**THE ROLE OF LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY IN FOOD AUTHENTICITY TESTING AND FIGHTING FOOD FRAUDS**

**Emila Fornal**

*Department of Bioanalytics, Medical University of Lublin, ul. Jaczewskiego 8b,
20-090 Lublin, Poland, e-mail: emilia.fornal@umlub.pl*

Many food scandals have alarmed the authorities and consumers for the last decade and raised their awareness that food frauds pose huge public health risks and are responsible for immense economical losses. The adulterations of food involve various practices, most of which are driven by pursuit of higher financial profits, pressure to lower costs or are taken with the intention of circumventing the applicable law and regulations restricting manufacturers’ activities. The adulterations and frauds take the wide range of forms including substitutions of ingredients with the ones of lower quality (e.g. horse meat scandal), additions of components which pretend nutrients (e.g. melamine in powdered milk scandal), relabelling of product with a new expiry date to hide a finished shelf life, addition of mechanically recovered meat instead of actual meat (muscle tissue), overdeclaration of the amount of meat in products with fat and gristle added instead, overdeclaration of protein content, mislabelling of protein source origin, pretending geographical origin (e.g. Argentinian beef, New Zealand lamb, Japanese kobe beef, jamón ibérico), mislabeling of method of production (e.g. extra virgin olive oil) of breeding method (e.g. wild *vs* farmed, organic *vs* conventional), and many others. Food products are complex mixtures, which together with the huge scale, variability and fast shifting nature of frauds makes the detection of frauds challenging and traditional analytical methods fail.

There is a huge challenge for analytical chemistry to deliver solutions which will ensure safeguarding consumers. Only the growth in the availability of sophisticated analytical methods and equipment enabling more widespread food testing will make fast identifying and removing adulterated food from market, effective identification of dishonest labelling and misdecription as well as the identification and punishment of dishonest manufacturers possible. Challenges, opportunities and innovations in the field of applications of analytical chemistry in fighting food frauds, with the main focus on utility of liquid chromatography coupled to mass spectrometry, will be discussed.

Acknowledgements*:The study was supported by the National Science Centre, Poland (project number 2017/25/B/NZ9/02000 and 2018/31/B/NZ9/02762) and the National Centre for Research and Development,, Poland ((project number TANGO-IV-C/0003/2019.*

**Literature:**

[1] K. Robson, M. Dean, S. Haughey, C. Elliott, *Food Control* 2021, 120, art. 107516.

[2] N. Sajali, S.C. Wong, S. Abu Bakar, N.F. Khairil Mokhtar, Y.N. Manaf, M.H. M.N. Mohd Desa, *Int. J. Food Sci. Tech.* 2021, 56, 1535-1543.

[3] A. Stachniuk, A. Sumara, M. Montowska, E. Fornal, *Mass Spectrom. Rev.* 2021, 40, 3-30.

[4] A. Stachniuk, A. Trzpil, A. Kozub, M. Montowska, E. Fornal, *Food Chem.* 2023, 405, art. 135013.

|  |  |
| --- | --- |
|  | Prof. dr hab. Emilia Fornal jest chemiczką analityczką, ekspertką w zakresie w chromatografii cieczowej i spektrometrii mas. Pracuje w Uniwersytecie Medycznym w Lublinie, pełni funkcję Prodziekanki Wydziału Biomedycznego, kieruje Katedrą Dietetyki i Bioanalityki oraz Zakładem Bioanalityki. Odbyła liczne zagraniczne staże naukowe i z zakresu zarządzania, m.in. w GlaxoSmithKline R&D (UK), London Imperial College (UK), IBM TJ Watson Research (USA) i w Uniwersytecie Stanforda (USA). Autorka licznych prac naukowych oraz patentów dotyczących wykrywania zafałszowań i uwierzytelniania żywności. |