



Nitrosamines

Fish, Meat, Drinks, Malting Barley & Roasted Malt in the Spotlight

Nitrosamines are a class of nitrogen-containing organic compounds with the general structural formula R_1R_2N-NO whereby R_1 and R_2 are alkyl or aryl radicals.

Accordingly, a large number of different nitrosamine derivatives are possible. Nitrosamines are found in many different foods, however, also in tobacco, cosmetics and consumer goods. Unprocessed plant-based foods are generally considered to be nitrosamine-free.

In addition to teratogenic and mutagenic properties, nitrosamine compounds are especially attributed to act carcinogenic.

Occurrence and Formation

Nitrosamines are formed by the reaction of nitrite with secondary amines. Small amounts of amines are found in fruit, higher amounts in meat or sausages and very high amounts in cheese as well as fish. Since food can also additionally contain nitrite the exogenous formation of nitrosamines is always possible, which is further promoted by an acidic environment and heat exposure.

Beer and malt coffee in particular may contain high levels of nitrosamine due to an improper malt production. Other potentially highly contaminated foods include cured meat and fish products due to the processing with nitrate or nitrite-based salts. By further heating processes, e.g. roasting, the level increases again significantly.

By means of suitable measures, such as lowering the nitrite and nitrate content in cured foods, adding antioxidants (ascorbic acid or tocopherols) and reducing nitrate content in vegetables, a substantial reduction of the nitrosamine concentration in foods is possible.

Toxicology

90% of nitrosamines examined in animal experiments caused a carcinogenic effect. Resulting tumours appear preferentially in the esophagus, stomach, liver, kidney and urinary tract. It is assumed that the endogenous rearrangement of nitrosamines to diazoalkanes which lead to an alkylation of the DNA, RNA and/or proteins promotes the tumorigenic process.

Analysis

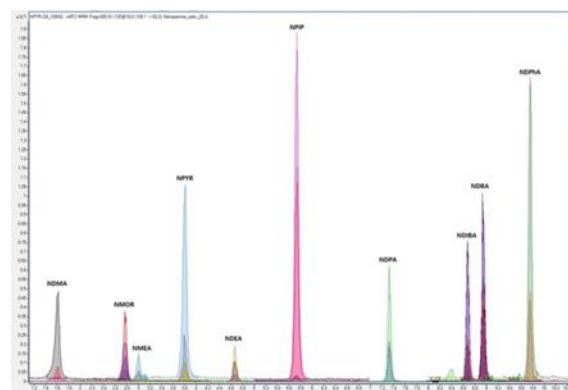
The Eurofins experts for organic contaminants offer the analysis of the most important nitrosamines using the LC-APCI-MS/MS-technology.

The analysis of nitrosamines can be performed in different analytical scopes. The following parameters are available with a limit of quantification of 1 µg/kg per substance:

- N-Nitrosodimethylamine NDMA
- N-Nitrosomethylethylamine NMEA
- N-Nitrosodiethylamine NDEA
- N-Nitrosodiisobutylamine NDIBA
- N-Nitrosodibutylamine NDBA
- N-Nitrosodipropylamine NDPA
- N-Nitrosopiperidine NPIP
- N-Nitrosopyrrolidine NPYR
- N-Nitrosomorpholine NMOR

A stable isotope-labelled internal standard for exact quantification is available for each of the nine analytes.

Analysis of nitrosamines is currently available in the matrices fish, meat, beverages (alcohol-free and up to an alcohol content of 5%) and malting barley/roasted malt. The analysis can also be performed in other matrices after appropriate validation upon request.



Legal Background

Nitrosamines belong to the most carcinogenic substances in animal experiments. Therefore, no limit values can be set below which the nitrosamines are considered harmless. The minimisation principle applies. Guideline values for nitrosamines (NDMA) were only established for malt and beer (malt: 2.5 µg/kg; beer: 0.5 µg/kg; guideline values from Bavarian State Office for Health and Food Safety, LGL).

Furthermore, fish and fishery products exported to the Russian Customs Union must comply with the limits laid down in the "DECISION No. 162 On the Technical Regulation of the Eurasian Economic Union 'On the safety of fish and fish products.'"

