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Biological Effects of Inadvertent Perchlorate Releases During Launch Operations

Authors: [Mark E. Hines](#); [Frank von Hippel](#); [John Kennish](#); [TRW SPACE AND ELECTRONICS GROUP REDONDOBEACH CA](#)

Abstract: Solid rocket motor fuel contains large quantities of ammonium perchlorate as the primary oxidant and this material has been shown to be toxic to life. In the event of an aborted rocket launch, it is possible that unspent propellant could be deposited near the launch site and coastal marine and terrestrial habitats could be adversely affected. This report presents the results of the following experiments: effects of perchlorate on primary and secondary production in freshwater and marine water samples; decomposition processes in marine and freshwater sediments, freshwater wetland peat, and upland soils; effects of perchlorate on the behavior and growth of the fish species threespine stickleback; and the bioaccumulation of perchlorate by freshwater and marine plankton and in the threespine stickleback fish. Results show that perchlorate will affect **photosynthesis** in aquatic systems, but this effect appears to occur only when perchlorate levels are extremely high (1000 ppm). Bacterial production also was not adversely affected by the presence of perchlorate except at very high levels in seawater samples. Respiration in marine and freshwater sediments and wetland peat was not adversely affected by perchlorate concentrations as high as 1000 ppm. Soil samples exhibited significant decreases in respiration activity in the presence of 100 and 1000- ppm perchlorate, so it is possible that the deposition of perchlorate to coastal soils following a flight abortion could decrease the rate that material is decomposed in soil, which could adversely affect plant growth. The presence of potassium perchlorate at concentrations up to 10 ppm and perchlorate concentrations nearing 30 ppm in aquaria containing solid propellant had no effect on stickleback mating or the birth and growth of fry. Both the algal/ bacterial and fish in aquaria accumulated significant levels of perchlorate that could be passed on to other tropic levels and later lead to deleterious effects.

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