

# Occurrence of phenylacetonitrile as an odourous nitrogenous disinfection by-products in drinking water and its amino acid and algal precursors

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## Abstract

Possible reaction products from chlorination of amino acids are a concern both for the production of odours and nitrogenous disinfection byproducts (N-DBP). An investigation into odourous chlorination products of phenylalanine produced several aromatic reaction products of which phenylacetonitrile was the dominant product. Phenylacetonitrile, which is an unregulated N-DBP, was confirmed through mass spectrometry and nuclear magnetic resonance spectroscopy. Phenylacetonitrile was generated through decarboxylation, dechlorination and/or hydrolyzation processes. With its aromatic structure, phenylacetonitrile has an unpleasant odour and an odour threshold concentration of <1 µg/L as measured through gas chromatography-olfactometry. The half-life times of phenylacetonitrile in reagent water and chlorinated water at room temperature were on the order of days; thus it can stably exist in water distribution system. An occurrence investigation of phenylacetonitrile in tap water revealed that µg/L concentrations were present in nine different distributed drinking waters in China and the United States. Phenylacetonitrile can deteriorate the aesthetic quality of drinking water and may possess risk under the circumstances that amino acids are ubiquitous in raw water and this odourous N-DBP is stable in the presence of residual chlorine and will be transported to the consumer's tap.