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Liquid Chromatography-Mass Spectrometry in Antidepressant Drug Monitoring – Current Role

Resende Sara*

Department of Chemical Sciences, University of Porto, Portugal

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***Corresponding author**: Resende Sara, Department of Chemical Sciences, Laboratory of Applied Chemistry, Faculty of Pharmacy, University of Porto, Portugal, Email: sara.teixeiraresende@gmail.com

Mini Review

Mental disorders are on the rise in the European Union. Major depression is a commonly occurring, serious, recurrent disorder linked to a diminished role functioning and quality of life, which can even lead to suicide. In a recently survey made by World Mental Health Organization, 49.4% of the respondents claim already had a time lasting several days when they were sad, depressed, or lost interest in their usual activities [1]. Usually, the treatment for these cases is performed with the use of antidepressants and antipsychotics [2]. These drugs are often associated with Deliberate Self-Poisoning (DSP) and it is one of the most common reasons to visit the emergency department [3]. The pharmacologic effects of antidepressant drugs have a direct correlation with their concentrations in plasma, which can serve as a basis for Therapeutic Drug Monitoring (TDM) [4]. In fact, psychiatry was one of the first medical disciplines introducing routine TDM to increase safety and efficacy of pharmacological treatment [5].

Determining the presence of various drugs is an important facet of toxicology, to establish their use and possible contribution to the cause of poisoning or even death. Liquid Chromatography-Mass Spectrometry (LC-MS) has established itself as the clear leader in the quantification of the psychotropic drugs in biological samples. There are numerous reports of using LC-MS methods for determination of these compounds in biological matrices, such as plasma, serum or whole blood [2,6-13]. Different ionization techniques are used for mass spectrometry. In pharmaceutical industry the atmospheric pressure ionization (Electrospray Ionization and Atmospheric-pressure chemical ionization) has been the most used technique in combination with tandem mass spectrometry. LC–MS/MS has revolutionized the strategies and achievement of modern drug discovery.

Today, LC-MS is the method of choice because the sensitivity, selectivity and the relatively high throughput that can be achieved and the determination of multiple groups of compounds can be performed in a single method. Some of the advantages of this technique include easier sample preparation, avoidance of derivatization procedures and short analysis time [14].

In the future, LC-MS will become a standard technique for detection of very low concentrations in clinical and forensic toxicology, if some drawbacks are finally overcome. Matrix effects is still the most important drawback in LC-MS however, papers were published to help researchers avoid this issue [15-17]. Selectivity is another drawback. In cases of doubt, a further method must be used for confirmation. Mass spectral detection typically provides rather high selectivity, but it depends on the number of monitored ions or transitions. Stability of analytes in the biosample is also important to be considered. A full validation of the method is required to avoid analyte degradation after, for example, a freeze-thaw cycle [18]. With careful assessment of matrix effects, selectivity and stability and judicial use of the appropriate sample preparation coupled with adequate chromatography, LC–MS can provide a robust analytical platform.

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