



Review

Determination and identification of synthetic cannabinoids and their metabolites in different matrices by modern analytical techniques – a review

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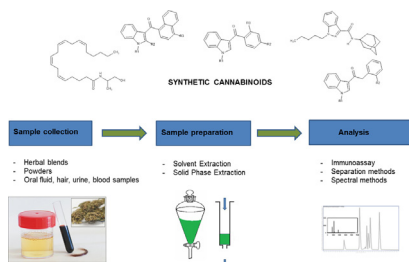
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HIGHLIGHTS

- Synthetic cannabinoids from analytical point of view.
- Determination and identification methods of synthetic cannabinoids in different matrices.
- Analytical techniques used from thin layer chromatography to high resolution mass spectrometry.
- Detailed survey of gas and liquid chromatography methods for synthetic cannabinoids analysis.

GRAPHICAL ABSTRACT



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ABSTRACT

Synthetic cannabinoids have gained popularity due to their easy accessibility and psychoactive effects. Furthermore, they cannot be detected in urine by routine drug monitoring. The wide range of active ingredients in analyzed matrices hinders the development of a standard analytical method for their determination. Moreover, their possible side effects are not well known which increases the danger.

This review is focused on the sample preparation and the determination of synthetic cannabinoids in different matrices (serum, urine, herbal blends, oral fluid, hair) published since 2004. The review includes separation and identification techniques, such as thin layer chromatography, gas and liquid chromatography and capillary electrophoresis, mostly coupled with mass spectrometry. The review also includes results by spectral methods like infrared spectroscopy, nuclear magnetic resonance or direct-injection mass spectrometry.

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Abbreviation: SCs, synthetic cannabinoids.

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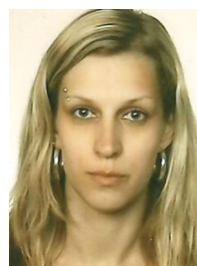
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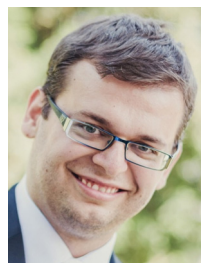
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