Finding safer and more economical methods for treatment of hydrazine (HZ) and monomethylhydrazine (MMH) wastes are of great interest to NASA and more specifically to the Kennedy Space Center (KSC) because these wastes are the major hazardous wastes streams produced there. A new method using alpha ketoglutaric acid (AKGA) was proposed to treat HZ and MMH wastes. From the reaction of AKGA with HZ and MMH two products are formed PCA and mPCA respectively. In order to find if PCA and mPCA can be safely disposed of into the Cape Canaveral Air Force Station Wastewater Treatment Plant (CCAFS WWTP), the toxicity of these compounds were studied using bioassays on fish (Pimephales promelas) and crustaceans (Ceriodaphnia dubia). In addition, respiration inhibition tests using activated sludge (AS) samples from the CCAFS WWTP and viability tests using heterotrophic plate counts (HPCs) were performed. Also, biodegradation test were conducted to observe if PCA and mPCA could be decomposed by AS organisms.

From the bioassay studies performed using mPCA the lethal concentration that would kill 50 percent of the population (LC50) of C. dubia was estimated as 0.77 g/L ±0.06 (with a 95% confidence level). The LC50 could not be identified on P. promelas, so the value must exceed 1.5 g/L. On the other hand, the mortality/immobilization caused by exposing C. dubia to PCA was low compared to mPCA with 100 % survival at 1.0 g/L and below, and 80 % survival at 1.25 and 1.5 g/L. No effect on the mortality and the behavior of the fish was observed after exposing them to concentrations of up to 1.5 g/L of PCA.

From the analysis of total respiration and heterotrophic respiration (inhibiting nitrification) a significant effect on the respiration of the microbes at concentrations at or below 1.5 g/L of mPCA and PCA was not observed. The viability of heterotrophic organisms after exposing them for 4 hours to PCA and mPCA was estimated with heterotrophic plate counts (HPCs). There was not a significant difference between the samples exposed to PCA and mPCA compared to a control sample suggesting that PCA and mPCA did not affect the viability of heterotrophic bacteria.

Based on the results from the biodegradation tests, activated sludge (AS) organisms were capable of biodegrading up to 67% of PCA (with respect to its total theoretical oxygen demand) after 28 days of incubation. On the other hand, biodegradation of mPCA was not observed over 28 days of incubation. The results suggest that neither compound was inhibitory to AS biomass. However mPCA was more toxic than PCA, and also it was not as biodegradable. There may be some possibility that mPCA may not be entirely removed during wastewater treatment, but this would need to be confirmed with tests with a denser concentration of biomass more representative of an actual AS reactor.

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The public is welcome to attend.