



## Authenticity, traceability, counterfeiting:

### a challenge to the chemist that can be tackled by Nuclear Magnetic Resonance spectrometry

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The traceability of a product may be defined as the “ability to trace the history, application or location of manufactured or distributed products”. In this context, counterfeits based on deliberate copying of processes for generic medicines are not straightforward to detect, unless the molecular probe is the active molecule itself. Natural versus synthetic origin of food or cosmetic ingredients is also a concern to the consumer. In this framework, impurity profiling by chromatography is inadequate. Techniques employing stable isotope analyses, in contrast, deal directly with the target molecule by stripping down its atomic composition. Such an intimate constitution is unique and characteristic of the different stages of the history of any molecule.

Historically, the possibility of measuring position-specific  $2\text{H}/1\text{H}$  ratios (quantification of each  $2\text{H}$  at different positions) had been exploited for the detection of forbidden chaptalization of wine and to authenticate natural aromas. The  $^{13}\text{C}$  equivalent methodology ( $^{13}\text{C}$  NMR) has been established only recently. The main difficulty of isotope  $^{13}\text{C}$  NMR is meeting the requirement for a high level of precision: better than 1‰!

Several examples (ethanol, vanillin, tramadol, ibuprofen and naproxen) will be used to demonstrate that  $^{13}\text{C}$  isotopic profiles, by giving access to a larger number of parameters, offer a new tool for the chemist in terms of authenticity and characterization of molecular process (synthetic and/or biosynthetic). Furthermore, by taking advantage of recent developments in NMR, sensitivity and resolution are improved allowing the study of smaller amounts of product. The new concept of ‘isotopomic’ can be then introduced.

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Université de Genève – Bâtiment Sciences II  
Auditoire A. Pictet A100  
30, quai Ernest-Ansermet, Genève

**La conférence est publique**

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