Ethoxyquin in food and feed using LC-ESI-MS/MS

Residues and contaminants in fish, poultry and feed

More and more frequently, harmful substances are reported in food, such as ethoxyquin in fish. Disagreement about the health effects of these substances and the lack of uniform limit values for them are increasing consumer demand for more information. To ensure consumer safety, it is becoming increasingly important to be able to detect antioxidants even in small quantities in food and feed.

Use of Ethoxyquin

Ethoxyquin was used as a pesticide until 2011 and is now used as an antioxidant. It is often added to animal feed to protect unsaturated fatty acids. Other applications include adding it to apples and pears to prevent brown discoloration, in poultry feed to alter skin and egg pigmentation and in animal feed to increase milk stability.

The accumulation of antioxidants in the fat and meat tissues of animals means that the issue is becoming increasingly important from the point of view of food safety. Ethoxyquin can be degraded to several metabolites. The most frequently described oxidative degradation product is the ethoxyquindimer, as this is even more stable than ethoxyquin itself.

Effects on health

It is known that antioxidants intercept free radicals and thus help to slow down the process of aging due to oxidative stress. Studies have also shown that ethoxyquin has antimutagenic properties.

In addition to the originally positive effect of antioxidants, recent studies also show contrary results. For example, health problems such as liver, kidney, thyroid and reproductive dysfunctions, carcinogenic effects, allergic reactions and skin problems have been demonstrated at dogs and chickens. It is further discussed whether antioxidants also promote the development of asthma, allergies and obesity.
Legal Foundation

Ethoxyquin was authorised as a feed additive in accordance with Guideline 70/524/EEC and entered in the register of feed additives in accordance with Article 10(1) of Regulation (EC) No 1831/2003. Due to the unclear health risk posed by ethoxyquin and its by-products, the European Food Safety Authority (EFSA) prepared a new safety assessment, which was published in October 2015. As the safety of these substances has not been demonstrated, they pose a risk to human and animal health. Therefore, the authorisation of ethoxyquin as a feed additive was suspended under the new Regulation (EU) No 2017/962. The Regulation entered into force on 28 June 2017 and provides for certain transitional provisions for ethoxyquin in feedingstuffs and premixtures of feedingstuffs.

Due to the earlier use of ethoxyquin as a pesticide, there are also corresponding references in Regulation (EC) No 396/2005 on maximum residue levels of pesticides. For example, ethoxyquin may be present in products of animal origin such as poultry, cattle, goats or horses up to 50 µg/kg. A maximum residue level for fish is not fixed.

Analysis of Ethoxyquin at Eurofins

Our experts from the competence center for organic contaminants have many years of experience in the field of trace analysis using LC-MS/MS and offer the analysis of both ethoxyquin and ethoxyquindimer in food and feed. With the innovative UHPLC-ESI-MS/MS technique, it is possible to analyse with a lower limit of determination of 5 µg/kg as well as with a limit of determination of 0.2 mg/kg.

Fig. 1: Chromatogram of an egg with 15 µg/kg ethoxyquin and ethoxyquindimer each