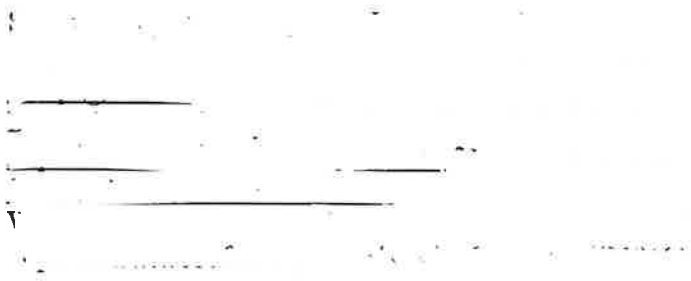
Consiglio Nazionale delle Ricerche
Istituto di Biofisica

**Curriculum vitae et studiorum**

**VERA PLAKHOVA**



## EDUCATION

2000 Ph.D., Biology, Dissertation topic "Mechanisms of interaction of defensins and pyrasins with slow sodium channels of sensory neurons"

1996-2000 Graduate Studies, I.P. Pavlov Institute of Physiology of Russian Academy of Sciences

1991-1996 – specialist, St. Petersburg State University, biological faculty, department of Human and animal physiology

## POSITIONS

2011–present: research fellow (senior), laboratory of physiology of excitable membranes, Pavlov Institute of Physiology, Russian Academy of Sciences, Russia,

2009–2011: research fellow, Pavlov Institute of Physiology, Russian Academy of Sciences, Russia

1998–2009: junior research fellow, Pavlov Institute of Physiology, Russian Academy of Sciences, Russia

1996–1998: junior research fellow, Ukhtomsky Research Institute, St. Petersburg State University, Russia

## GRANTS AND AWARDS

2020 - until now: participant of the research center "Pavlov Center for Integrative Physiology to Medicine, High-tech Healthcare and Stress Tolerance Technologies" funded by the Ministry of Science and Higher Education of the Russian Federation.

2018 - 2021: Grant of the Russian Science Foundation for Basic Research, "New analgesics of endogenous nature: probable mechanisms of modulation of nociceptive signal ls by cardiac steroids", grant manager

2014 - 2016: Grant of the Russian Science Foundation for Basic Research "Possible mechanism of NO-ergic and GABA-ergic regulation of nociceptive signals", grant manager.

2010 - 2016: 2 Grants of the Russian Science Foundation for Basic Research, Principal Investigator

2003: Personal Grant of St. Petersburg Government for Young Scientists

1999: Fellowship of Governor of St. Petersburg for Postgraduate Students

## RESEARCH INTERESTS AND EXPERIENCE

She is the author of a hundred original publications in international and Russian journals in the field of physiology, pharmacology, chemistry, and laser biology. She is the co-author of one monograph published by Bentham Science. She has 1 patent.

Her scientific interests are focused on molecular mechanisms of nociception, especially sodium channels of sensory neurons. She has a strong and documented experience of working in electrophysiology: Patch clamp and Voltage clamp methods, dissociated cell and tissue culture, laser microscopy. Data Analysis and software skills in general: Microsoft Office, PatchMaster, Statistica 10 (StatSoft). Experienced in mentoring pre-graduate, master and Ph.D students.

She participated in many conferences: 33 International Congress of Physiological Sciences (St. Petersburg. Russia, 1997); the second International Conference "Tools for Mathematical modelling" (St.-Petersburg. 1999); International Symposium dedicated to Academician Ivan Pavlov's 150 anniversary "Mechanisms of adaptive behavior" (St. Petersburg, Russia 1999); SPAS on New Approaches to High-Fourth International Workshop Tech: Nondestructive Testing and Computer Simulations in Science and Engineering. (St. Petersburg, Russia, 2000); The Fourth International Conference "Tools for mathematical modeling" (St. Petersburg, Russia, 2003); Pavlov Centenary Symposium "Integrative Physiology and Behavior" (2004, St. Petersburg, Russia); Alexander von Humboldt Foundation Conference "Technologies of the 21st century: biological, physical, informational and social aspects" (St. Petersburg, Russia, 2005); The 2nd St.-Petersburg Humboldt-Kolleg Conference «Technologies of the 21st Century: Biological, Physical, Informational and Social Aspects» (Saint-Petersburg, Russia 2008); the congresses of physiologists of the CIS (Moldova, 2008, Sochi 2014), Global Symposium on Pain "Translational approaches to cause-oriented treatment of pain symptoms" (St. Petersburg, Russia,2012); the NATO Advanced Research Workshop "Advanced Bioactive Compounds Countering the Effects of Radiological, Chemical and Biological Agents" (Yalta, Crimea, Ukraine, 2012); Russia-NATO Advanced Research Workshop on "Prevention of Free Radical Mediated Cardiovascular Injures due to Radiation, Chemical and Biological Agents" (Saint Petersburg, Russia, 2013); International Symposium "Interaction Of Nervous And Immune Systems In Health And Disease" (St. Petersburg, Russia, 2017, 2019); Russian congress "Integrative physiology" (St. Petersburg, Russia, 2018, 2019, 2020, 2021, 2022), SBSP 2021 Hybrid Congress: Special Issue dedicated to 75th anniversary of Fazly Ataullakhanov (Moscow, Russia, 2021);

THE 39TH IUPS CONGRESS (IUPS2022) Marvels Of Life – Integration And Translation (Beijing, China, 2022, online).

**LANGUAGE:**

Russian (native), English (intermediate), Italian (intermediate) Spanish (pre-intermediate).

## List of main publications:

1. Rogachevskii Ilya V., Samosvat Dmitriy M., Penniyaynen Valentina A., **Plakhova Vera B.**, Podzorova Svetlana A., Ma Ke, Zegrya Georgy G., and Krylov Boris V. Role of the rhamnosyl residue of ouabain in activation of the Na,K-ATPase signaling function // Life. 2023. In press.
2. Kalinina Arina D., Rogachevskii Ilya V., Samosvat Dmitriy M., Zegrya Georgy G., Butkevich Irina P., Mikhailenko Viktor A., **Plakhova Vera B.**, Penniyaynen Valentina A., Podzorova Svetlana A., and Krylov Boris V. Analgesic effect of the lysine-containing short peptide is due to modulation of the Nav1.8 channel activation gating device // Membranes. 2023. In press.
3. **Plakhova V. B.,** Samosvat D. M., Zegrya G. G., Penniyaynen V. A., Kalinina A. D., Ke Ma, Podzorova S.A., Krylov B. V. and Rogachevskii I. V. Role of the Guanidinium Groups in Ligand–Receptor Binding of Arginine-Containing Short Peptides to the Slow Sodium Channel: Quantitative Approach to Drug Design of Peptide Analgesics// Int. J. Mol. Sci. 2022, 23 (18), 10640; https://doi.org/10.3390/ijms231810640
4. Rogachevskii I.V., **Plakhova V.B,** Penniyaynen V.A, Kalinina A.D, Podzorova S.A., Samosvat D.M, Zegrya G.G., Krylov B.V. Arginine-containing tripeptides as analgesic substances: the possible mechanism of ligand-receptor binding to the slow sodium channel // Int. J. Mol. Sci. 2022, Vol. 23, N 11. Art. No: 5993. [16]p. DOI https://doi.org/10.3390/ijms23115993
5. Rogachevskii I., **Plakhova V.,** Penniyaynen V., Terekhin S., Podzorova S., Krylov B. New approaches to the design of analgesic medicinal substances // Canadian Journal of Physiology and Pharmacology. 2022. V. 100. N 1. P. 43-52. https://doi.org/10.1139/cjpp-2021-0286
6. **Plakhova V.B.,** Penniyaynen V.A., Terekhin S.G., Podzorova S. A., Kalinina A. D., Krylov B. V. The Role of Slow Sodium Channels in GABAergic and NOergic Modulation of Nociceptive Neuron Excitability // Neurosci. Behav. Physi. 2021. V. 51, P. 831–836. https://doi.org/10.1007/s11055-021-01140-z
7. **Plakhova V.B.,** Rogachevskii I.V., Penniyaynen V.A., Podzorova S.A., Kalinina A.D., Krylov B.V., Nozdrachev A.D. Modulation of voltage sensitivity of slow sodium channels by a synthetic cyclic peptide // Human Physiology, 2021, Vol. 47, No. 5, pp. 564–570. https://doi.org/10.1134/S036211972105008X
8. Rogachevsky I.V., Kalinina A.D., Penniyainen V.A., Terekhin S.G., Podzorova S.A., Krylov B.V., **Plakhova V.B.** A possible mechanism of modulation of slow sodium channels in the sensory neuron

membrane by short peptides // Biophysics, 2021, Vol. 66, No. 4, pp. 579–588. DOI: 10.1134/S0006350921040205

9. **Plakhova V.B.,** Penniyaynen V.A., Rogachevskii I.V., Podzorova S.A., Khalisov M.M., Ankudinov A.V., Krylov B.V. Dual mechanism of modulation of Nav1.8 sodium channels by ouabain // Can J Physiol Pharmacol. 2020. V. 98, 11. P. 785–802. dx.doi.org/10.1139/cjpp-2020-0197
10. Penniyaynen V.A., Khalisov M.M., Podzorova S.A., Ankudinov A.V., **Plakhova V.B.,** and Krylov B.V. Possible antinociceptive mechanisms triggered by nanomolar ouabain concentrations in primary sensory neurons // Neuroscience and Behavioral Physiology, 2021.V. 51, No. 5. P. 687-693. DOI 10.1007/s11055-021-01122-1
11. Penniyaynen V.A., **Plakhova V.B.,** Rogachevsky I.V., Terekhin S.G., Podzorova S.A., Krylov B.V. Molecular mechanisms and signaling by comenic acid in nociceptive neurons influence the pathophysiology of neuropathic pain // Pathophysiology. 2019. Vol. 26. N3-4. P. 245-252. doi.org/10.1016/j.pathophys.2019.06.003
12. **Plakhova V.,** Penniyaynen V., Yachnev I., Rogachevskii I., Podzorova S., Krylov B. Src kinase controls signaling pathways in sensory neuron triggered by low-power infrared radiation // Canadian Journal of Physiology and Pharmacology. 2019. V 97. N.5. P. 400-406. dx.doi.org/10.1139/cjpp-2018-0602
13. Dick O.E., Krylov B.V., **Plakhova V.B.,** Nozdrachev A.D. Modification of the activation system of Nav 1.8 channels determines the molecular mechanism of the antinociceptive response // Biophysics. 2018. T. 63. № 6. C. 921-924. https://link.springer.com/article/10.1134/S0006350918060076
14. Penniyaynen V., **Plakhova V.,** Rogachevskii I., Krylov B. Src kinase is involved in comenic acid-triggered signaling pathways in sensory neurons // Activitas nervosa superior rediviva. 2018. V. 60. N 1. P. 19-27. http://www.rediviva.sav.sk/60i1/19.pdf
15. Tyurenkov I., Perfilova V., Vasil'eva O., Rogachevskii I., Penniyaynen V, Shelykh T., Podzorova S., Krylov B, **Plakhova V.** GABA- and NO-ergic modulators control antinociceptive responses // Activitas nervosa superior rediviva. 2018. V. 60. N 1. P. 1-8. http://www.rediviva.sav.sk/60i1/1.pdf
16. Yachnev I.L., Shelykh T.N., Podzorova S.A., Rogachevskii I.V., Krylov B.V., **Plakhova V.B.** Possible molecular effect related to the reception of low-intensity IR radiation: Role of Src-kinase // Technical Physics 2016, V. 61, N 6, P 929-933. http://link.springer.com/article/10.1134/S1063784216060244?wt_mc=Internal.Event.1.SEM.ArticleAuthorOnlineFirst)
17. Shelykh T. N., Rogachevsky I. V., Nozdrachev A. D., Veselkina O. S., Podzorova S. A., Krylov B. V., and **Plakhova V. B.** Molecular Mechanism of Modulation of Nociceptive Neuron Membrane Excitability by a

Tripeptide // Doklady Biochemistry and Biophysics. 2016. Vol. 466. P. 77–80.) https://link.springer.com/article/10.1134/S1607672916010191

18. Rogachevskii I.V., Shelykh T.N., Podzorova S.A., Krylov B.V., **Plakhova V.B.** Ab initio conformational analysis of marinobufagenin molecule and molecular targets of the action of cardiotonic steroids // Russian Journal of Organic Chemistry 2015, V. 51, N 11, P. 1620–1626 http://link.springer.com/article/10.1134/S1070428015110172
19. Dik O.E., Shelykh T.N., **Plakhova V.B.,** Nozdrachev A.D., Podzorova S.A., Krylov B.V. Application of Bifurcation Analysis for Determining the Mechanism of Coding of Nociceptive Signals // Technical Physics, 2015, Vol. 60, No. 10, pp. 1545–1548. https://link.springer.com/article/10.1134/S1063784215100126
20. Dick O. E., Shelykh T. N., **Plakhova V. B.,** Nozdrachev A. D., Krylov B. V. Comenic Acid Decreases the Impulse Frequency of the Nociceptive Neuron Membrane // Doklady Biochemistry and Biophysics, 2015, Vol. 462, pp. 155–157. DOI: 10.1134/S1607672915030047
21. **Plakhova V.,** Rogachevsky I., Lopatina E., Shelykh T., Butkevich I., Mikhaienko V., Otellin V., Podzorova S., Krylov B. A novel mechanism of modulation of slow sodium channels: from ligand-receptor interaction to design of an analgesic medicine // Activitas Nervosa Superior Rediviva. 2014, Vol. 56, N3-4. P. 55-64. http://www.rediviva.sav.sk/56i3/55.pdf
22. Shelykh, T.N., **Plakhova, V.B.,** Podzorova, S.A. et al. Modulating effect of the cardiotonic steroid marinobufagenin on slow sodium channels // Doklady Biological Sciences. 2014. V. 458. P, 278–280 https://doi.org/10.1134/S0012496614050111
23. **Plakhova V.B.,** Shelykh T.N., Podzorova S.A., Kravtsova, Kornilova E.S., Krylov B.V. Epidermal Growth Factor Modulates Voltage Sensitivity of Slow Sodium Channels // Doklady Biological Sciences. 2013. Vol. 450, P. 123–125. https://doi.org/10.1134/S0012496613030095
24. Yachnev I.L., **Plakhova V.B.,** Podzorova S.A., Shelykh T.N., Rogachevsky I.V. and Krylov B.V. Mechanism of pain relief by low-power infrared irradiation: ATP is an IR-target molecule in nociceptive neurons // Medicinal chemistry. 2012, V. 8, N 1 P. 14-21. DOI:10.2174/157340612799278595
25. Lopatina E.V., Yachnev I.L., Penniyaynen V.A., **Plakhova V.B.,** Podzorova S.A., Shelykh T.N, Rogachevsky I.V., Butkevich I.P., Mikhailenko V.A., Kipenko A.V. and Krylov B.V. Modulation of signal-transducing function of neuronal membrane Na+,K+-ATPase by endogenous ouabain and low-power infrared radiation leads to pain relief // Medicinal chemistry. 2012, V. 8, N.1 33-39. DOI:10.2174/157340612799278531
26. Rogachevskii, I.V., **Plakhova, V.B.** & Shelykh, T.N. Quantum-chemical study on the electronic structure and ligand-receptor binding mechanisms of some pyridin-4(1H)-one and pyran-4-one derivatives // Russian

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Patents:

Krylov B.V., **Plakhova V.B.,** Rogachevsky I.V. Substance with sedative effect// United States Patent No US 8,476,314 B2, Date of Patent Jul 2, 2013

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