Suspect Screening in Food Supplements

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Adulteration and fraud in food supplements is a complex and constantly evolving problem, and can have serious consequences for public health. Fraud can take place in many forms, including the substitution of ingredients, the addition of prohibited substances and the use of misleading claims. Chemical analysis is one of the tools used to detect food adulteration. The search for active plant ingredients, toxins or pharmaceutical drugs using mass spectrometry coupled with liquid chromatography can identify exogenous substances illegally added to food supplements.

For this, we developed an LC-MS/MS screening method based on high-resolution spectral acquisition. After a simple extraction, the sample is injected to an Orbitrap tandem mass spectrometer (Q-Exactive Focus, Thermo Fisher Scientific) hyphenated to a liquid chromatograph (Vanquish, Therm Fischer Scientific). An inclusion list of more than 400 natural toxins, known adulterants and drugs is used for data-dependent triggering of tandem mass spectra acquisition and the corresponding spectral library is used for compound identification.

Screening food supplements sold on the Swiss marked resulted with the identification of several of them containing illegal drugs, active natural compounds and pharmaceutical ingredients. Among other substances, yohimbine, hyperforin, amphetamine and sildenaphil was identified in several products. The presence of these substances could not be explained from the ingredient list.

This study shows that adulteration and contamination of supplements with illegal drugs and active compounds is still a common practice, despite multiple surveys and alerts. LC-MS/MS approaches are effective to screen for active compounds in such products.