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Fund “Nauka” Project № 25022 Resume – Competition-based Session 2025:

“Omega-3 fatty acid dietary supplements: a comparative analysis of content and its correlation with lipid profiles in clinically healthy volunteers”

Project leader: chief assist. prof. Ivelin Rosenov Iliev, PhD, MPharm

The aim of the present study is to investigate the content and dynamic effects of long-chain polyunsaturated omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), present in dietary supplements, on lipid profiles in clinically healthy volunteers, with a primary focus on the early prevention of cardiovascular risk.

In a synthesized framework, the objectives of the multidisciplinary research team include the development and validation of an analytical method for the quantitative determination of long-chain unsaturated omega-3 fatty acids using GC–MS, the application of this method for the assessment of composition and quality of selected dietary supplements available on the Bulgarian pharmaceutical market, the prediction of pharmacokinetic and pharmacodynamic characteristics of EPA and DHA using in silico approaches, and the evaluation of the actual physiological effects of long-chain omega-3 fatty acids in the prevention of cardiovascular diseases.

The subject of the study comprises dietary supplements containing long-chain polyunsaturated omega-3 fatty acids (EPA and DHA) and their effects on the lipid profile of clinically healthy volunteers following a defined period of supplementation.

The obtained data are expected to have scientific and practical relevance. On one hand, they may support the development of preventive and therapeutic strategies aimed at improving lipid metabolism and reducing cardiovascular risk through the identification of predictors of individual response to omega-3 fatty acid supplementation in healthy individuals. On the other hand, the results are expected to contribute to the standardization of analytical procedures for quality control of omega-3-containing products, thereby establishing a reliable basis for regulatory evaluation of their content and purity.

The obtained data are expected to have both scientific and practical value and may be used for the development of preventive and therapeutic strategies aimed at improving lipid metabolism and reducing cardiovascular risk.

Expected results:

1. Analytical and methodological aspect: The developed and validated GC–MS method is expected to enable precise and reproducible quantitative determination of EPA and DHA in dietary supplements. This will contribute to the standardization of analytical procedures for quality control of omega-3-containing products and will establish a reliable basis for regulatory assessment of their content and purity;

2. Computational modeling and mechanistic aspect: The results of the *in silico* analyses are expected to allow the identification of potential molecular targets of omega-3 fatty acids and to elucidate mechanistic relationships between their chemical structure and biological activity. This will support a deeper understanding of the pharmacodynamic mechanisms of EPA and DHA and facilitate the development of predictive models of their effects under different physiological and pathological conditions;
3. Clinical and biological aspect: Based on the monitored changes in lipid profiles, integrated indices (RC, TG/HDL-C ratio, atherogenic index of plasma (AIP), ApoB/A-I ratio, among others), and clinical laboratory parameters including complete blood count, creatinine, glucose, uric acid, C-reactive protein (CRP), AST, and ALT, an evaluation of the biological activity and efficacy of the investigated omega-3 dietary supplements will be performed. Predictors of individual response to omega-3 fatty acid supplementation in healthy individuals are expected to be identified, supporting a personalized approach to cardiovascular disease prevention;
4. Applied scientific and regulatory aspect: The results are expected to contribute to the development of recommendations and standards regarding the content and labeling of omega-3 fatty acids in dietary supplements. This will have direct relevance for the pharmaceutical and food industries by increasing consumer and investor confidence and supporting the implementation of scientifically justified criteria for quality and efficacy;
5. Educational and capacity-building aspect: The implementation of the project will enhance the scientific and practical capacity of early-career researchers through active involvement in all stages of the study, from analytical measurements and statistical analysis to the interpretation of *in silico* and clinical results. Training will be provided in the use of high-technology instrumentation (GC–MS, molecular modeling software) and in the development of skills for integrated analysis of experimental and computational data;
6. Scientific output and dissemination of results: The project is expected to result in three scientific publications, one in the periodicals of the Medical University of Varna and two in journals indexed in international databases (Web of Science and/or Scopus). The results will also be presented at national and international scientific forums, increasing the visibility of the research and contributing to the establishment of a scientific platform for future interdisciplinary projects.