

STATEMENT

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Regarding: The public competition for the position of Associate Professor in the research and educational field codenamed 7.1. (Biochemistry), published in State Gazette No. 64 from 30 Aug 2021.

The procedure for opening the position has been followed according to the officially endorsed guidelines. The relevant documents have been prepared according to the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria and its adjoining Rules of Procedure.

A single candidate has applied for the position within the defined timeframe, namely, Dr. Asya Tsanova, PhD. Dr. Tsanova presently holds the position of Senior Assistant Professor of Biochemistry in the Department of Chemistry and Biochemistry, Physiology and Pathological Physiology at the Faculty of Medicine of the Sofia University “St. Kliment Ohridsky”.

1. Brief career profile of the candidate

Asya Tsanova received her BSc degree in molecular biology in 2003. In 2005, she received her MSc degree in Plant Physiology at the Faculty of Biology of the Sofia University “St. Kliment Ohridsky”. For the following two years, Asya Tsanova worked as a biologist, initially in the Faculty of Biology and later at the TchaikaPharma Highquality Medicines Inc. pharmaceutical company. In 2007, she was elected Assistant at the Department of Chemistry and Biochemistry, Physiology and Pathological Physiology at the Faculty of Medicine of the Sofia University “St. Kliment Ohridsky”. In 2010 she started her doctoral work. In 2014 Asya Tsanova received her PhD degree in the research field codenamed 4.3 Biological sciences (Molecular Biology). The doctoral thesis was titled “ Properties and mechanisms of the interaction of neuropeptides with model membranes and its potential applications in the field pharmacology“ and has been prepared under the supervision of Prof. Zdravko Lalchev, member-correspondent of the Bulgarian Academy of Sciences from the Department of Biochemistry at the Faculty of Biology of the University of Sofia. Since 2015, Dr. Asya Tsanova has been working as a Senior Assistant Professor at the Department of Chemistry and Biochemistry, Physiology and Pathological Physiology at the Medical Faculty of the Sofia University “St. Kliment Ohridsky”.

Research activity of the candidate

Dr. Asya Tsanova participates in the competition for the position of Associate Professor with a total of 49 publications. Of these, 24 are research papers published in peer-reviewed journals and 21 are in non-indexed journals, yearbooks, proceedings of scientific conferences. Dr. Tsanova also coauthored 4 textbooks. By the time of the competition, these

papers have yielded a total of 34 citations in the specialized literature. Of the 49 publications, a total of 45 (namely, 21 papers published in peer-reviewed journals, 21 in non-indexed journals, yearbooks, proceedings of scientific conferences, and all 4 textbooks) were not included in the list of papers related to the PhD thesis of the candidate.

The total impact factor (IF) of the publications in peer-reviewed journals is 24.477, whereas the individual IF is 4.639. Asya Tsanova is the first author in a total of 18 publications. There are a total of 81 reports and communications in international and national scientific conferences. Of these, 73 were not included in the list of papers related to the PhD thesis of the candidate. Thus, the scientific achievements of Dr. Asya Tsanova undoubtedly meet the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria.

Scientific contributions

The works presented for review may be systematized in three thematic areas:

- Analysis of the composition, properties and characteristics of the alveolar surfactant in normal and pathology. This area is comprised of both fundamental and applied components, as the link between the composition of the alveolar surfactant and its properties is examined in fine detail and the obtained results possess significant applied value in the clinical practice.

- Interaction of biologically active molecules (neuropeptides, hydrophilic polymers, antimicrobials) with model membranes. Again, the subject matter is investigated regarding its pure research value as well as the potential applications.

- Last, but not least in importance, is the thematic area dedicated to teaching and education of medical students in the Faculty of Medicine at the University of Sofia. Teaching is a major component of the job of the university researcher and an integral part of their academic career.

In the first thematic area, namely "Analysis of the composition, properties and characteristics of the alveolar surfactant in normal and pathology", the following major contributions may be listed:

- There are significant differences between phospholipid profiles of preterm and term infants.

- The exogenous surfactant Curosurf may significantly improve the composition and properties of the pulmonary surfactant in newborns.

- Analysis of gastric aspirates is a reliable method for determination of lung maturity in newborns. Thus, it could potentially replace the analysis of tracheal aspirates that is more complicated and more invasive. The specific surfactant proteins SP-A, SP-B and SP-C were detected in gastric aspirates from premature infants whose mothers received corticosteroid therapy when pregnant, in order to accelerate fetal lung maturation. The expression of the different isoforms of the the surfactant proteins was found to be timed in the course of intrauterine life.

- The minimum surface tension is the parameter that provides maximum information about the functionality of the alveolar surfactant. As such, it may find practical clinical application for rapid assessment of pulmonary maturity in premature infants.

- The combination of axisymmetric drop shape analysis and Brewster-angle microscopy in gastric aspirates was shown to be effective as a tool for rapid assessment of the risk of developing respiratory distress syndrome in premature infants and the potential need for surfactant therapy.

- There are significant difference in the likelihood of formation of black foam film between preterm infants with respiratory distress syndrome, at-risk infants receiving corticosteroids, and healthy term infants.

- The effectiveness of corticosteroid therapy for acceleration of lung maturity was analyzed in pregnancies occurring after vitro fertilization and in twin pregnancies, demonstrating that corticosteroids activate the biosynthesis of alveolar surfactant in at-risk neonates.

- Addition of hydrophilic polymers (polyethylene glycol, dextran, polyvinylpyrrolidone and hyaluronic acid) their surface properties.

- Addition of polyvinylpyrrolidone and polyethylene glycol to tracheal aspirates in preterm infants with respiratory distress syndrome improves their biophysical parameters, whereas the addition of dextran exerts a negative effect. The positive effect of the addition of polyvinylpyrrolidone and polyethylene glycol is significantly stronger when added to commonly used exogenous surfactants than when added to tracheal aspirates.

- Complete broncho-alveolar lavage was shown to have a beneficial effect in pulmonary alveolar proteinosis, probably via increasing the equilibrium surface tension.

- Hypoxia and use of inhalation anesthetics during surgery may alter the biochemical and biophysical properties of the pulmonary surfactant, probably by modulation of the phospholipid biosynthesis.

- The hanging drop method may be used in clinical practice as a tool for rapid assessment of the functionality of the alveolar surfactant and the individual needs for specific therapy.

In the second thematic area, namely, "Interaction of biologically active molecules with model membranes", the major contributions may be listed as follows:

- There is significant potential of using Langmuir monolayers as a model system for studying the molecular interactions and properties of surface films at the air/water interface in synthetic methionine-enkephalins (Met-enk) and tear film.

- Differently charged forms of methionine-enkephalin exhibit different capacity for penetration in monolayers composed of differently charged phospholipids. A putative mechanism was proposed.

- There were different degrees of penetration of methionine-enkephalins within monolayers of membrane raft lipids. The highest degree of penetration was observed with monolayers made of cholesterol and cholesterol-containing mixtures. Amidated enkephalin Met-enk-NH₂ had apparently higher degree of penetration than unamidated Met-enk. A putative mechanism was proposed.

- The interaction of leucine-enkephalin (Leu-enk) and its amidated form with membrane raft lipids was investigated and significant differences were noted for the two forms. The latter effect was strongest in monolayers composed of sphingomyelin and cholesterol.

- There were significant differences in the surface morphology of dimyristoylphosphatidylcholine monolayers, raft lipids and their mixtures in the presence of enkephalins (Met-enk, Leu-enk and their amides) at different monolayer densities.

- Newly synthesized water-soluble quaternary ammonium benzantrone could penetrate within monolayers composed of lipids modeling bacterial membranes. The effect was most pronounced in negatively charged phosphatidylglycerols and dipalmitoleyl phosphatidyl ethanolamine. A putative mechanism was proposed.

- The interaction between poloxamers and phosphatidylcholine molecules in monolayers and foam films is dependent on the size of the copolymer and the length of the acyl chain of phosphatidylcholines.

- The importance of the combination of hydrophobic and electrostatic intermolecular forces for the lipid-protein interaction was demonstrated using the interaction between the cytochrome b6f complex and monolayers composed of different membrane phospholipids.

- A putative mechanism was proposed for the formation of the contact of cytochrome b6f with monogalactosyldiacylglycerol in thylakoid membranes by the formation of hydrogen bonds between the galactose group of the lipid and the protein portion of cytochrome b6f.

The thematic area dedicated to teaching and education of medical students brings forth the following contributions:

- Novel teaching activities in the subject of Biochemistry, such as small-group discussions, didactic and role-playing games, multimedia-based education, and others have been introduced and real-time tested in the education of medical students at the Faculty of Medicine of the Sofia University. These innovative teaching methods have apparently resulted in significant increase in the students' interest and attention in Biochemistry classes and in their better overall results in the subject.

- The efficiency of hybrid education for students of the Faculty of Medicine has been evaluated and validated.

- The candidate has revealed the need for development of a terminological bilingual dictionary of terms and phrases commonly used in the medical literature, in order to improve the learning process in the academic subjects at preclinical stage.

Summary of the scientific contributions of the candidate

The contributions listed above outline the course of the academic career of Dr. Asya Tsanova and bring out the fundamental as well as the applied aspects of her work in the field. The overall research activities of Dr. Tsanova and the works presented for this competition reveal her excellent background in Biochemistry and her dedication to research and teaching.

Project activities

In the 2005 – 2021 Dr. Asya Tsanova had participated in 18 research projects, mainly with the National Science Fund, but also in projects funded by Operative Programmes.

Teaching activities

Between 2007 and 2015, being an Assistant Professor in the Department of Chemistry and Biochemistry, Physiology and Pathological Physiology at the Faculty of Medicine of the

University of Sofia, Dr. Tsanova taught more than 2500 academic hours of practicals in Biochemistry to medical students at the Faculty of Medicine. In the same period, Dr. Tsanova also taught over 200 academic hours of practicals in Biochemistry to foreign medical students studying Medicine in English at the Faculty of Medicine, and another 200 academic hours of practicals in Biochemistry to students in Biology and Ecology and Environmental Sciences at the Faculty of Biology. Since 2015, Dr. Tsanova has taught more than 1500 academic hours of practicals in Biochemistry to medical students at the Faculty of Medicine and about 900 academic hours of practicals in Biochemistry of foreign medical students. Dr. Tsanova has also taught practicals in Highlights of normal and pathological metabolism to Bulgarian and foreign medical students at the Faculty of Medicine.

Along with other members of the Biochemistry Section of the Department of Chemistry and Biochemistry, Physiology and Pathological Physiology, Dr. Asya Tsanova has actively participated in the preparation of several textbooks in Biochemistry intended for use of medical students at the Faculty of Medicine of the University of Sofia.

Dr. Asya Tsanova apparently possesses impressive teaching experience that exceeds the minimal requirements posed by the Law on the Development of Academic Staff in the Republic of Bulgaria.

Involvement with administrative and research organizations

Dr. Asya Tsanova has been a member of the National Selection Board for state matriculation examinations in Biology and Health education since 2013. Since 2015, Dr. Tsanova has been a member of the Board for examination in Biology of aspiring medical students at the University of Sofia. Since 2018, she has been also a member of the Board for examination in Chemistry.

Dr. Asya Tsanova is a member of the Bulgarian Association of Biochemists since 2019.

Conclusion

The professional achievements of Dr. Asya Tsanova present her as a recognized and respected member of the research community with pronounced capacity for generation of scientific ideas, their further development into research projects and significant potential as a researcher as well as a teacher in higher education.

Considering this, I would strongly advise the distinguished members of the scientific jury to support her candidacy for the position of Associate Professor in the corresponding academic field.

21.11.2021 г.

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/Prof. Stoyan Chakarov, PhD/