

SupelMIP SPE Chloramphenicol - a review of the product

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Background

Chloramphenicol is a broad spectrum antibiotic that has been determined as a potential causative agent of aplastic anemia and possible carcinogen in humans. Because of these health concerns, the EU, the US and Canada have banned the use of chloramphenicol in food-producing animals and livestock. Because the drug is still widely available in developing countries and no “safe” residue levels determined in food, public health concerns still arise. As of today, a “zero” tolerance level has been established for this antibiotic. It is therefore critical to develop a highly selective and sensitive analytical assay to control and monitor chloramphenicol residues in difficult matrices such as foodstuffs.

A range of analytical methods has been developed for the determination of CAP in finished foods and food raw materials. All confirmatory methods consist of some clean-up procedure and GC/MS or LC/MS detection. Chloramphenicol needs to be determined in several different food, feed and biological samples which are often very complex matrixes. The development of a reliable method can be challenging and conventional SPE columns may not give clean enough extraction for chromatographic analyses at trace level. SupelMIP SPE methods have been specially developed for sample clean-up prior to analysis of Chloramphenicol in shrimp, urine, honey and plasma. Data sheets can be found on the product page at MIP Technologies webpage www.miptechnologies.com/chloramphenicol.asp

Information, literature and informative links:

- www.miptechnologies.com/chloramphenicol.asp
- www.sial.com/supelmip

Chloramphenicol in shrimp

The latest new application of this material is for trace level extraction of Chloramphenicol from shrimp samples. The method was evaluated in 2008 in the FAPAS (Food Analysis Performance Assessment Scheme) proficiency test for analyses of Chloramphenicol in prawns. The SupelMIP method was one of the few that measured the correct concentration in the unknown sample (0.61 µ/kg with a z-score of 0). The method also had the lowest LOD of all SPE methods. The SupelMIP has also been evaluated in comparison to a conventional hydrophilic polymer SPE method. The evaluation was presented at Euroresidue 2008 (1). In this study the SupelMIP method provided a significant increase in selectivity relative to the described conventional hydrophilic polymer SPE method. The method was robust with a high precision (5 %). The recoveries were determined to be above 90 %. The extracts were cleaner and contained lowered amounts of interferences, allowing lower detection limits (7 ng/kg). The method is particularly advantageous where trace detection limits and routine analyses are required.

1) Euroresidue2008 abstract “The selective extraction of Chloramphenicol from shrimp using Molecularly imprinted polymers (MIPs)” AK.Wihlborg, BBoyd, S Kroonauer and C.Widstrand, MIP Technologies AB, Sweden.

1) Euroresidue 2008 abstract:
http://www.miptechnologies.com/news/letter/Euroresidue2008_abstract_THE_SELECTIVE_EXTRACTION_OF_CHLORAMPHENICOL_FROM_SHRIMP_USING_MOLECULARLY_IMPRINTED_POLYMERS.pdf

Chloramphenicol in urine

The SupelMIP SPE Chloramphenicol has recently been evaluated for analysis of Chloramphenicol (CAP) in urine samples at the Institute for State Control of Veterinary Biologicals and Medicaments in Brno, Czech Republic. The study was presented at the Euroresidue2008 conference in Antwerp, Belgium and recently an article was written for the Supelco Reporter, *Rejtharová et al (2)*. The

method described was fully validated according to CD 2002/657/EC, CC α was 0.06 ng/mL, CC β was 0.1 ng/mL. This method was reported to be considerably robust and allowed the processing of even 'very dirty' samples. The procedure was also considered to be simple, time efficient, provided high throughput of samples and could be used for both routine screening and confirmatory analyses.

2) *Method Validation for Determination of Chloramphenicol in Urine Using Molecularly Imprinted Polymer (MIP) SPE*. Rejtharová, M., Rejthar, L., Institute for State Control of Veterinary Biologicals and Medicaments, Brno, Czech Republic

2) Rejtharová et al.
http://www.miptechnologies.com/pdf/reporter_35.pdf

Chloramphenicol in milk and plasma

For analysis of Chloramphenicol in milk Nestlé has successfully evaluated the SupelMIP™ Chloramphenicol cartridges for extraction from various milk samples. The method was validated according to EU criteria and resulted in significantly lowered detection levels and the sample handling time for the extraction was reduced by at least 50 %. The evaluation performed by Nestlé was published by Mohamed et al. *Anal Chem.* 2007 (3).

The SupelMIP SPE Chloramphenicol also applicable for plasma samples. The procedure was evaluated at Evira, the Finnish food safety authority. Using the SupelMIP™ SPE Chloramphenicol, higher sample throughput and higher recoveries were obtained and the presence of interfering compounds in the final extract was significantly reduced. The cleanness of the extracts also has a cost impact by reducing instrument maintenance.

3) *Advantages of Molecularly Imprinted Polymers LC-ESI-MS/MS for the Selective Extraction and Quantification of Chloramphenicol in Milk-Based Matrixes. Comparison with a Classical Sample Preparation*. Mohamed et al. *Anal Chem.* 2007 Dec 15;79(24):9557-65

3) Mohamed et al. *Anal Chem.* 2007
<http://pubs.acs.org/doi/abs/10.1021/ac7019859>
 Short newsletter
 summary: http://www.miptechnologies.com/newsletter/SupelMIP_CAP_in_plasma.pdf

Development of the material

Traditionally in many academic studies using molecularly imprinted materials the target analyte has been used to make (to template) the selective cavity of the material. In all SupelMIP materials and also in the SupelMIP Chloramphenicol material an analogue of the analyte was used as the template in the production process for the MIP. This eliminates the risk of interfering analyte bleeding that has occasionally been a problem associated with MIPs. The evaluation of the SupelMIP Chloramphenicol material has been described in an article published in *Journal of Chromatography A*, 2007, Boyd et al (4). During the development of the material an analytical method was developed for the confirmation of chloramphenicol using the SupelMIP SPE material as a clean-up step prior to analysis by LC-MS/MS.

In the study the SupelMIP method was compared with non-imprinted MIP material (no template present) and with a traditional analyte-imprinted material. In addition, the SupelMIP method was also compared with conventional hydrophilic polymeric SPE phases and liquid-liquid extractions published previously. In all comparisons the SupelMIP provided more accurate and more sensitive data. The method was validated for honey and urine sample matrices according to EU criteria for confirmatory analytical methods. The SupelMIP extracts turned out to be cleaner allowing better detection limits and dramatically reduced noise effects due to the sample matrix. Details of the evaluation are found in "Development of an improved method for trace analysis of chloramphenicol using molecularly imprinted polymers" Boyd et al, 2007 (4).

3) Boyd et al.
<http://www.sciencedirect.com/science?ob=ArticleURL&u di=B6TG8-4PKFH4R-3& user=10& rdoc=1& fmt=& orig=search& sort=d& view=c& acct=C000050221& version=1& urlVersion=0& userid=10& md5=340851d9f8c0db9e0b52996aa9f1df45>

4) *Development of an improved method for trace analysis of chloramphenicol using molecularly imprinted polymers*, Boyd, B., Björk H, Billing J, Shimelis O, Axelsson S, Leonora M, Yilmaz E, *Journal of Chromatography A* (2007).