

## Investigating trends of hydrogen peroxide in Ohta and Kurose rivers and rainwater in Hiroshima prefecture, Japan

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Hydrogen peroxide ( $H_2O_2$ ) plays a significant role in advanced oxidation process to remove the pollutants from water systems. However, its excess concentration in water has been proven detrimental for many of aquatic life forms under laboratory conditions. For this purpose we determined  $H_2O_2$  distribution in river water (Ohta River: six sites = OR2–OR7 and Kurose River: KR1–KR3, Saijo A, Saijo B, Shitami A and Shitami B) and precipitation (rain and snow at Hiroshima University Higashihiroshima campus) from Hiroshima prefecture, Japan. In both rivers,  $H_2O_2$  concentrations varied spatially with it's increasing concentrations from upstream (sites: KR1 and KR2; OR2 and OR3) to mid/downstream (K3; OR6 and OR7). The  $H_2O_2$  concentrations ranged between 67–175 nM and 21–195 nM in Ohta and Kurose rivers, respectively. The  $H_2O_2$  ranged from 1.91  $\mu M$  to 4.23  $\mu M$  in rainwater and was 0.61  $\mu M$  in snow samples. The  $H_2O_2$  concentrations at mid/downstream sites in both rivers could be related with anthropogenic activities. For example at two branches of Kurose River (Shitami A and Shitami B) elevated  $H_2O_2$  may be the result of untreated domestic wastewater discharge and agricultural runoff in these streams. Additionally, rainfall also increased the  $H_2O_2$  levels at Shitami A and Shitami B, when measured one hour after rainfall started. In Kurose River higher levels of  $H_2O_2$  were recorded during October compared with  $H_2O_2$  values reported for December month. The  $H_2O_2$  concentrations correlated well with the water temperature ( $r^2=0.66$ ;  $p < 0.001$ ,  $n=14$ ) and fairly with solar radiation ( $r^2=0.41$ ;  $p < 0.05$ ,  $n=14$ ) in Kurose River. This study suggested that these two parameters are important in determining the  $H_2O_2$  levels in Kurose River. However, in Ohta River and rainwater, no significant correlation of  $H_2O_2$  with water temperature, solar radiation and dissolved carbon was observed, which could be due to scarcity of available data.

Keywords: Hydrogen peroxide, River water, Rainwater, Hiroshima prefecture