

Research Activity of Francesca Buiarelli

The research is divided into three main lines:

1. Search for pollutants (PAHs, nitro-PAHs, markers of bioaerosol) in environmental samples (air, water and soil) in collaboration with INAIL Sector Research Certification and Verification. The proposed methods can also be transferred to different matrices such as food and biological.
2. The second line of research is
 - the development, and validation, according to the criteria of the European legislation, of new analytical methodologies for research and determination of endogenous substances and trace contaminants in complex matrices such as: xenobiotics, drug residues, and growth promoters in human and animal biological fluids.
 - Study of the metabolism and excretion of drugs in human urine, and doping substances prohibited by the World Anti-Doping in sport (WADA), as anabolic hormones, protein hormones, corticosteroids, stimulants etc.
 - Study of metabolism of drugs and substances not allowed in the veterinary field in collaboration with the Zooprofilattico Institute and with the National Institute of Health (food safety). Such research has had interesting practical application, since the proposed methods have been applied in the analysis of screening and / or confirmation by the anti-doping laboratory and in the chemical laboratory of the Zooprofilattico Institute.

In parallel, also the active ingredients in pharmaceutical formulations are analyzed quantitatively and proposed as alternative methods to those of Pharmacopoeia, sometimes long and laborious (since they involve the determination of the active ingredients individually). The purpose of the research is to develop methods universal, reliable for routine pharmaceutical analysis, rapid, simple, low cost and fully validated according to current ISO standards and enabling in a single analysis the determination of all the components of a pharmaceutical preparation.

3. Study of the composition, quality and food safety.

For this purpose, the research has focused on the one hand on the characterization of natural organic compounds present in complex food matrices, on the other hand on the search of possible residues and contaminants in foods harmful to human health. Food safety and consumer health are indeed of high priority in our society, therefore the production and consumption of foods have significant economic, social and, in many cases, environmental implications.

The characterization of food allows to verify the authenticity of the products and to highlight potential fraud, contamination and alteration of the same. The food matrices considered are both of plant origin (oils, wines, citrus essential oils, honey, etc.) and animal (milk, eggs, meat, etc.). Some of the studies are conducted in

collaboration with the chemical laboratory of the Zooprofilattico Institute of Lazio and Tuscany, which participates providing raw materials, performing sampling, whereas methods and analysis strategies are studied in our laboratory.

The need for reliable, rapid, and fully validated analytical procedures, requires besides the use of classic chromatographic and electrophoretic techniques (HPLC - UV and CE - UV), especially the GC- MS, HPLC -MS and liquid chromatography coupled to tandem mass spectrometry (HPLC - MS / MS) . In particular the tool used in the latter case is HPLC / mass spectrometry triple quadrupole . Particular attention is paid to the development of rapid, simple and effective procedures for extraction and/or purification of complex samples upstream of chromatographic analysis ,

The studies have been the subject of several scientific publications in international journals and presentation at conferences.