EVOLUTION OVER TWO DECADES OF ANALYTICAL STRATEGIES IN FOOD CHEMICAL SAFETY

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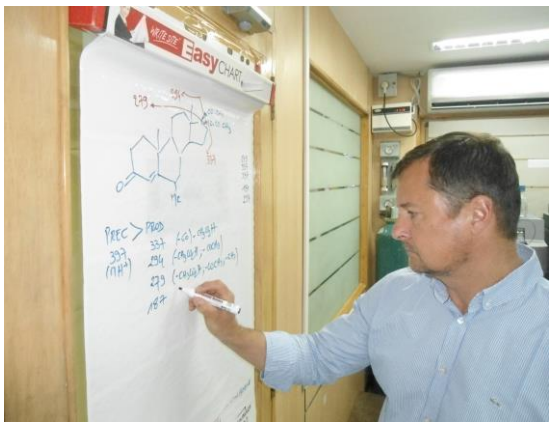
In order to increase consumer confidence in their food, official food control systems rely on laboratories with measurement technologies adapted to the increasing demands of the field. They are faced with the continuous extension of the spectrum of chemical substances to which humans are exposed but also with the need to characterize these molecules at ever lower concentrations. The methods developed to meet these analytical challenges are relying on mass spectrometry under all its forms. Initially based on mono-dimensional mass spectrometry and the use of single quadrupoles, the instrumentation evolved at the beginning of the millennium towards bidimensional mass spectrometry and the use of triple quadrupole systems. High-resolution mass spectrometry, initially based on magnetic sectors and then on time of flight, has seen the emergence of Orbitrap systems before 2010, with the advantage of producing highly resolved recordings while allowing the system to measure any signal within its range. Initially used for very broad targeted screening, the community realized that these systems could also generate information without *a priori* knowledge. This ability was quickly put to use to detect emerging substances as new markers of exposure. What was originally thought to be a competition between targeted and non-targeted approaches turned out to be a complementarity offering extremely promising perspectives for the characterization of the exposome. Non-targeted approaches, whether based on time-of-flight or Orbitrap systems, then offered the Food Safety community a second opportunity to change the paradigm of measurement strategies. Indeed, the capacity of non-targeted approaches based on very high-resolution mass spectrometry has rapidly allowed the search for biomarkers of effect (and no longer the substance itself or its residue) to sign the exposure of livestock to prohibited substances. The biomarkers of effect thus revealed make it possible today, whatever the active molecule used (even if its chemical structure is unknown) to detect a metabolic anomaly in the animal having received the administration of this substance, provided that it belongs to the same pharmacological group. This is the case today for methods targeting growth promoters, notably β-agonists in cattle, and will be the case tomorrow for other pharmacological classes such as steroids or growth hormone, in other species of animals.



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