论文

基于MALDI-TOF-MS的脂质组学研究——鲫鱼受镉暴露的潜在生物标志物

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摘要：

以含镉(Cd)500 μg/L水体中养殖0, 10, 20 d的3组鲫鱼为研究对象, 测定鱼肉中Cd含量, 借助HPLC与MALDI-TOF-MS离线联用技术得到鱼肉磷脂图谱, 并采用偏最小二乘判别分析法(PLS-DA)针对图谱数据开展模式识别分析. 结果表明, 在20 d暴露期内, 鱼肉中Cd含量呈持续上升趋势, 而磷脂酰胆碱(PC)含量在暴露10 d后显著低于正常水平(未受镉暴露)($p<0.05$), 暴露20 d后基本恢复到正常水平. PLS-DA分析实现了3组样本的组间判别, 说明磷脂指纹图谱能更好的反映外源Cd对鲫鱼的代谢影响. PC可以作为指示水体Cd对鲫鱼毒害作用的生物标志物. HPLC与MALDI-TOF-MS离线联用技术不仅能定量分析鱼肉中PC总量, 也分离纯化了PC组分, 从而使MALDI-TOF-MS成功用于复杂鱼肉样品的磷脂分析, 适用于脂质组学研究.

关键词： 镉; 磷脂; 生物标志物; 脂质组学; 基质辅助激光解析电离飞行时间质谱

MALDI-TOF-MS for Lipidomics Analysis——Potential Biomarker for Cadmium Effect on Crucian Carp(Carassius auratus)

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Abstract:

The biochemical effects of cadmium(Cd) on Crucian Carp was studied by MALDI-TOF-MS-based lipidomics. Crucian Carps were exposed to water with 500 μg/L Cd^{2+} for 0, 10, 20 d, respectively. Muscle samples from Cd-treated fishes were analyzed either by Atomic absorption spectrophotometer (AAS) for Cd contents, or analyzed by HPLC and MALDI-TOF-MS for phospholipids. All MALDI-TOF-MS spectra data were analyzed by pattern recognition using partial least square-discriminant analysis(PLS-DA). During the whole exposure period, Cd contents in muscle kept increasing, while phosphatidylcholine(PC) contents after 10 d exposure were significantly lower than that of normal level (no exposure)($p<0.05$), and the PC contents after 20 d exposure were nor significantly different from the normal level. The three groups were discriminated successfullyby PLS-DA, which suggested that lipidomics studies could better reflect the biochemical effects of Cd. PC could be the biomarker indicating the toxicity of Cd to Crucian Carp. Offline combination of HPLC and MALDI-TOF-MS could not only give the quantify PC, but also isolate and purify PC substraction, hereby it was applicable for lipidomics analysis.

Keywords: Cadmium; Phospholipids; Biomarker; Lipidomics; MALDI-TOF-MS

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