

Application of HPLC-APCI-MS for sensitive determination of bioactive amines in fish-based food products intended for infants and young children

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INTRODUCTION

The presence of bioactive amines (BA) such as putrescine (PUT), cadaverine (CAD), histamine (HIS), tyramine (TYR), spermidine (SPD) and spermine (SPM) in food products intended for infants and young children should be analysed and controlled in respect to their direct (HIS, TYR) or potential toxicity properties (SPD, SPM).

The aim of this work was to evaluate the selected bioactive amines content in fish-based food products intended for infants and young children using optimized HPLC-APCI-MS method.

EXPERIMENTAL METHODS

In this work, a high-performance liquid chromatography atmospheric pressure chemical ionization single quadrupole mass spectrometry method with selected ion monitoring (SIM) for quantitative analysis were used. Experimental and detector parameters were optimized in order to achieve the best analytical conditions for sensitive analysis of BA content in 21 samples available on Polish market. The HPLC system consisted of Shimadzu Performance binary system coupled to LCMS-2020 detector with an APCI interface. The amines were separated on Phenomenex Gemini-NX C₁₈ column (150×4.6 mm, 3 μm particle size) with pre-column (4×3 mm), operated at 25 °C with flow rate of 0.8 mL min⁻¹. The mobile phase consisted of 10 mM ammonium formate (A) and acetonitrile (B) with gradient elution program. The 5 g of homogeneous samples were extracted with 0.4 M HClO₄. Then, the standard solutions/samples were derivatized into dansyl derivatives, extracted and injected to the column in triplicate. Statistical analyses were performed using Statistica 10.0 (one-way ANOVA). Differences between means at the 95 % (p < 0.05) confidence level were considered statistically significant.

RESULTS AND DISCUSSION

Obtained biogenic amines content in analysed products was estimated in range from 1037-46090 μg·kg⁻¹ PUT, 10-1105 μg·kg⁻¹ CAD, 7-671 μg·kg⁻¹ HIS, 30-774 μg·kg⁻¹ TYR, 1056-33805 μg·kg⁻¹ SPD, 229-4840 μg·kg⁻¹ SPM. The highest HIS and TYR levels were found in meals containing tuna. To our knowledge, the use of HPLC-APCI-MS for quantitative analysis of specified biogenic amines in fish-based food products intended for infants and young children has not been reported up to date. The optimized method is suitable for simultaneous analyses of selected amines in low LODs, with appropriate sensitivity and precision resulting in high quality of estimated results.

CONCLUSIONS

Evaluated BA content indicate, that there is a need to remove tuna from components of analysed products as a consequence of higher HIS and TYR amount estimated for those meals.

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