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Genetic Instabilities in Marine Bivalve Following Benzo(α)pyrene Exposure: Utilization of Combined Random Amplified Polymorphic DNA and Comet Assay

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Abstract : Marine ecosystem is facing intensified multiple stresses caused by environmental contaminants from human activities. Xenobiotics, such as benzo(α)pyrene (BaP) have been discharged into marine environment and cause hazardous impacts on both marine organisms and human beings. As a filter-feeder, marine mussels, Mytilus spp., has been extensively used to monitor the marine environment. However, their genomic alterations induced by such xenobiotics are still kept unknown. In the present study, gills, as the first defense barrier in mussels, were selected to evaluate the genetic instability alterations induced by the exposure to BaP both in vivo and in vitro. Both random amplified polymorphic DNA (RAPD) assay and comet assay were applied as the rapid tools to assess the environmental stresses due to their low money- and time-consumption. All mussels were identified to be the single species of Mytilus coruscus before used in BaP exposure at the concentration of 56 μg/l for 1 & 3 days (in vivo exposure) or 1 & 3 hours (in vitro). Both RAPD and comet assay results were showed significantly increased genomic instability with time-specific altering pattern. After the recovery period in 'in vivo' exposure, the genomic status was as same as control condition. However, the relative higher genomic instabilities were still observed in gill cells after the recovery from in vitro exposure condition. Different repair mechanisms or signaling pathway might be involved in the isolated gill cells in the comparison with intact tissues. The study provides the robust and rapid techniques to exam the genomic stability in marine organisms in response to marine environmental changes and provide basic information for further mechanism research in stress responses in marine organisms.

Keywords : genotoxic impacts, in vivo/vitro exposure, marine mussels, RAPD and comet assay
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