

SUMMARY

In recent years there has been a huge increase in the number of new psychoactive substances (NPS) that have appeared on the drug market. By the end of 2017, the European Monitoring Center for Drugs and Drug Addiction reported over 670 new compounds. The producers of such products intentions were to avoid the existing drug prohibitions and design substances that mimicked the intoxication effects of the compounds already banned.

New psychoactive substances are often simple modifications of controlled substances, obtained primarily by introducing an additional chemical group into the structure of such compounds or replacing an existing moiety with a new one. Due to the high similarity in their structures, the risk of misidentification is high, and therefore forensic laboratories are forced to use more advanced techniques to identify new compounds.

For this reason, the usefulness of liquid chromatography coupled with mass spectrometry with a hybrid combination of a quadrupole and a time-of-flight analyzer (LC-QTOFMS) to identify new psychoactive substances has been evaluated. This method was mainly used for the analysis of high-molecular-weight compounds, whereas, so far it has been applied for the identification of psychoactive substances to a very limited extent. The results presented in the publications included in this doctoral dissertation have contributed to the dissemination of this method in the analysis of NPS.

During the experiments, the fragmentation patterns of synthetic cannabinoids and phenethylamine derivatives were determined. It turned out that these compounds fragment in a characteristic way, giving particular elements of their structures. Knowledge of these specific ions allowed identification of completely new compounds from the NPS group. The undeniable advantage of the LC-QTOFMS method is the ability to determine the exact mass of the tested compounds and their fragments, and therefore making the assignment of an ion with a certain m/z value to a given fragment very precise.

The performed study, resulting from the practical need of analysts in forensic laboratories, proved that the LC-QTOFMS method is very useful for identifying new psychoactive substances from the group of synthetic cannabinoids and phenethylamine derivatives.