OPINION

of Assoc. Prof. Dr. Maya Hristova Guncheva,
Institute of Organic Chemistry with the Centre of Phytochemistry (IOCCP)-BAS

a Member of the Scientific Jury, Order of the Director of IOCCP-BAS № РД-09-15/30.01.2025

Regarding: the materials submitted for participation in the competition for the academic position of "Professor" at IOCCP-BAS in the field of higher education 4. Natural Sciences, Mathematics and informatics, Professional Field 4.2 "Chemical Sciences", Scientific Speciality "Bioorganic Chemistry, Chemistry of Natural and Physiologically Active Compounds".

Dr. Lyudmila Georgieva Velkova, an Associate Professor at IOCCP-BAS, is the only candidate in the competition for the academic position of "Professor", announced in the State Gazette No. 104 of 10.12.2024 and on the Website of IOCCP-BAS. The candidate has submitted within the deadline all the necessary materials according to the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (LADRB), the Regulations for its implementation, and the respective Regulations of BAS and IOCCP-BAS on the conditions and procedures for the acquisition of scientific degrees and for holding academic positions.

Lyudmila Velkova completed her higher education at the Faculty of Chemistry (now Faculty of Chemistry and Pharmacy) of Sofia University "St. Kliment Ohridski" in 1988 as an M.Sc. in "Organic and Analytical Chemistry". In 2012, she received a Ph.D. degree after a successful defense at IOCCP-BAS of her Ph.D. thesis entitled: "Structure and function of carbohydrate chains of hemocyanin isolated from the sea snail *Rapana venosa*". Since 2001, she has worked in the Laboratory "Chemistry and Biophysics of Proteins and Enzymes" at IOCCP-BAS, successively holding the positions of chemist-specialist (2001), Assistant Professor (March 2013), Senior Assistant Professor (August 2013), and Associate Professor (2019).

Assoc. Prof. Velkova is a co-author of 72 scientific publications, two co-authored monographs, and two university textbooks. In the current competition, she has participated with six scientific publications, which are considered equivalent to a habilitation thesis (Indicator C, point 4 of Table 2 for Field of higer education 4 - Natural Sciences, Mathematics and Informatics, according to the Regulations for the Immplementation of LADRB for occupation of the Academic Positions at IOCCP-BAS. In addition, she has included 22 scientific publications and two recognized utility model applications under indicator D. None of the above mentioned were included in her doctoral thesis or in the previous competition for the academic position of an Associate Professor and are therefore subject to evaluation.

The distribution of the journals in which the scientific articles submitted for this competition were published, by quartile (Q factor), is as follows Q1 – 10 articles (5 under indicator C and 5 under indicator D); Q2 – 7 articles (1 under indicator C and 6 under indicator D); Q3 – 8 articles (under indicator D); Q4 – 3 articles (under indicator D). The number of citations in Web of Science and Scopus, received after the 2019 competition for the occupation of the academic position "Associate Professor", is 265 points. Her h-index is 12 (excluding all citations of co-authors).

The research activity of Assoc. Prof. Velkova includes the leading of two ongoing projects funded by the Bulgarian National Science Fund and one under the Bulgaria's National Recovery and Resilience Plan, as well as her involvement in 15 other projects funded by national sources, 15 international or bilateral projects, and 2 infrastructural projects. Some of the results in the period following the her habilitation were presented at 31 scientific forums. Assoc. Prof. Velkova is a co-inventor of 6 utility models and 4 registered national patents.

The habilitation thesis of Assoc. Velkova reflects the scientific results of her research on biologically active substances isolated from the mucus and haemolymph of gastropods.

Using state-of-the-art chromatographic, biochemical, and biophysical methods, proteins, peptides, and low molecular weight compounds with biological activity were isolated, identified, and structurally characterized for the first time from the mucus of the garden snail Cornu aspersum. By *de novo* sequencing and interpretation of the results of MALDI-TOF MS/MS analyses, 30 novel peptides with molecular mass below 3 kDa were identified. Structural similarity of the newly isolated peptides with known antimicrobial peptides was established by bioinformatic approaches, suggesting their potential antibacterial, antiviral, and antifungal activities. These results were confirmed by in vitro experiments on microbial strains. The structural reorganization of the peptides in solution was followed experimentally by physicochemical techniques and theoretically by *in silico* molecular dynamics modeling. A hypothesis on the interaction of the formed oligomeric protein structures with bacterial membranes and their antibacterial activity is proposed. Peptide formulations with added activated carbon have been developed, and a utility model has been filed.

By proteomic analysis of fractions of the hemolymph of the sea snail *Rapana venosa* that exhibited antimicrobial activity against different microbial strains, the proteins responsible for the activity were identified, and a hypothesis regarding their mechanism of action was proposed. Biologically active fractions with antibacterial, antifungal, and potentially antitumor activity were isolated from the hemolymph of sea snails of the species *Rapana venosa*. Proteomic analysis, combined with chromatographic and electrophoretic methods, as well as bioinformatic approaches, was used to identify the

proteins responsible for the observed biological effects. On this basis, hypotheses regarding possible mechanisms of action have been proposed.

For the first time, Velkova and co-workers have evaluated the potential of a standardized extract of snail *Cornu aspersum* mucus to improve memory and cognitive performance in scopolamine-induced Alzheimer-type dementia in rats. The research has also been extended to a preparation containing an extract of the mucus of the garden snail *Helix aspersa*. The composition has been protected as a useful model with beneficial effects on Alzheimer-type dementia.

Critical Comments and Recommendations:

I have no critical comments or recommendations for this candidate.

Personal impressions:

I have known Assoc. Prof. Velkova for many years as a colleague in the Laboratory "Chemistry and Biophysics of Proteins and Enzymes". She shows high motivation, scientific precision, and consistency in her work. As an established researcher in the isolation and characterization of enzymes and proteins, she applies state-of-the-art experimental approaches. She actively transfers knowledge to younger researchers in the team.

The research activities of Assoc. Prof. Velkova are characterized by interdisciplinarity and high quality, which is reflected in a significant number of scientific publications and citations, as shown in the attached reference. She successfully manages scientific and applied projects, showing high responsibility and efficiency in their implementation.

I am convinced that Assoc. Prof. Velkova will continue to contribute significantly to the development of the laboratory and the institution as a whole, both through her scientific output and through the training of young staff.

CONCLUSION

The documents and materials submitted by Assoc. Prof. Dr. Lyudmila Georgieva Velkova comply with all the requirements of the Law for the Development of Academic Staff in the Republic of Bulgaria (LADASB), the Regulations for the Implementation of the LADASB, the Regulations for the Implementation of the LADASB of the Bulgarian Academy of Sciences, and the Regulations of the IOCCP-BAS.

The results achieved by the candidate in her scientific research activities fully meet the specific requirements of the IOCCP-BAS Regulations for the application of the LADASB for holding the academic position of "Professor."

After reviewing the materials and scientific works submitted for the competition, and analyzing their significance and the fundamentaland applied contributions they contain, I find it fully justified to give my positive assessment and to recommend that the Scientific Jury prepare a report-proposal to the Scientific Council of IOCCP-BAS for the election of Dr. Lyudmila Georgieva Velkova to the academic position of "Professor" at IOCCP-BAS in professional field 4.2 "Chemical Sciences," Scientific specialty "Bioorganic Chemistry, Chemistry of Natural and Physiologically Active Compounds."

09.04.2025 г. **Signature**:

Sofia /Assoc. Prof. Dr. Maya Guncheva/