

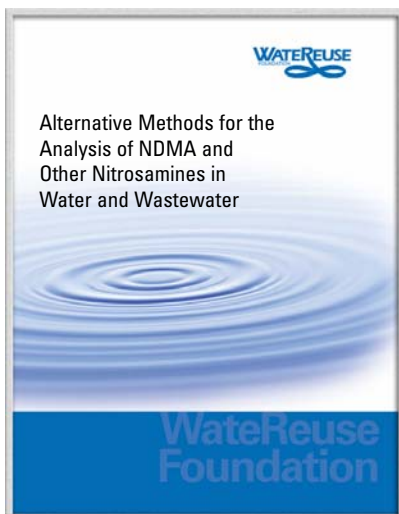
# Project PROFILE



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Advancing the Science of Water Reuse and Desalination through Research

## Alternative Methods for the Analysis of NDMA and Other Nitrosamines in Water and Wastewater



**Product Number:** 01-001-01  
**WRF Subscribers:** \$15  
**WRA Members:** \$25  
**Others:** \$45

**Project Number**  
WRF-01-001

**Principal Investigator**  
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The chemical, N-nitrosodimethylamine (NDMA), has been identified as a probable human carcinogen by the U.S. Environmental Protection Agency. The general population may be exposed to NDMA from various pathways, including inhalation (air) and ingestion (food and beverages).

More recently, NDMA has been detected in potable water, recycled water, and wastewater. Because no approved testing methods are available for NDMA, relatively few labora-

tories are currently performing analyses for NDMA and other nitrosamines, thus leading to relatively high analytical costs.

### Objectives

The goals of this project were to evaluate, refine, and develop multiple methods for NDMA analysis, and where applicable, determine how well these methods were able to detect other nitrosamines.

Although low-level detection limits are important considerations for developing these methods, another purpose of this project was to evaluate the performance of multiple methods when applied to a variety of water matrices. Methods achieving the anticipated drinking water detection level requirement (~2 ng/L) in pristine waters may not be capable of detecting to such a low level in other matrices (e.g., wastewater).

An additional project goal was to evaluate the capabilities of nitrogen (N)-selective GC (gas chromatography) detectors (i.e., the nitrogen-phosphorous detector (NPD) and nitrogen chemiluminescence detector (NCD)) and compare these detectors to currently used mass spectrometer (MS) detection systems.

The alternative extraction and detection methods should offer options for laboratories to use for nitrosamine analysis, which should lead to lower costs.

### Benefits

This research makes significant strides toward standardizing NDMA testing methods. Existing methods were examined and the relevant factors refined in order to optimize the absolute recoveries for NDMA and other nitrosamines. This research also developed modified viable testing methods that were validated through an extensive round-robin process. All laboratory procedures are documented in detail.

### Highlights

- The methods examined in this study are derivations or refinements of existing methods and included liquid-liquid extraction (LLE) and solid-phase extraction (SPE) techniques.
- The methods examined and refined from this research all measure lower levels of nitrosamines.
- Four different water matrices were analyzed: potable, RO effluent, secondary effluent, and tertiary effluent.
- Tests performed comparing the alternative detectors to GC/MS quantitation showed that as developed, the GC/MS can currently provide for the lowest detection limits.
- This is believed to be the first study to document the occurrence of nitrosamines other than NDMA with verification by a suite of analytical methods.

# Order Form



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## Related Research

Removal and Destruction of NDMA and NDMA Precursors during Wastewater Treatment (Product No. 01-002-01)

Investigation of N-Nitrosodimethylamine (NDMA) Fate and Transport (Product No. 02-002-01)

## About the Foundation

The mission of the WaterReuse Foundation is to conduct and promote applied research on the reclamation, recycling, reuse, and desalination of water.