

ABSTRACT

Biochemistry is a fundamental discipline, considered to be a bridge between all the specializations with medical profile - Pharmacy, General Medicine, Dental Medicine or Nutrition, being a common specialized language among the specialists in the field. If in the organic chemistry the equilibrium of a chemical reaction is influenced by physico-chemical factors, most often controllable and modifiable, in biochemistry many laws and dogmas are modified during the reaction, the direction in which a synthesis or degradation process is performed and can be changed at any time, by complex, adaptive and inducible catalytic and regulatory mechanisms by considering also many physiological factors (age, sex, metabolic status, diet, co-administration of treatments, etc.), as well as pathological (enzyme deficiencies, diabetes, dyslipidemia, etc.).

The human body has the ability to synthesize complex molecules: proteins, cholesterol, fatty acids, triglycerides, glycogen, phospholipids etc, starting from simple precursors, moreover, it can synthesize its own enzymes that modify the rate of these reactions and have the ability to control the catalytic effect of key enzymes through the synthesis of hormones and mediators.

In the pharmaceutical field, Biochemistry, although not considered as a speciality discipline, can find applications in many fields, the thesis having an interdisciplinary character, at the border between nutrition, pharmacology, drug analysis, food chemistry, sports medicine, clinical laboratory, because "*Without friends, no one would want to live, even if he had all other goods* - Aristotle."

The habilitation thesis has three main research directions:

Part I - Fortified foods and dietary supplements for a healthy lifestyle or non-quantifiable risk factors?

Part II - Biochemical expertise as an anti-doping tool

Part III - Contribution of biochemical studies in quantifying the efficacy and safety of some substances

The society in which we live, undergoing through continuous change, daily submits the human body to chemical, biochemical, pharmacological and physiological tests, and a healthy lifestyle and nutrition seems an increasingly difficult task. Under these conditions, the use of dietary supplements to correct food deficiencies, with an age-appropriate dosage, is a *sine qua non* indication. Unfortunately, the legislative gap that places dietary supplements, marketed in pharmaceutical forms and containing active substances, sometimes with well-proven pharmacological properties, sometimes, on the contrary, lacking toxicity studies or with a low therapeutic index, under the supervision of the Ministry of Agriculture and Rural Development. Part I of the habilitation thesis, studies the most frequently used types of dietary supplements and, therefore, most often subject to counterfeiting. Numerous cases of poisoning, sometimes fatal, due to the consumption of dietary supplements of questionable quality, purchased from the Internet, are described in the literature.

Part II of the thesis is dedicated to the special biochemical aspects in the metabolism of the athletes. Detecting doping in sports has become a real challenge for analysts, simple biochemical analyses can no longer cope with the multitude of substances used to improve sports performance. The introduction of the "athlete's biological passport" started from the use in doping of substances normally derived from the endogenous synthesis, for which the abuse is extremely difficult to prove. The detection of doping, nowadays, involves not only analytical performance, but especially biochemical and pharmacological knowledge - action on receptors, metabolism pathways, normal compound / metabolite

ratio (testosterone / dihydrotestosterone), or even differences in the glycation of some proteins (erythropoietin).

Part III of the thesis presents biochemical methods for testing the efficacy and safety of some substances through determinations from different biological samples: serum, urine, milk, etc. The use of specific biochemical markers represents the future in the medical field, and biochemistry is a science capable of combining biological aspects (the correct selection of the biological matrix in these determinations or the selection of a specific metabolite for a particular metabolic pathway), with the chemistry of complex endogenous compounds, with high structural organization, upon which their function depends in the end, and the knowledge of the intimate localization of processes, at the level of the organs and of the cellular organelles, represents only an advantage.

The results presented in this thesis unite points located in different research directions from the huge area which means *knowledge in biochemistry*.