

## STAND POINT

In a competition for the academic position "Associate Professor"

In the field of higher education 4. Natural sciences, mathematics and informatics, professional field:

4.3. Biological sciences and scientific specialty "Biophysics",

announced in SN no. 32/26.04.2022

**from Prof. Antoaneta Vidolova Popova**

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member of the Scientific Jury, according to order № 304/30.05.2022 of the Director of IBPhBME-BAS

Only one candidate, Senior Assistant Professor Dr. Anelia Stefanova Kostadinova, applied for the current competition for the academic position "Associate Professor" in professional field 4.3. "Biological Sciences", scientific specialty "Biophysics". Anelia Kostadinova completed her higher education in 1993 and received a Master degree in "Cell Biology and Developmental Biology" at the Faculty of Biology of the Sofia University "St. Kl. Ohridski". In 2003 she joined the Institute of Biophysics of the Bulgarian Academy of Sciences as a specialist in biology. In 2012 she successfully defended a PhD thesis on "Modulation of the interaction of cells with polymer surfaces and membranes" and obtained the educational and scientific degree "Doctor" in professional field 4.3. "Biological Sciences", scientific specialty "Biophysics". Supervisors of the thesis were Prof. DSc. Georgi Altonkov and Prof. DSc. Yana Tsoneva.

Dr. Anelia Kostadinova participates in the current competition with 32 scientific articles, 11 of which in journals with an Impact Factor (from 0.234 to 5.076), 5 in journals with SJR and 15 in journals without IF and not referenced in Scopus or in Web of Science. One book chapter was published in 2019. In 16 of the published articles Dr. Kostadinova is the first author. According to the ranking of scientific journals by quartiles, the papers published by Dr. Kostadinova are as follows – 5 in journals with Q1, 4 in journals with Q2 and 8 in Q3. The published papers were cited 125 times (SCOPUS). Dr. Kostadinova's h-factor, after excluding self-citations in SCOPUS, is 5. Scientific results have been presented at 27 international and national scientific meetings.

Dr. Kostadinova has participated in the implementation of 19 research projects - 12 funded by the Bulgarian Science Fund, 1 - by SU "St. Kl. Ohridski", 2 - by DFG, 1 - by Roshe Diagnostic, 1 - by BMBF-WTZ and was a participant in COST action. Dr. Kostadinova was the principle investigator of an EBR research project with Egypt. When listing the projects, it would be good to include the name of the

respective project, the funding organization and the principle investigator. In the list of projects under number 12 and 14 is given one and the same project.

For the period 2004-2022, Dr. Kostadinova was leading practical courses and lectures in cell biology, cytology and cell cultivation and in biochemistry at the Faculty of Biology of SU "St. Kl. Ohridski". She was the supervisor of 4 diploma students. Dr. Kostadinova realized 6 specializations in Teltow, Germany - at GKSS Research Center, Institute of Chemistry. She is a member of the editorial boards of 3 international scientific journals.

A completed reference for the fulfillment of the minimum national requirements under Art. 2b of the Law on the Development of the Academic Staff of the Republic of Bulgaria (LDASRB), field of higher education 4. Natural sciences, mathematics and informatics, scientific field 4.3. Biological sciences, scientific specialty "Biophysics" for the academic position "Associate Professor". For all indicators (A, B, G and D) are presented more than the required points. Dr. Kostadinova provided an extended habilitation reference of her scientific achievements.

#### **Contributions for the fundamental science**

The interactions of different types of cell lines with synthetic or natural materials, as well as with nanoparticles, were monitored to evaluate the biocompatibility and applicability of these materials in modern biomedicine. Surface hydrophobicity of synthetic membranes and coatings has been shown to be essential for the organization of integrin receptors and focal-adhesive contacts in fibroblasts. To improve the biocompatibility of polymeric synthetic biomaterials, synthetic polydimethylsiloxane coatings have been created by applying plasma treatment, acrylic acid and polyethylene glycol or polyvinylpyrrolidone. It was established that the interaction of cells with the modified surfaces depended on the length, structure and density of the polymer chains as well as on the presence of COOH groups. A new synthetic block-copolymer PDMS-b-PAA (polydimethylsiloxane-block-polyacrylic acid) has also been created for the needs of regenerative medicine. A significant part of research is focused on the development of nanoparticles for biomedical applications. By incorporation of the widely used in cancer therapy drug cisplatin into composite materials as triazole salts, a significant reduction of its side effects was achieved. Novel collagen/zinc titanate antimicrobial biomaterials have been developed. Chitosan-based nanoparticles have been shown to influence the ordering and organization of lipids in biomimetic membranes. Collagen materials, modified with the addition of graphene oxide and silver or silicon compounds, demonstrated increased antibacterial activity and moderate cytotoxicity to human epithelial cells.

**Scientific contributions for practical application, related to the interaction of cell membranes with amphiphilic molecules of natural and synthetic origin.**

The effects of medical plants extracts, rich in biologically active substances (myconoside, sesquiterpene lactones and phenolic acids) were investigated and was shown to affect the arrangement of membrane lipids, cell contacts and the related actin cytoskeleton. A special plug-in was developed through the "Cell Tool" application which allows the evaluation of the lipid order parameter and the fluidity of cell membranes of living cells labeled simultaneously with two fluorescent probes, Dianep and Laurdan. The combined application of the synthetic amphiphilic drugs miltefusin and rimfamycin with an electric field in *in vitro* model systems of cancer and healthy cells, resulted in an increased cytotoxicity of the drugs, which allowed a reduction in the application doses.

Dr. Kostadinova has formulated three topics for her future research:

- Development of new 3D biocompatible nanocomposites with a matrix of RGO (reduced graphene oxide) for the needs of biomedicine and tissue engineering.
- Investigation of the effects of newly synthesized compounds with double selenate salts on biomimetic membranes.
- Investigation of the structural and functional characteristics of liquid crystal nanocomposites for applications in photonics, sensors and biomedicine.

**In conclusion, I believe that the scientific indicators and scientific contributions presented fulfill the minimum national requirements for acquiring the scientific position "Associate Professor", set in the Law on the Development of the Academic Staff of the Republic of Bulgaria for the field of higher education 4. Natural sciences, mathematics and informatics, scientific field 4.3. Biological sciences, scientific specialty "Biophysics". I completely agree Senior Assis. Prof. Dr. Anelia Stefanova Kostadinova to be elected of as "Associate Professor" for the needs of the Department "Lipid-Protein Interactions" at IBPhBME - BAS.**

20.09.2022 г.

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/Prof. Antoaneta Popova/