

Temporal trends in erythrocyte nuclear abnormalities and leukocyte count of hybrid red tilapia upon prolonged exposure to crude oil

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Acute exposure to sub-lethal doses of crude oil is known to cause erythrocyte nuclear abnormalities (ENA) in fish, yet studies reporting temporal trends in the relevant effects of prolonged crude oil exposure are rare. This study aims to report temporal trends in genotoxic effects (ENA) and relative leukocyte counts of hybrid red tilapia (*Oreochromis niloticus* L. x *Oreochromis mossambicus* Peters) exposed to two concentrations of crude oil, 3ppm (T1) and 15ppm (T2) (V/V ratio in water) using a 40-day controlled laboratory experiment. Blood smears prepared (n=9 fish per tank, two replicates) on the days 5, 10, 20 and 40 were used to count cells of different types of ENA (per 5000 RBC's) and total leukocytes (per 1000 RBC's). Micronuclei were totally absent in all groups, and nuclear buds (NB), bi nucleated cells (BN), fragmented apoptotic cells (FA) were not detected in the control group. A significantly higher frequency ($p < 0.05$) of all observed ENA types (i.e. NB, BN, FA, and other types of altered nuclei-AN) were found in both treatment groups compared to the control on all sampling days, except for AN between control and T1 group on day 10. Between-group effect in ENA frequencies showed similar patterns temporally as well. However, temporal trends in ENA types within groups varied. Total leukocytes showed an increase ($p < 0.05$) in T2 compared to that of the control on all sampling days. Similarly, T1 group also showed significant increase except on day 40. The count was significantly higher in T2 than in T1 on all respective sampling days indicating some dose-dependent effect, except on day 10. An increasing temporal trend was found in leukocyte count in T1 and T2 groups until day 20, and decreased on day 40. The results show that prolonged crude oil exposure causes induction of some ENA types and increase in total leukocytes in the groups exposed to crude oil indicating genotoxic effects on juvenile red tilapia over 40 day period, and that the among-group differences were temporally consistent.

Key words: crude oil, ENA, genotoxic effects, leukocytes, temporal trend

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