Opinion

by Prof. Iva Ugrinova, PhD

Regarding the materials submitted for the competition for the academic position of "professor" in the professional field 4.3. Biological Sciences, professor of Cell Biology, for the Department of Cell Biology and Developmental Biology, needs at the Faculty of Biology, Sofia University "St. Kliment Ohridski," as announced in the State Gazette issue 32 of 09.04.2024.

1. General Information

The review of the documents submitted for participation in the competition shows that the procedure was followed, and the documents were submitted according to the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria (LDASRB) and its regulations.

2. Brief Biographical Data

Tanya Topouzova-Hristova was born on May 17, 1969, in Haskovo. She graduated from Sofia University "St. Kliment Ohridski" in 1994 with a degree in Biology and a specialization in Cell Biology and Developmental Biology, obtaining a Master's degree. In 2008, she defended her doctoral dissertation on "The Influence of Halogenated Inhalation Anesthetics on the Integrity and Reparative Abilities of Lung Cells.". She obtained a Doctor of Cell Biology degree. Since 2014, she has held the position of Associate Professor at the Faculty of Biology at Sofia University. In her teaching activity, Tanya Topouzova-Khristova lectures on Cell Biology, Cytology, Histology, Embryology, and other disciplines for students from various specialties, including Biology, Pharmacy, and Ecology. She supervises diploma and doctoral students and conducts scientific research in cell biology.

3. Publication Activity and Compliance with the Requirements of LDASRB

Associate Professor Dr. Topouzova participated in the competition with 25 publications, 18 of which are in journals with an impact factor (IF). The publications equivalent to habilitation work submitted for the fulfillment of the indicators from group B by Associate Professor Dr. Tanya Topouzova-Khristova with IF are 7. They are distributed by rank in the quartiles of WoS/Scopus as follows: Q1 – 2 (28.6%), Q2 – 4 (57.2%), and Q3 – 1 (14.3%), collecting an IF of 20.904. Five publications in non-refereed journals are also presented for this group of indicators. For covering the indicators from group G, ten publications with IF are presented, distributed by rank in the quartiles of WoS/Scopus as follows: Q1 – 7 (70%), Q2 – 2 (20%), and Q3 – 1 (10%), collecting an IF of 34.535, and 2 publications in non-refereed journals are included in this group. Associate Professor Topouzova has provided data on 166 citations in scientific publications without self-citations

(h-index = 11). Besides scientific publications, she authorizes nine educational aids for students. Tanya has supervised two doctoral students; one successfully defended their thesis, and the other is in their second academic year. She has also supervised 14 diploma students obtaining bachelor's or master's degrees. Her impressive teaching activity is evident from the presented data, showing that she conducts over 210 hours of lectures annually, along with numerous practical exercises.

4. Scientific Activity and Contributions of the Candidate

The publications equivalent to habilitation work submitted to fulfill the indicators from group C by Associate Professor Dr. Tanya Topouzova-Hristova focus primarily on the biological effects of plant secondary metabolites on cultured bacterial and eukaryotic cells.

Pharmacological potential of Bulgarian medicinal plants. Tanya Topuzova-Hristova and her team focus on identifying bioactive compounds from various Bulgarian plants. Various methods have investigated these compounds' activity on bacterial and eukaryotic cells. For example, plant extracts are subjected to chemical analysis to identify their constituent components and tested for various biological activities, such as antimicrobial and antitumor activity. For her research, associate professor Topuzova focused on several species of medicinal plants known for their medicinal qualities - Orpheus flower (*Haberlea rhodopensis)*, white dead nettle (*Lamium album L.*), nine species of the Inula genus were studied, and after a thorough analysis, the elecampane (*Inula helenium*) and rose (*Rosa damascena*), the exciting thing here is that it works on the valorization of plant mass after the extraction of essential oils. In general, the research in this group can be considered as follows:

Determination of the chemical composition of the studied extracts. It has been found that extracts of the Orpheus flower contain numerous bioactive compounds, of which the candidate focuses on purified monoxide. The plant white dead nettle is known for its wealth of secondary metabolites. Chromatography and mass spectrometry have shown that extracts contain various polyphenols, flavonoids, and other compounds with potential biological activity. Sesquiterpene lactones and other bioactive compounds, such as helenin and alantolactone, have been found in the white oman. Flavonoids and phenolic compounds such as geraniol, citronellol, and nerol are also found in the well-known Bulgarian rose, along with many essential oils.

Antimicrobial activity assay. Elecampane extract has a strong antimicrobial effect against various bacterial strains, including pathogenic bacteria (gram-positive and gram-negative) resistant to standard antibiotics. Rosa damascena essential oils and extracts show strong antimicrobial activity against various bacterial and fungal strains.

Study of antitumor activity. Part of the research aims to evaluate the cytotoxicity of plant extracts on cancer cell lines. These tests include measurement of cell viability, proliferation,

and induction of apoptosis. Research has shown that some of the plant compounds (extracts of white dead nettle (*Lamium album L.*), elecampane (*Inula helenium*), and rose (*Rosa damascena*) can inhibit the growth of cancer cells and induce cell death, making them potential candidates for the development of new antitumor drugs.

I want to draw particular attention to a group of publications that I found particularly interesting (publications 01, 04, 05, 07); they reveal the mechanism of action of monox*ide on the lipid membrane and the actin cytoskeleton*. Myconoside has been studied for its influence on the organization of lipids in the cell membrane. This involves using various techniques to visualize and analyze membrane structure, such as fluorescence microscopy and spectroscopy. Research shows that myconoside can induce significant lipid structure changes, affecting membrane fluidity and cell signaling. The actin cytoskeleton maintains cell shape, motility, and intracellular transport. The effect of myconoside on the actin network has been investigated using various biochemical and cell biological techniques. It has been found that myconoside can induce reorganization of the actin cytoskeleton, leading to changes in cell morphology and functions.

I will summarize the contributions of Associate Professor Topuzova, which she indicates for her habilitation thesis. These studies reveal the significant potential of plant extracts as sources of new antimicrobial and antitumor agents. The effects of myconoside on cell membranes and the cytoskeleton contribute to expanding the understanding of cell biology and the potential therapeutic applications of these compounds. Research on *Lamium album L.* shows that traditional medicine can be a source of effective bioactive compounds with applications in modern medicine.

Publications to cover indicators of group D. These publications relate to developing new polymer nanosized drug carriers and studying mechanisms of internalization and release of biologically active cell material. In general, research can be grouped into three groups:

Polymer structures for biomedical applications. Various polymer structures, including microsponges and collagen/zinc titanate nanocomposites, have been developed in collaboration with other institutes. These materials have shown promising antimicrobial properties, making them suitable for biomedical applications, such as fabricating biomaterials for wounds and implants.

Drug loading capacity and release profile. Research has shown that homogeneous coamorphous microsponge-type structures have a high drug-loading capacity and a controlled desorption profile. This means that these structures can effectively deliver drugs to target cells and release the active ingredients in a controlled manner, which is key to optimal therapeutic effectiveness.

Comb-like polyethyleneimines and nanosized polyplex particles. Comb-like polyethyleneimine successfully condenses linear and plasmid DNA into nanosized polyplex particles. These particles show different pathways of internalization and transfection efficiency in human cells, which is important for developing gene therapies and delivering genetic material.

Conclusion

The brief analysis of the presented materials for the competition with which Dr. Tanya Topouzova participates shows the developed topics' high scientific value and originality. This is why I believe that the candidate fully meets and, in many respects, exceeds the requirements of LDASRB and the regulations of Sofia University for occupying the academic position of "Professor" in the professional field of 4.3. Biological Sciences.

From my personal impressions, Tanya is an excellent specialist, a good and responsive colleague, and a wonderful and beloved teacher. She knows how to work with young people, organize teamwork, and seek collaborations with colleagues outside the faculty. Associate Professor Topouzova is undoubtedly an established researcher with extensive experience and possesses the most modern methods and approaches in cell biology.

Based on the above, I strongly recommend that the Scientific Jury approve the candidacy of Associate Professor Dr. Tanya Topouzova-Hristova for the academic position of "Professor" in Cell Biology.

I vote "YES" and wish the candidate success.

31.07.2024

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