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A fast, accurate and sensitive GC-FID method for the analyses of glycols in Water and Urine

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Glycols, specifically ethylene glycol and 1,2-propanediol, are some of the major organic compounds found in the humidity condensate samples collected on the International Space Station. The current analytical method for glycols is a GC/MS method with direct sample injection. This method is simple and fast, but it is not very sensitive. Reporting limits for ethylene glycol and 1,2-propanediol are only 1 ppm. A much more sensitive GC/FID method was developed, in which glycols were derivatized with benzoyl chloride for 10 minutes before being extracted with hexane. Using 1,3-propanediol as an internal standard, the detection limits for the GC/FID method was determined to be 50 ppb and the analysis only takes 7 minutes. Data from the GC/MS and the new GC/FID methods shows excellent agreement with each other. Factors affecting the sensitivity, including sample volume, NaOH concentration and volume, volume of benzoyl chloride, reaction time and temperature, were investigated. Interferences during derivatization and possible method to reduce interferences were also investigated.