Trend barometer: taking the underground to the airport

Hyphenations in HPTLC – the potential for efficient analysis

Prof. Dr Gertrud Morlock, interdisciplinary Research Center (IFZ), Institute of Nutritional Sciences, Justus Liebig University Gießen, Germany

Yes – you can talk about an ‚underground system' in terms of analysis. Many samples are forwarded in parallel – including unstyled raw extracts in any condition. The connection to the airport is assured and today molecules can fly in a myriad of different ways.

Faster characterisation of samples is now possible with high-performance thin-layer chromatography (HPTLC) in combination with bioassays, derivatisation reagents and spectroscopic or spectrometric detection options (Fig. 1). A very interesting branch is effect-directed analysis, which combines chromatography with aqueous bioassays but still maintains sharp separation zones (Fig. 2). A team of experts is currently devising the planar Yeast Estrogen Screen (pYES) bioassay to be used directly in combination with HPTLC. Substances with an oestrogen-like action are directly identified in complex mixtures. Is it not in the general interest to establish which everyday foods are pharmacologically active and how they compare with drugs? If an active substance is found, it flies directly into the high-resolution mass spectrometer – only what is active and therefore important is selected on a targeted basis. No pointless flights take place.

This is the actual strategy (Fig. 3) which – only in the last five years – has been facilitating fast characterisation of the zone right through to the sum formula obtained by commercially available ambient mass spectrometry processes, such as LESA, DART, DESI and TLC-MS Interface as well as MALDI (Fig. 4). The direct scanning of ATR-FTIR spectra from zones via the versatile TLC-MS Interface was also demonstrated [1]. Similarly, the

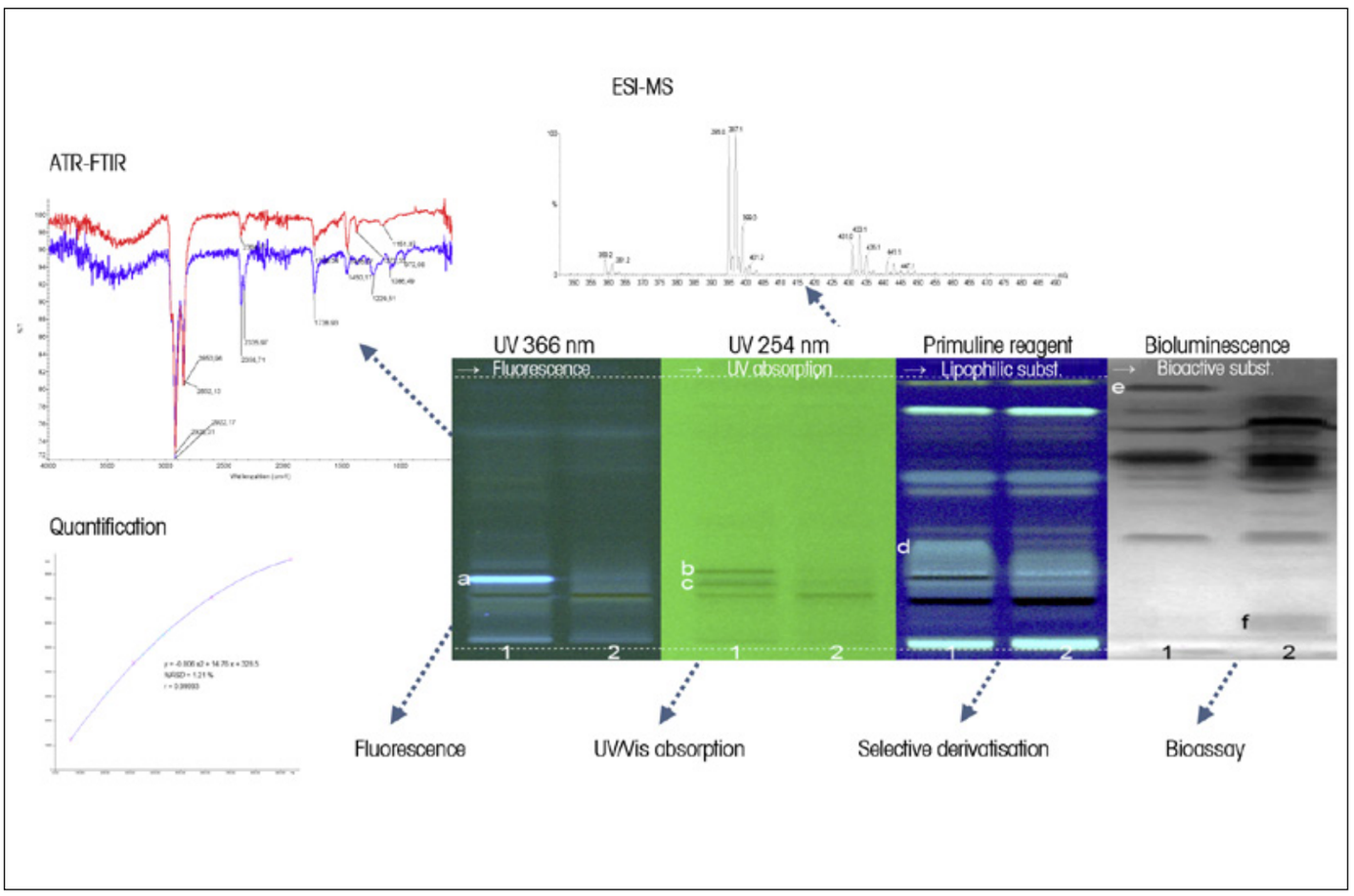

Fig. 1 Fast characterisation of two samples (track 1/2: not active/active) via multiple detection options: the various zones a-f are directly recognisable.

possibility of NMR spectra scanning was discussed [2] and briefly demonstrated [3]. As such, important analytical processes are connected to HPTLC on an analytical scale. Over the coming years, this new kind of analytical platform will see actual examples of applications.

A deeper look at research reveals something unanticipated: the new discipline of Office Chromatography [4] combines the advances made by innovative printing and media technologies with miniaturised separation materials. Novel electrospun [5], nanostructured [6], or monolithic layers [7] are also considered in a business card format. Researchers have been trying to work out

Coming events

- HPTLC 2014, 2-4 July 2014, Lyon, www.hptlc.com
- pYES bioassay expert group; appointments on request
- GDCh course Hyphenations in HPTLC, 12 November 2014, JLU Gießen

GDCh-course 335/14: Hyphenations in HPTLC

12 November 2014 at JLU Gießen

Objectives of the course:

- Recognise the potential of HPTLC
- Find out about current combinations involving HPTLC
- Recognise how hyphenations in HPTLC provide an efficient means of supporting analysis
- HPTLC-UV/Vis/FLD-ESI-MS with experiment
- HPTLC-UV/Vis/FLD-bioassay-ESI-MS with experiment
- HPTLC-UV/Vis/FLD-ATR FTIR with experiment
- DC-HPLC-DAD-ESI-MS with experiment
- HPTLC-UV/Vis/FLD-MALDI-TOF MS with experiment
- HPTLC-UV/Vis/FLD-DART SVPA-MS with experiment
- HPTLC-UV/Vis/FLD-DESI-MS with experiment
- Discussion of the various hyphenations

fb@gdch.de, www.gdch.de/fortbildung

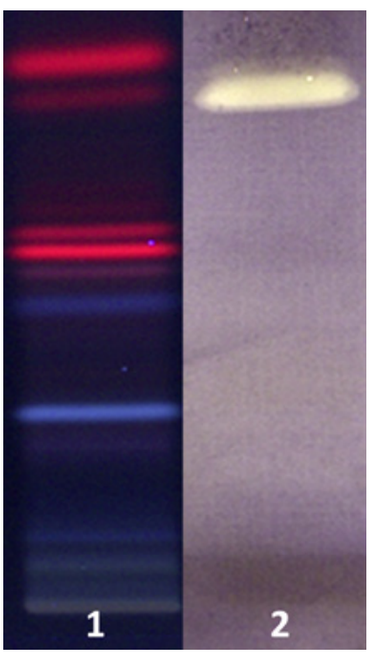

Fig. 2 White substance zone with an antibiotic action in a plant extract after immersion in a suspension of *Bacillus subtilis* bacteria and a substrate of tetrazolium salt (track 2; compared with fluorescence detection at 366 nm for track 1).

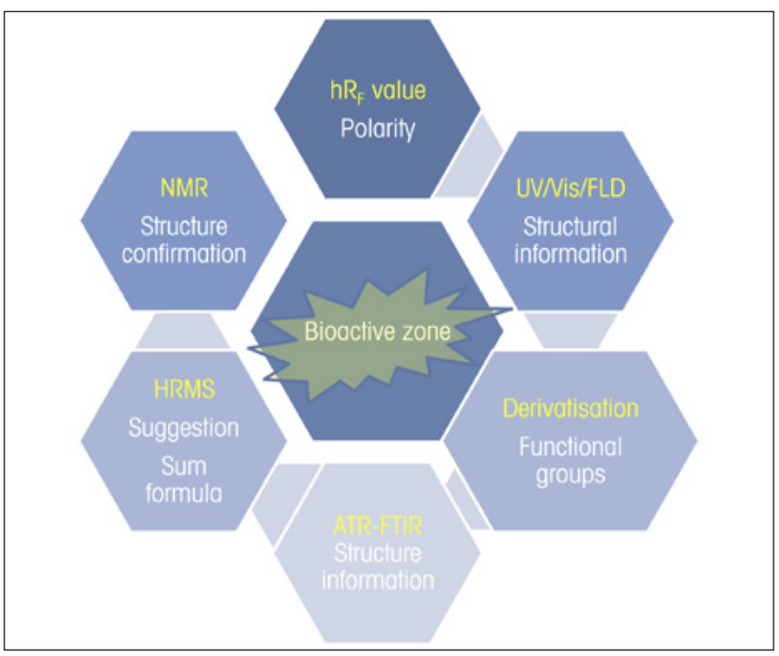

Fig. 3 From the bioactive zone to the structure: hyphenations for effect-directed analysis at an analytical level.

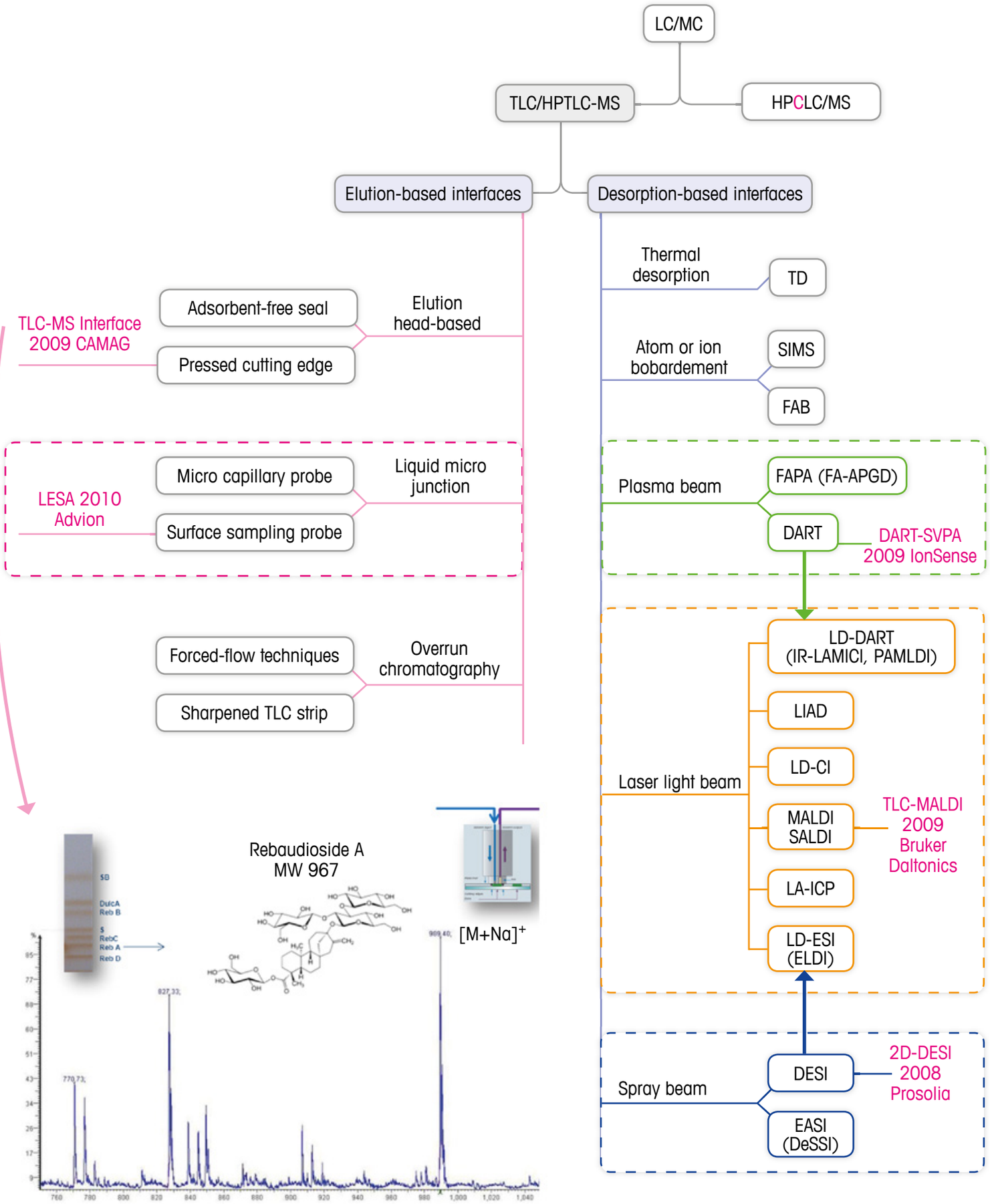

Fig. 4 Approaches involving the TLC/HPTLC-MS combination (red: commercially available systems; circled: scan option; rebaudioside A – mass spectrum obtained by the elution-head-based approach).

how to make these synergies more efficient. It is possible to perform many sample analyses in parallel in anything from one to just a few minutes, which means, in purely mathematical terms, that individual separations take less than a second.

Events always represent an ideal opportunity to discover whether high-performance thin-layer chromatography would be a suitable solution for one's own analytical problems or challenges. For example, more than 333 participants from over 40 countries attended the last HPTLC symposium during 2011 in Basel. HPTLC 2014 will be held in Lyon between 2 and 4 July 2014.

■ **gertrud.morlock@ernaehrung.uni-giessen.de**

Literature
[1] Dytkiewitz, E. & Morlock, G.E. (2008) J. AOAC Int. 91, 1237–1243
[2] Morlock, G. (2010) HPTLC-MS in Pharmaceutical Analysis and Food Analysis. Lecture, University of Applied Sciences Northwestern (FHNW), Basel, Switzerland
[3] Gössi, A. et al. (2012) Chimia 66, 347–349
[4] Morlock, G. et al. (2010) Anal. Chem. 82, 2940–2946
[5] Kampalanonwat, P. et al. (2013) J. Chromatogr. A 1299, 110–117
[6] Wannenmacher, J. et al. (2013) J. Chromatogr. A 1318, 234–243
[7] Lv, Y. et al. (2013) J. Chromatogr. A 1316, 154–159

Gertrud Morlock,

born in 1966, studied and was awarded her doctorate at Saarland University. From 1995 to 1998, she led the chromatography laboratory of a leading Swiss company and then worked as a senior scientific consultant. In 2008, she qualified as a professor at the Hohenheim University in Stuttgart, and since 2010 has been an additional professor there (at the Institute of Food Chemistry with Prof. Dr Wolfgang Schwack). Since 2012, she has held the Chair of Food Sciences at the Justus Liebig University Giessen. Her research areas are planar chromatography, office chromatography, hyphenation in HPTLC, effect-directed analysis, food analysis, natural product screening, pattern recognition, trace analysis, analysis of plant extracts, pharmaceutical formulations and environmental analysis. Gertrud Morlock has received many awards, including the Kurt Täufel Prize for young scientists of the Society of Food Chemistry (LChG) and the Highly Cited Author Award of the Journal of Chromatography A.

Working Group Food Sciences, www.uni-giessen.de/cms/food