# Dynamics of $H_2O_2$ in the external *milieu* of corals – from single organism to the reef

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Symbiont-bearing corals are subjected to internal fluxes of reactive oxygen species (ROS) from their symbiotic algae as well as external fluxes from photochemically generated ROS in overlying waters. Here, combining sensitive methods, kinetic approaches and statistical tools, we characterized the dynamics of the membrane permeable ROS - hydrogen peroxide ($H_2O_2$) - in the external *milieu* of corals in a laboratory setting and in a natural coral reef. On the organism level, we observed flow-induced release of $H_2O_2$ and antioxidants from intact corals over 2-4 hour periods. In the absence of flow we found that antioxidants associated with the coral quickly degraded externally applied $H_2O_2$. Scaling up to the ecosystem level, we observed coral-induced changes in $H_2O_2$ concentrations and elevated antioxidant activities in the proximity of a coral knoll and in the reef lagoon. This newly described ability of corals to change the chemistry of their surrounding water by releasing both $H_2O_2$ and antioxidants may bare important implications for coral physiology and interactions with the environment. External antioxidant activity may enable corals to offset exogenous $H_2O_2$ whereas the flow induced $H_2O_2$ release may aid corals in discarding internal $H_2O_2$.

# Traffic-associated heavy metal pollution and source discrimination in Jiangxi Province, China

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Road traffic is recognized as an important source of heavy metals. In order to identify the levels and sources of heavy metal contamination on three highways in Jiangxi Province, concentrations of Zn, Cu, Pb, Sb, Cd in different chemical forms in airborne particles, road dusts and soils were analyzed. All of the Zn, Cu, Pb, Sb, Cd concentrations in road dusts and soils exceeded background values. And the heavy metal concentrations in road dusts were higher than those in soils. Heavy metal concentrations in airborne particles, road dusts and soils presented similar rules: Zn > Cu, Pb > Sb, Cd. Zinc, Cu, Pb, Sb, Cd concentrations in airborne particles, road dusts and soils were all significantly correlated with vehicle number, indicating that road traffic was one of the main source of these metals. For all these metals, we also found that the ratios were higher near the toll stations than on normal driving road, indicative of an increased heavy metal emission rates under the conditions of low driving velocity and discontinuous movement of vehicles. The sources of the heavy metals were also identified by comparing chemical forms of the heavy metals in airborne particles, road dusts and soils. Lead in airborne particles was dominated by the acid soluble/exchangeable fractions (67%) while that in road dusts and soils was dominated by the residual fractions (45.3% and 43.8%, respectively), which suggested that Pb in airborne particles was derived from traffic, and that in road dusts and soils resulted mainly from the use of leaded gasoline in the past. In raining days, Zn concentrations in PM10 increased possibly because tire abrasion turned to be weak due to the lubrication of rainwater and so more small particles were emitted from the tyre wear. The difference in chemical forms of the heavy metals in airborne particles, road dusts and soils was associated with concentrations of organic matters. Bioavailability of heavy metals in airborne particles was much higher than that in road dusts and soils..

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