Toxicology. 2006 Apr 17;221(2-3):225-8. doi: 10.1016/j.tox.2006.02.003. Epub 2006 Mar 10.

Experimental results from the reaction of bromate ion with synthetic and real gastric juices

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PMID: 16530909 DOI: 10.1016/j.tox.2006.02.003

Abstract

This study was designed to identify and quantify the effects of reducing agents on the rate of bromate ion reduction in real and synthetic gastric juice. This could be the first element in the sequence of a pharmacokinetic description of the fate of bromate ion entering the organism, being metabolized, and subsequently being tracked through the system to the target cell or eliminated. Synthetic gastric juice containing H+ and Cl- did exhibit reduced bromate ion levels, but at a rate that was too slow for a significant amount of bromate to be reduced under typical stomach retention time conditions. The reaction orders for Cl- and H+ were 1.50 and 2.0, respectively. Addition of the reducing agents hydrogen sulfide (which was shown to be present and quantified in real gastric juice), glutathione, and/or cysteine increased the rate of bromate ion loss. All of the reactions showed significant pH effects. Half-lives as short as 2 min were measured for bromate ion reduction in 0.17 M H+ and Cl- and 10(-4) M H2S. Therefore, the lifetime of bromate ion in solutions containing typical gastric juice concentrations of H+, Cl-, and H2S is 20-30 min. This rate should result in as much as a 99% reduction of bromate ion during its residence in the stomach. Bromate ion reduction in real gastric juice occurred at a rapid rate. A comparison of real and synthetic gastric juice containing H+, Cl-, cysteine, glutathione, and hydrogen sulfide showed that the component most responsible for the considerable decrease of the concentration of bromate ion in the stomach is hydrogen sulfide.