NATALIA Y. SHILYAGINA

University	National Research Lobachevsky State University of Nizhny Novgorod
Level of English proficiency	B2
Educational program and field of the educational program for which the applicant will be accepted	1.5. Biological Sciences 1.5.2. Biophysics
List of research projects of the potential supervisor (participation/leadership)	Research team leader: 1. RFBR Grant No. 20-34-70124 Stability "Analysis of mechanisms of beta radiation-induced secondary production of hydrogen peroxide in tumour cells and its role in cell response to radiation exposure" (2020-2021) 2. Scholarship of the President of the Russian Federation to young scientists and postgraduate students conducting promising research and development in priority areas of modernisation of the Russian economy SP-1609.2021.4 "Screening studies of a series of new porphyrazine compounds with the properties of photosensitizers and sensors of local viscosity for solving problems of personalised photodynamic therapy" (2021-2022) Core researcher: 1. RSF No. 18-15-00279 "Mechanisms of cell death in photodynamic therapy of neuro-oncological diseases", 2018-2020, extension 2021-2022. Research team participant: 1. State assignment of the Ministry of Science and Higher Education of the Russian Federation No. FSWR-2023-0032 "Influence of urban ecosystems on the adaptation potential of the human body", 2023-2025. 2. State assignment of the Ministry of Science and Higher Education of the Russian Federation No. 0729-2020-0061 (basic part) "Molecular basis of adaptation of living systems", 2020-2022. 3. Project of the Ministry of Science and Higher Education of the Russian Federation "Creation and development of the world-class scientific centre "Photonics Centre" (agreement No. 075-15-2020-927 dated 13.11.2020), 2020-2025.
List of the topics offered for the prospective scientific research	Study of the mechanisms of action of ionising radiation on tumour cells in different modes and exposure doses. Study of combined effects of different types of antitumour therapy. Analysis of the efficacy of photosensitizers of porphyrazine nature and the possibility of their application as agents for personalised photodynamic therapy. Investigation of nano- and submicron particles for selective delivery of antitumour drugs. Analysis of macrophage participation in selective delivery of anti-Stokes nanophosphors to peritoneal tumour foci using human ovarian cancer model as an example.

Research supervisor:

Natalia Y. Shilyagina,

Candidate of Biology Science (Russia)

(Voronezh State University)

Biology and biotechnology

Supervisor's research interests

1. Research in the field of radiobiology: dose-effect relationship, cell death mechanisms, witness effect.
2. Photodynamic therapy research: antitumour activity, cellular uptake features, selectivity of accumulation in tumour models.
3. Research on nano- and submicron particles: targeted delivery systems, diagnosis and therapy of cancer.

Research highlights

The postgraduate student's work will be carried out (depending on the topic chosen) using the following techniques:

- cell culture cultivation,
- confocal fluorescence microscopy,
- flow cytometry,
- assessment of cell culture viability and cell death pathways,
- surface fluorescence imaging,
- radiometric analysis,
- spectrophoto- and fluorimetry.

Supervisor's specific requirements

Basic knowledge in the field of biophysics.
Ability to search for relevant scientific literature in English-language search databases of biomedical data with subsequent analysis of the material.
Proficient use of statistical data analysis software (GraphPad Prizm or other).
Experience in writing scientific articles and presenting papers at scientific conferences.
Good command of English.
Responsibility and diligence.

Supervisor's main publications

ORCID: 0000-0001-5766-6880
WoS (Хирш индекс 14) 15 публикаций
Scopus (Хирш индекс 14) 15 публикации
RSCI (Хирш индекс 12) 40 публикаций

1. Verkhovskii RA, Ivanov AN, Lengert EV, Tulyakova KA, Shilyagina NY, Ermakov AV. Current Principles, Challenges, and New Metrics in pH-Responsive Drug Delivery Systems for Systemic Cancer Therapy. Pharmaceutics. 2023 May 22;15(5):1566. doi: 10.3390/pharmaceutics15051566. PMID: 37242807; PMCID: PMC10222897
(https://pubmed.ncbi.nlm.nih.gov/37242807/)
IF 6.525
2. Shestakova LN, Lyubova TS, Lermontova SA, Belotelov AO,

	Peskova NN, Klapshina LG, Balalaeva IV, Shilyagina NY. Comparative Analysis of Tetra(2-naphthyl)tetracyano-porphyrazine and Its Iron Complex as Photosensitizers for Anticancer Photodynamic Therapy. Pharmaceutics. 2022 Nov 30;14(12):2655. doi: 10.3390/pharmaceutics14122655. PMID: 36559148; PMCID: PMC9786040. (https://pubmed.ncbi.nlm.nih.gov/36559148/) IF 6.525 3. Parakhonskiy B.V., Shilyagina N.Yu, Gusliakova O.I., Volovetskiy A.B.., Kostyuk A.B., Balalaeva I.V., Klapshina L.G., Lermontova S.A., Tolmachev V., Orlova A., Gorin D.A., Sukhorukov G.B., Zvyagin A.V.A method of drug delivery to tumors based on rapidly biodegradable drug-loaded containers // Applied Materials Today,2021, V.25, 101199 https://doi.org/10.1016/j.apmt.2021.101199 https://www.sciencedirect.com/science/article/pii/S2352940721002638 IF 6.514 4. Alzeibak R, Mishchenko TA, Shilyagina NY, Balalaeva IV, Vedunova MV, Krysko DV. Targeting immunogenic cancer cell death by photodynamic therapy: past, present and future. J Immunother Cancer. 2021 Jan;9(1):e001926. doi: 10.1136/jitc-2020-001926. Erratum in: J Immunother Cancer. 2021 Oct;9(10): PMID: 33431631; PMCID: PMC7802670. https://pubmed.ncbi.nlm.nih.gov/33431631/ IF 12.469 5. Guryev EL, Shilyagina NY, Kostyuk AB, Sencha LM, Balalaeva IV, Vodeneev VA, Kutova OM, Lyubeshkin AV, Yakubovskaya RI, Pankratov AA, Ingel FI, Novik TS, Deyev SM, Ermilov SA, Zvyagin AV. Preclinical Study of Biofunctional Polymer-Coated Upconversion Nanoparticles. Toxicol Sci. 2019 Jul 1;170(1):123-132. doi: 10.1093/toxsci/kfz086. PMID: 30985900. https://pubmed.ncbi.nlm.nih.gov/30985900/ IF 4.849
	Results of intellectual activity 1. Russian Federation utility model patent No. 150108. Priority from 29.09.2014. Device for the study of light activity of photosensitisers in vitro. 2. Russian Federation utility model patent No. 151289. Priority from 29.09.2014. Device of enhanced efficiency for the study of light activity of photosensitisers in vitro. 3. Russian Federation Patent No. 2611653 Priority from 23.12.2015. Composition for imaging and damaging target cells. 4. Russian Federation Patent No. 2621710 Priority from 23.08.2016. Porphyrazine, gadolinium porphyrazine complex and their applications. 5. Russian Federation Patent No. 2, 665,471 Priority from 07.12.2017. Cyanoporphyrazine free base and its applications 6. Russian Federation Patent No. 2700421 Priority from 23.07.2018. Method of estimation of hydrogen peroxide content in tumour cells during photodynamic action 7. Russian Federation Patent No. 2672806 Priority from 19.11.2018. Method of photodynamic therapy with real-time efficiency control