

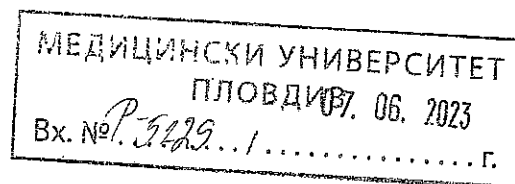
## REVIEW

by

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member of the Scientific Jury set by order No. P-1182/05.05.2023 of the Rector of Medical University of Plovdiv



**Regarding** the competition for filling the academic position of Associate Professor in the Professional Field 7.3. Pharmacy, and Scientific Specialty "Pharmaceutical Technology and Biopharmaceutics", announced in the State Gazette, No. 19, dated 28.02.2023, for the needs of the dept. of Pharmaceutical Technologies, Faculty of Pharmacy, Medical University of Plovdiv.

This Review was prepared in response to order No. P-1182/05.05.2023 issued by the Rector of Medical University-Plovdiv and the decision of the first meeting of the scientific jury held on May 10<sup>th</sup> 2023. The report is in accordance with the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (LDASRB), the Regulations for its Implementation and the Regulations of MU-Plovdiv, for applying the Act aforementioned.

Dr. Plamen Dimitov Katsarov was the sole candidate in the contest for "Associate Professor", announced in the State Gazette No. 19, dated 28.02.2023, for the needs of the department of Pharmaceutical Technologies, Faculty of Pharmacy, Medical University of Plovdiv, currently appointed as Senior Assistant Professor in the same department.

The set of documents presented by the candidate in the electronic format is in full compliance with the National Academic Development Policy Regulations, and meets the Medical University-Plovdiv's institutional criteria (Art. 108) for acquiring the academic position of an Associate Professor.

### ❖ **SHORT BIOGRAPHICAL DATA AND PROFESSIONAL DEVELOPMENT OF THE CANDIDATE**

Assistant Professor Plamen Dimitrov Katsarov was born in 1986. In 2012 he completed his higher education at the Medical University of Plovdiv, obtaining a Master's degree in Pharmacy. Plamen Katsarov's academic career began in 2012 when he joined the Department of Pharmaceutical Technologies at Faculty of Pharmacy, Medical University of Plovdiv as an assistant professor, where in 2017 he successfully defended his dissertation on "Polymeric microspheres with doxylamine and pyridoxine for nasal application", thus obtaining his PhD degree. Since 2018 till now he is a senior assistant professor in the same department. His postgraduate studies continued at the Medical University of Plovdiv, where in 2018 he acquired a specialty in Drug Technology and Biopharmaceutics. Simultaneously, during the period 2013 - 2019 Plamen Katsarov also worked in a community pharmacy, and since 2020 until now the candidate has also worked as a researcher at the Research Institute of Medical University-Plovdiv. Senior asst. prof. Plamen Katsarov has successfully completed several additional classification courses and training seminars on instrumental techniques for chemical analysis, separation and spectral analytical methods,

advances in spray drying, etc. The candidate received the highest score in his institutional appraisal for the period 2019-2021. The candidate is proficient in English and German.

#### ❖ **ASSESSMENT OF THE SCIENTIFIC AND RESEARCH ACCOMPLISHMENTS OF THE CANDIDATE**

##### **I. Publication activity and citation of the scientific papers of the candidate**

In the present competition the candidate presented a total of 26 full-text scientific publications, of which 13 are in referenced and indexed in Scopus and/or Web of Science journals and 12 of these articles are in journals with a high impact factor such as: *European Journal of Pharmaceutical Sciences, Marine drugs, Molecules, Polymers* etc., which testifies the high quality of the candidate's scientific works. The cumulative impact factor of the publications in the contest is 36,671. Plamen Katsarov also presented a list of 13 articles published in unreferred peer-reviewed journals or those published in edited collective volumes. Very impressive fact is that all publications submitted by Sen. Assit. Prof. Plamen Katsarov are in the profile of the scientific specialty of the competition.

During the search in the available databases (Scopus and Web of Science), a total of 152 citations of the scientific papers of the candidate were found. Citations are mostly in specialized journals with high impact factor and one of the listed publications has been cited more than 70 times. The estimated Hirsch index of the candidate is 7, showing that the candidate's research is widely cited and used by other authors, and he himself has an excellent publication image.

The research accomplishments of Plamen Katsarov, were also disseminated through their presentation at 4 renowned international and 21 national or university scientific forums.

##### **II. Research areas and contributions**

The scientific research of Sen. Assist. Prof. Plamen Katsarov is mainly focused on three relevant and significant areas of modern pharmaceutical science, namely: Design and characterization of micro- and nanosized carriers as platforms for targeted drug delivery; Development and optimization of methods for extraction and analysis of natural polysaccharides and development and validation of spectral methods for quantitative analysis of drugs in mixtures.

Some of the major contributions of the candidate in the relevant areas are as follows:

###### ✓ ***Design and characterization of microcarriers as platforms for targeted drug delivery:***

In this direction, the main scientific contribution is that for first time, a high encapsulation efficacy of simultaneously loaded pyridoxine and doxylamine in micro-sized carriers based on cross-linked chitosan was achieved. In addition the two substances were loaded in equimolar concentrations which fully satisfies the therapeutic requirement for equivalent administration of the two drugs. Spray drying was used as a method for preparation microspheres. In the development of the method, the main contribution of fundamental scientific importance was the detailed evaluation of the influence of variables (such as inlet temperature, the speed of supplying the drying gas, the concentration of the starting solutions and the speed of their injection) on the yield of microparticles. Also, for the first time, it has been unequivocally proven that the two drugs are compatible with the chitosan – the excipient used for the preparation of microparticles.

Another significant contribution is the development of mucoadhesive chitosan microparticles loaded with chlorhexidine and their subsequent formulation into tablets for buccal administration. The experimental conditions for obtaining microparticles of high loading efficiency and controlled

drug release were investigated in detail and, as a result, the optimal preparation scheme was derived. The modified release was achieved by using an innovative strategy to cross-link chitosan with glutaraldehyde prior to microsphere preparation, resulting in limiting polymer swelling and sustained chlorhexidine release.

An indisputable scientific contribution of the candidate is the development spray drying method for preparation of microparticles as carriers of essential oils. Microcapsules of maltodextrin and acacia gum were prepared and loaded with peppermint and lavender oil. Optimal technological conditions have been determined to achieve high loading efficiency and, at the same time, a high yield of microcapsules. For the first time, the influence of the type of oil on the encapsulation process and on the structure of the obtained microcapsules was also investigated. The results of the conducted studies undoubtedly expand the fundamental knowledge regarding the use of spray drying as a suitable approach for encapsulating liquid, volatile substances in solid microstructures, with suitable properties for their subsequent formulation into solid dosage forms.

✓ ***Development and optimization of methods for extraction and analysis of natural polysaccharides***

In this direction, the main scientific contribution is the development and validation of method for the extraction of polysaccharides out of algae from the natural flora of the Bulgarian Black Sea. By the method thus developed of acid extraction at elevated temperature and subsequent alkalization and ethanol precipitation, alginate was successfully extracted from *C. Crinita*, and for the first time a detailed analysis of the chemical composition and structure of the extracted polysaccharide was performed. The pronounced anti-inflammatory properties of alginate have been investigated and proven *in vivo* in a rat model of induced inflammation.

Another contribution of Plamen Katsarov is the isolation for the first time of fucoidan from algae *C. crinita*, harvested from the Bulgarian Black Sea. Based on a thorough research the optimal extraction conditions: time for sample sonication, temperature and extraction time - have been derived in order to achieve maximal fucoidan yield. An innovative approach is the preliminary purification of the algae from accompanying substances such as: pigments, lipids and phenols, which is of crucial importance for the quality of the extracted fucoidan.

Another scientific contribution of the candidate's research is the first pharmacognostic analysis of the leaves of *Plantago media*, and subsequently a comparative pharmacognostic analysis of the leaves of *Plantago major*, *Plantago lanceolata* and as a result, the main diagnostic microscopic features in the leaves of *Plantago media* were deduced and the quantitative microscopic parameters were defined. In addition, the process of enzymatic hydrolysis of polysaccharides extracted from *Plantago major* leaves was investigated for the first time in order to obtain low molecular fractions of oligosaccharides, which were subsequently evaluated as potential prebiotics in relation to lactobacillus probiotic bacterial strains.

✓ ***Development and validation of spectral methods for quantitative analysis of medicinal substances formulated individually or in mixtures in drug dosage forms***

The candidate's scientific contributions in this field can be summarized as follows:  
Three new methods for quantitative spectrophotometric determination of doxylamine and pyridoxine in mixtures have been developed and validated.

A quantitative analytical method based on the net signal of the analyte using the partial least squares technique was developed. This method was proven to be used for the quantitative determination of medicinal mixtures of paracetamol, propifenazone and caffeine, which are established in clinical practice, included in a common dosage forms.

A novel UV-spectrophotometric method was developed suitable for quantification of enalapril maleate in two different media – enzyme-free artificial saliva at pH 6.8 and enzyme-free artificial gastric juice at pH 1.2.

On the basis of the thorough analysis of the scientific works of Asst. prof. Plamen Katsarov in the field of development of microdimensional drug carriers and the extraction and detailed characterization of new natural polysaccharides, I believe that the candidate's contributions are a novelty in the technology of drug dosage forms, which can lead not only to the enrichment of the library of natural polymers as potential carriers for the development of innovative drug-delivery platforms, but also to their use as potential drug candidates.

### **III. Monograph evaluation**

For his participation in the competition, the candidate presents a monographic work co-authored with P. Lukova entitled "Polysaccharide microcarriers for drug delivery" ISBN 978-619-189-217-4, published in 2023. The monograph reviewed by two reviewers, consists of 265 pages and is structured in two parts: Part 1, a detailed systematic review of the types of microparticles, as well as the routes of their introduction into the body, with an emphasis on oral, nasal, ocular and dermal route of administration. The second part of the monograph is devoted to the types of polysaccharide polymers and the methods of their extraction from natural sources. An excellent impression is made by the authors' own research presented in the monograph, focused on the preparation of microparticles based on cross-linked chitosan, as carriers of chlorhexidine, which were subsequently formulated into buccal mucoadhesive tablets. Another part of the individual research presented is aimed at the isolation and detailed characterization of two polysaccharides: fucoidan and alginate from Bulgarian brown algae of the *Cystoseira Crinita* species. In addition, an original strategy is considered, modifying the isolated polysaccharides to low molecular weight fractions with subsequent investigation of their prebiotic potential. It is important to mention that the individual research included in the monographic works does not repeat those stated in the works for the candidate's PhD degree acquisition.

### **IV. Participation in scientific research and educational projects**

Sen. Assist. Prof. Plamen Katsarov participated in a total of 11 scientific and educational projects financed by institutional, national or international funding sources, as follows: 5 scientific projects financed by Medical University of Plovdiv, 2 educational projects financed by the Ministry of Education and science of Republic of Bulgaria and 4 projects financed by European Union funds. The participation in the above-mentioned projects testifies the high scientific and educational commitment of the candidate.

## **V. Teaching activities**

Sen. Assist. Prof. Plamen Katsarov is involved in conducting practicals, seminars and practical exams in the disciplines "Pharmaceutical Technology" part I and II and "Biopharmacy and pharmacokinetics" in Bulgarian and English. He also teaches the elective "Pharmaceutical Calculations" course, and also participates in the lecture course on the "Drug Technology and Biopharmacy" discipline for students in the "Pharmacist's Assistant" specialty at the Medical College of the Medical University of Plovdiv. In parallel, for the period 2016-2022, Plamen Katsarov was the academic mentor of Pharmacy students in MU-Plovdiv under the program "Student Practices Phase 1" and "Student Practices Phase 2" of the Ministry of Education and Science. He is also responsible for educational activities of the Department of Pharmaceutical Sciences, Faculty of Pharmacy, MU Plovdiv.

In summary, the study load of Sen. assistant professor Plamen Katsarov for the last three years, according to the reference submitted by the candidate, is over 2527 hours

## **GENERAL ASSESSMENT OF THE CANDIDATE**

After a thorough analysis of the scientific works, teaching activities, projects and contributions of the candidate, it is beyond any doubt for me that Sen. Assist. Prof. Plamen Katsarov, not only meets, but far exceeds the minimum requirements stated in the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB) and the quantitative scientometric indicators according to the Regulations of the MU-Plovdiv for its implementation:

- 26 publications (12, of which in journals with IF), as compared to 10 and 6 required respectively;
- 152 citations in refereed journals, compared to 12 required
- Participation in 11 projects, with 2 required
- Acquired PhD degree in the specialty of the announced competition
- Acquired specialty, also in the scientific profile of the competition

As a result of the above, the candidate collects a total of 3642.17 points, compared to 1270 required by the regulations.

From which, it can be concluded that Sen. Assist. Prof. Plamen Katsarov categorically meets the requirements for holding the academic position of "ASSOCIATE PROFESSOR" laid down in the Institutional regulations the MU-Plovdiv.

## **CONCLUSION**

As a result of the above, I strongly believe that Sen. Asst. Plamen Dimitrov Katsarov fully meets the criteria stated in the Regulations for the terms and conditions for the acquisition of scientific degrees and landing of academic positions at MU-Plovdiv, exceeding the set quantitative indicators for acquiring the academic position of "Associate Professor".

Taking into account the professional qualities and over 10 years of research and teaching experience and his constant development as a scientist in the field of Pharmaceutical Technology I firmly believe that Sen. Assist. Prof. Plamen Dimitrov Katsarov fully meets all the requirements for acquiring the academic position of "ASSOCIATE PROFESSOR" and I confidently give my positive


assessment. I also recommend the members of the scientific jury to vote positively for the election of Sen. Assist. Prof. Plamen Dimitrov Katsarov in the position of "ASSOCIATE PROFESSOR" in professional field 7.3 "Pharmacy", for the needs of the Department of "Pharmaceutical Sciences" of the Faculty of Pharmacy of MU-Plovdiv.

Sofia, May 26<sup>th</sup> 2023

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Заличено на основание  
Чл. 5 §1, б. "В" Регламент (ЕС) 2016/679

Reviewer:

  
/Prof. Denitsa Momekova, PhD/