What is/are nitrosamines?

Nitrosamines are primarily present in drinking water as disinfection by-products associated with chloramination. N-nitrosodimethylamine (NDMA) is the dominant form, most often cited, and likely to be of greatest concern to water agencies. Currently, USEPA is considering regulation of nitrosamines. A determination to regulate is anticipated Q4 2012, and if regulated, compliance would be required around 2020.

Are nitrosamines in drinking water a concern?

NDMA and other nitrosamines are classified by USEPA as a “probable human carcinogen,” with a $10^{-6}$ cancer risk level in the ng/L range. Note, however, that drinking water typically represents a small fraction of exposure to nitrosamines (some report less than 1%) with the other sources of nitrosamines being food and beverages as well as natural production within the human body.

How are nitrosamines formed? What are the contributing factors to nitrosamine formation?

Nitrosamines in drinking water are primarily a disinfection by-product of chloramination. Unlike THMs and HAAs, natural organic matter (NOM) is not a primary precursor. Nitrosamine precursors are primarily associated with domestic or industrial wastewater loads upstream of a potable water plant intake or polymers or anion exchange resin used in the water treatment process. Dichloramine has been shown to form nitrosamines more effectively than monochloramine. Therefore, optimization of monochloramine formation conditions by applying chlorine prior to ammonia, maintaining proper chlorine to ammonia ratio, and maintaining appropriate pH is also important.

What types of systems are at risk?

Systems that use chloramination, polyelectrolyte polymers, or anion exchange resins, or have a significant wastewater contribution to their source water are at a higher risk of nitrosamine formation.

How can we remove them?

*Nitrosamines*: Biofiltration (some types), UV-AOP (photolysis). *Precursors*: oxidation with ozone, chlorine or chlorine dioxide, adsorption with GAC/PAC, reverse osmosis, change in polymer type

What’s going on at the Federal Level?

The listing of five nitrosamines on the CCL3 in 2009 made them a focus of occurrence and toxicity data gathering. EPA has indicted their intention to make a ruling on these compounds, likely under a group standard, as part of their next Regulatory Determination (RegDet 3) set to be proposed in late 2012. This would set promulgation of the Final RegDet 3 in mid-2014, proposal of a nitrosamine regulation in by mid-2016 and subsequent finalization by late 2017. Compliance would follow 3 years later (2020) with a possible 2-year extension for capital improvements.
It is unknown at this time where the standard would be set but it is safe to say that a utility with combined CCL3 nitrosamine concentrations ≥10 ng/L should consider their system at risk. According to AWWA, the potential nitrosamines regulation could impact 20%-40% of water systems, particularly chloraminated systems.

What’s going on at the State level?

California: In 1998, CDPH established a notification level of 10 ng/L for NDMA, NDEA and NDPA. In 2006, OEHHA established a 3 ng/L PHG for NDMA. An MCL for NDMA will likely not be available for several years (perhaps 2014 or 2015?), so 10-ng/L notification level will continue to be used to provide information to local governing agencies and consumers.

Texas: No current regulatory action. However, review of UCMR 2 data indicated that many utilities in Texas form NDMA.

What data do utilities have?

Utilities that participated in UCMR2 will have occurrence data (you can check this online – http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/data.cfm). Other utilities may have been proactive and taken some data as well, though many may not know if these are in their water.

What do systems need to be doing in the near future?

At a minimum, water utilities monitor regulatory development and maintain an up-to-date regulatory tracking and compliance plan that includes nitrosamines. More proactive utilities could consider sampling and process optimization for nitrosamine minimization (preoxidation, appropriate polymer selection and usage, optimizing monochloramine formation).

How can Carollo help?

1. Keep your client informed of nitrosamine regulatory development.
2. Help your clients determine what data they have and what data they might want to collect.
3. Help them understand what their risk level (i.e., data interpretation in the context of the current regulatory and toxicology data).
4. Help them plan and prepare for potential system changes or upgrades based on regulatory and agency-defined goals.