200 mg each drug / lit	All fishes are normal	All Fishes are dead & water color is turbid		

All fishes are appearing in normal conditions when they are exposed under only diclofenac stress up to 96 hours of period of exposure. The remarkable changes were observed,

when the diclofenac is treated along with paracetamol drug. The fishes show behavioural changes and finally all were observed in dead condition as the concentration of drugs were increased. The combined use of drugs i.e. diclofenac and paracetamol shows remarkable behavior and mortality in guppy fishes.

The present study reveals the effect of Diclofenac and Paracetamol on Guppy Fish, *Pooecilia reticulate.* The non-steroidal drugs have anti-inflammatory effects which are treated to reduce inflammation (swelling). The diclofenac may be supplied as either the sodium or potassium salt. Diclofenac is available as a generic drug. The residues of diclofenac found in surface water. This causes harmful effects on aquatic species.

DISCUSSION

The behavior of guppy fish on exposure to drugs was carried out in laboratory conditions. The remarkable behavior patterns were observed and noted. A climate was cold but suitable for the sake of convenient the fish to expose to drugs in small 4 litre glass aquarium. Different concentration of diclofenac (NSAIDs) in combination with Paracetamol work tested. Both the NSAIDs has not visible effect on the fish. But the same drug in combination with Paracetamol (Generally prescribed for humans to treat different condition) has drastic results. They died after 96 hrs at a concentration of Diclofenac 100 mg/lit, Paracetamol 100 mg/lit. These results are in contrast to those of another set in which exposed to Diclofenac alone at a similar concentration survived beyond 96 hrs. Another noticeable change occurring during the experiment was development of brown color to water in presence of Paracetamol; this seems to be due to some chemical property of the drug. The presence of fish in water doesn't affect color to develop because it happens even in absence of fish. Then in the different exposure experiment carried out different proportion of NSAIDs with the Paracetamol was tested & it was found that the presence of Paracetamol was the only reason of death of fish in all these experimental set ups. Hence our experiment indicates that the selected (NSAIDs) Diclofenac is relatively safe in a short term & do not have any effect on the fish *Poecilia reticulata* (guppy). It remains open to question whether the same drug have any affect if a longer exposure times are involved. Further work is required to evaluate the effect of these NSAIDs on guppy, specially its reproductive biology &population dynamics. Characters of population like sex ratio, developmental stage, age distribution, polymorphic forms etc can be influenced by presence of these similar other drugs.

References:

1. **Brooks, Robert (2000).** "Negative genetic correlation between male sexual attractiveness and survival". *Nature* 406.
2. **Common Names of *Poecilia reticulata*** FishBase.org. Retrieved 16 November 2013.
3. **Dutta NK, Annadurai S, Mazumdar K, Dastidar SG, Kristiansen JE, Molnar J, Martins M, Amaral L, (2007).** "Potential management of resistant microbial infections with a novel non-antibiotic: the anti-inflammatory drug diclofenac sodium". *Int. J. Antimicrob. Agents* 30 (3): 242-249. Doi:10.1016/j.ijantimicag.2007.04.018. PMID17644318.
4. **Dutta NK,Mazumdar K, Dastidar SG, Park JH (2007).** "Activity of diclofenac used alone and in combination with streptomycin against *Mycobacterium tuberculosis* in mice". *Int. J. Antimicrob. Agents* 30 (4): 336-340.Doi:10.1016/j.ijantimicag.2007.04.016. PMID17644321.
5. **Khoo, Gideon; Lim, Tit Meng; Chan, Woon-Khiong; Phang, Violet P. E. (1999).** "Genetic Basis of the Variegated Tail Pattern in the Guppy, *Poeciliareticulata*".*Zoological Science* 16 (3): 431-437.doi:10.2108/zsj.16.431.

6. **Magurran, Anne E,; Phillip, Dawn A. T. (2001).** "Evolutionary implications of large scale patterns in the ecology of Trinidadian guppies, *Poeciliareticulata*". *Biological Journal of the Linnean Society* 73: 1-9. Doi:10.1016/bijl.2000.0519.
7. **Magurran, Anne E. (2005)** Evolutionary Ecology: The Trinidadian Guppy. New York: Oxford University Press. ISBN 978-0-19-852786-2
8. **Mazumdar K., Dutta NK, Dastidar SG, Motohashi N, Shirataki Y (2006).** "Diclofenac in the management of *E. coli* urinary tract infections". In Vivo 20 (5): 613—619. PMID17091768.
9. **Stepanova S, Praskova E, Chromcova L, Plhalova L, Prokes M, Blahova J, Svobodova Z. (2013):** The effects of diclofenac on early life stages of common carp (Cyprinus carpio), Environ Toxicol Pharmacol. 2013 May: 35 (3): 454-460
10. ***Poecilia reticulata:*** Guppy. *SeriouslyFish.com.* Retrieved 24 February 2013.
11. **Naidoo V, swan GE(August 2008).** "Diclofenac toxicity in Gyps vulture is associated with decreased uric acid excretion and not renal portal vasoconstriction". *Comp. Biochem. Physiol. C Toxicol. Pharmacol.* 149 (3): 269-74. Doi:10.1016/j.cbpc.2008.07.014. PMID18727958.
12. ***Poecilia reticulate* Peters, 1860** . *Viviparos.com.* Retrieved 18Nov 2013.