

Opinion

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About a competition for the Academic position "Associate Professor" in the area of Higher Education 4. "Natural Sciences, Mathematics and Informatics", professional field 4.3. "Biological Sciences" (Biophysics) for the needs of the Electroinduced and Adhesive Properties Department at the Institute of Biophysics and Biomedical Engineering (IBPhBME), Bulgarian Academy of Sciences (BAS) announced in the State Gazette, issue 27/ 24.03.2023.

The only candidate in the competition for "Associate Professor" is a Senior Assistant Professor Severina Yordanova Semkova, PhD. The review of the submitted documents shows that the procedure for opening and conducting the competition has been followed as the documents have been prepared in accordance with the requirements of the Academic Staff Development Act in the Republic of Bulgaria, the Regulations for its implementation and the Regulations for Development of the Academic Staff (RDAS) at IBPhBME. The candidate has attached in a very diligent and logical form the full set of required documents.

Professional Development

Severina Semkova obtained her master's degree in *Biophysics* at the Faculty of Biology, Sofia University (SU) in 2013. The educational and scientific degree *Doctor in Biophysics*, Severina Semkova acquired in 2017. Her PhD thesis was entitled "*Combined approach for in vitro and in vivo visualization of the penetration and localization of fluorescent nanoparticles in tumors after electroporation*". Severina Semkova began her educational and scientific career in 2014 being enrolled as a doctoral student at IBPhBME and in the meantime is a part-time teacher in *Biophysics* for students in *Medicine* at the Faculty of Medicine, Department of Physics, Biophysics and Radiology, SU. The candidate was appointed as a biologist (part-time 4h) in IBPhBME in 2016. She acquired the academic position "Senior Assistant Professor" at IBPhBME in 2017.

Senior Assist. Prof. Semkova won a scholarship in 2018 from the Ministry of Education and Culture to carry out a postdoctoral research in Japan (1 year). The candidate is still continuing to work with colleagues from Japanese universities and scientific organizations evidenced by their published joint publications. This clearly declares the high quality of her research.

Research activity

The scientific achievements of Senior Assist. Prof. Severina Semkova are mainly in the field of discovering of new natural substances, drugs and their combinations, possessing an antitumor effect, as well as revealing their respective mechanisms of action. To date, the candidate has published 26 scientific papers, 22 of which are in scientific journals with impact factor (IF), 3 in journals with impact rank (SJR) and 1 in conference proceedings. The distribution by quartiles is as follows: 7- Q1; 12- Q2; 2- Q3 and 4- Q4. The total IF of the publications is 73.371. The total number of citations is 93, H-index=7. Senior Assist. Prof. Semkova is the first author of 9 publications.

In the competition of Academic position "Associate Professor", the candidate participates with a total of 17 scientific papers. All 17 scientific works are articles published in peer review journals. Of these 17 publications, 15 are with IF. 2 of the publications are in journals with SJR. The distribution of articles by quartiles is as follows: 4- Q1, 9- Q2, 2- Q3, 2- Q4.

In the reference for the fulfillment of the minimum requirements, it can be seen that 6 scientific papers are included in the Habilitation part. According to indicators B (112/100 fulfilled/required), G (222/200) and D (146/60), it completely covers, and on some of the indicators it exceeds the required number of points determined by IBPhBME for holding the academic position "Associate Professor". The candidate has published her scientific works in scientific journals with a high IF such as *Analytical Chemistry* IF 6.986, *Oxidative Medicine and Cellular Longevity* IF 6.543 and *Journal of Thermal Analysis and Calorimetry* IF 4.755, etc.

Senior Assist. Prof. Severina Semkova has participated in 15 research projects, financed mainly by the National Science Fund, the Ministry of Education and Science and the Sofia University. She participated in 3 international projects. She managed 3 scientific projects as a young scientist. She participated in 34 international and national scientific congresses. Senior Assist. Prof. Severina Semkova received 3 awards for high quality presentation of her research in International and National conferences (2 oral presentations and 1 poster were awarded).

Teaching and expert activity

Senior Assist. Prof. Severina Semkova clearly demonstrates the motivation to develop herself not only as a researcher but also as a teacher by charging herself from the dawn of her research career (2014) to be a part-time teacher in *Biophysics* for students in *Medicine* at the Faculty of Medicine of SU. This additional employment of Senior Assist. Prof. Semkova clearly demonstrates her dedication as a teacher at Sofia University which determines her excellent authority among students and teachers of Sofia University.

Senior Assist. Prof. Semkova has reviewed scientific publications for scientific journals indexed by *Scopus* and *Web of Science*.

Research contributions of the candidate in the field

The main scientific contributions of Senior Assist. Prof. Severina Semkova are formulated as fundamental and applied contributions. The candidate's contributions are framed as basic scientific contributions included in the habilitation work and those outside of it.

Fundamental and applied contributions of the habilitation work: these contributions are in the field of anticancer activity of biologically active substances and drugs on breast cancer cell lines. The efficiency of bioactive substances transfer into the cells was also studied by using the electroporation method. The scientific group in which Senior Assist. Prof. Severina Semkova works, *Electroinduced and Adhesive Properties* Department at IBPhBME, is a leader in the international scientific community distinguished by significant fundamental and applied contributions in the field of transfer of active substances through cell membranes by means of electroporation.

The anti-tumor properties of *Porphyridium sordidum polysaccharide*, trehalose lipid produced by *Rhodococcus wratislaviensis strain*, mono- and di-rhamnolipids were established, as well as a comparison of the effect of two anticancer drugs, miltefosine and cisplatin. Antitumor properties were tested on two different types of breast cancer (low metastatic (MCF-7) and highly metastatic (MDA-MB231) cell lines) and one "normal" epithelial (MCF10A) breast cell line.

Changes in morphology, adhesion, viability, migration and the ability to form colonies in cancer cell lines induced after treatment with biologically active substances and/or drugs have been found. Based on the obtained results, possible mechanisms of action are proposed. It has been found that electrochemotherapy (based on electroporation) is established as a promising method to complement current therapeutic strategies for the treatment of cancers in accordance with the concept of personalized medicine.

Fundamental and applied contributions beyond the habilitation work: effective platforms have been developed to visualize the introduction and delivery of substances into cells and tissues in combination/or not with electroporation; new aspects in the mechanisms of action of conventional anticancer drugs have been proven; the redox status and its relation to the treatment of cancer diseases were established; up-to-date therapeutic approaches based on changes in redox homeostasis have been developed; the antiproliferative and cytotoxic effects of redox-active substances and their combinations with conventional chemotherapeutics have been identified; new applications of approved and/or tested medicinal products have been identified and proven, outside the scope of their original medical indication (the so-called Drug-repurposing). Based on the contributions cited above, it is clear that Senior Assist. Prof. Semkova works in an exceptionally promising scientific field related to socially significant oncological diseases.

The candidate's scientific contributions raise and prove new hypotheses, new facts are obtained, new approaches are created, new mechanisms of action of various types of biologically active substances and drugs on cancerous and non-cancerous cells are suggested. The scientific product generated by the work of Senior Assist. Prof. Semkova, PhD, has proven fundamental and applied contributions, the originality of which lies in the scientific and health priority areas of development, both in Bulgaria and the European Union, which outlines an exceptionally positive forecast for the candidate's future scientific activity.

Personal impressions

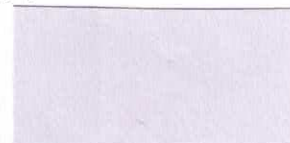
Over the years, Senior Assist. Prof. Severina Semkova proves to be an extremely responsible and dedicated scientist, who is always ready to share all the acquired knowledge and skills as a scientist and as a person. She always demonstrates a desire and readiness to participate in joint projects with colleagues from the country and abroad with his scientific expertise acquired over the years.

Conclusions

Based on what has been described so far, I conclude that the significant contributions of the scientific publications presented in the competition, their impacts in the scientific literature and the clearly defined scientific profile determine Senior Assist. Prof. Severina Semkova as a highly qualified and established scientist in the field of finding new biologically active substances, drugs, methods and approaches for their effective transfer through the cell membrane with contributions to the development of oncology medicine.

The candidate meets all the requirements for holding the academic position "Associate Professor" in the area of higher education 4. "Natural Sciences, Mathematics and Informatics", professional field 4.3. "Biological Sciences", scientific specialty "Biophysics", for the needs of the Department *Electroinduced and Adhesive Properties* at IBPhBME.

Therefore, I recommend to the esteemed members of the Scientific Jury to recommend to the esteemed members of the Scientific Council of IBPhBME-BAS to award Senior Assist. Prof. Severina Yordanova Semkova, PhD, the academic position "Associate Professor".



/Prof. Galya Staneva, PhD/

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