

Сведения о научном руководителе диссертации Фирсова Александра Михайловича

«Пермеабиллизация бислойных липидных мембран, индуцированная пероксидазной активностью цитохрома с»

Научный руководитель: Антоненко Юрий Николаевич

Учёная степень: доктор биологических наук

Должность: заведующий лабораторией

Место работы: лаборатория биологически свободного окисления отдела биоэнергетики Научно-исследовательского института имени А.Н. Белозерского Федерального государственного образовательного учреждения высшего образования «Московский государственный университет имени М.В. Ломоносова»

Адрес: г. Москва, ул. Ленинские горы, д.1, стр. 73

Тел.: +7(495)9395149

E-mail: antonen@genebee.msu.ru

Список основных научных публикаций по специальности 03.01.02 – биофизика за последние 5 лет:

1. Pustovidko A.V., Rokitskaya T.I., Severina I.I., Simonyan R.A., Trendeleva T.A., Lyamzaev K.G., **Antonenko Y.N.**, Rogov A.G., Zvyagilskaya R.A., Skulachev V.P., Chernyak B.V. Derivatives of the cationic plant alkaloids berberine and palmatine amplify protonophorous activity of fatty acids in model membranes and mitochondria. **Mitochondrion** 13 (5), 520-525, **2013**.
2. Chernyak B.V., **Antonenko Y.N.**, Domnina L.V., Ivanova O.Y., Lyamzaev K.G., Pustovidko A.V., Rokitskaya T.I., Severina I.I., Simonyan R.A., Trendeleva T.A., Zvyagilskaya R.A. Novel penetrating cations for targeting mitochondria. **Curr. Pharm. Des.** 19 (15), 2795-2806, **2013**.
3. Rokitskaya T.I., Ilyasova T.M., Severina I.I., **Antonenko Y.N.**, Skulachev V.P. Electrogenic proton transport across lipid bilayer membranes mediated by cationic derivatives of rhodamine 19: comparison with anionic protonophores. **Eur. Biophys. J.** 42 (6), 477-485, **2013**.
4. **Antonenko Y.N.**, Khailova L.S., Knorre D.A., Markova O.V., Rokitskaya T.I., Ilyasova T.M., Severina I.I., Kotova E.A., Karavaeva Y.E., Prikhodko A.S., Severin F.F., Skulachev V.P. Penetrating cations enhance uncoupling activity of anionic protonophores in mitochondria. **PLoS One** 8(4):e61902, **2013**.
5. Sorochkina A.I., Kovalchuk S.I., Omarova E.O., Sobko A.A., Kotova E.A., **Antonenko Y.N.** Peptide-induced membrane leakage by lysine derivatives of gramicidin A in liposomes, planar bilayers, and erythrocytes. **Biochim. Biophys. Acta – Biomembranes** 1828 (11), 2428-2435, **2013**.
6. Shchepinova M.M., Denisov S.S., Kotova E.A., Khailova L.S., Knorre D.A., Korshunova G.A., Tashlitsky V.N., Severin F.F., **Antonenko Y.N.** Dodecyl and octyl esters of fluorescein as

- protonophores and uncouplers of oxidative phosphorylation in mitochondria at submicromolar concentrations. **Biochim. Biophys. Acta – Bioenergetics** 1837 (1), 149-158, **2014**.
7. Antonenko Y.N., Kotova E.A., Omarova E.O., Rokitskaya T.I., Ol'shevskaya V.A., Kalinin V.N., Nikitina R.G., Osipchuk J.S., Kaplan M.A., Ramonova A.A., Moisenovich M.M., Agapov I.I., Kirpichnikov M.P. Photodynamic activity of the boronated chlorin e6 amide in artificial and cellular membranes. **Biochim. Biophys. Acta – Biomembranes** 1838 (3), 793-801, **2014**.
8. Rokitskaya T.I., Kotova E.A., Agapov I.I., Moisenovich M.M., Antonenko Y.N. Unsaturated lipids protect the integral membrane peptide gramicidin A from singlet oxygen. **FEBS Lett.** 588 (9), 1590-1595, **2014**.
9. Denisov S.S., Kotova E.A., Khailova L.S., Korshunova G.A., Antonenko Y.N. Tuning the hydrophobicity overcomes unfavorable deprotonation making octylamino-substituted 7-nitrobenz-2-oxa-1,3-diazole (n-octylamino-NBD) a protonophore and uncoupler of oxidative phosphorylation in mitochondria. **Bioelectrochemistry** 98, 30-38, **2014**.
10. Khailova L.S., Silachev D.N., Rokitskaya T.I., Avetisyan A.V., Lyamsaev K.G., Severina I.I., Il'yasova T.M., Gulyaev M.V., Dedukhova V.I., Trendeleva T.A., Plotnikov E.Y., Zvyagil'skaya R.A., Chernyak B.V., Zorov D.B., Antonenko Y.N., Skulachev V.P. A short-chain alkyl derivative of Rhodamine 19 acts as a mild uncoupler of mitochondria and a neuroprotector. **Biochim. Biophys. Acta – Bioenergetics** 1837 (10), 1739-1747, **2014**.
11. Silachev D.N., Khailova L.S., Babenko V.A., Gulyaev M.V., Kovalchuk S.I., Zorova L.D., Plotnikov E.Y., Antonenko Y.N., Zorov D.B. Neuroprotective effect of glutamate-substituted analog of gramicidin A is mediated by the uncoupling of mitochondria. **Biochim. Biophys. Acta – General Subjects** 1840 (12), 3434-3442, **2014**.
12. Омарова Е.О., Антоненко Ю.Н. Ингибирование окислительного гемолиза эритроцитов митохондриально-направленными антиоксидантами серии SkQ. **Биохимия** 79 (2), 187-194, **2014**.
13. Denisov S.S., Kotova E.A., Plotnikov E.Y., Tikhonov A.A., Zorov D.B., Korshunova G.A., Antonenko Y.N. A mitochondria-targeted protonophoric uncoupler derived from fluorescein. **Chemical Communications** 50 (97), 15366-15369, **2014**.
14. Firsov A.M., Kotova E.A., Korepanova E.A., Osipov A.N., Antonenko Y.N. Peroxidative permeabilization of liposomes induced by cytochrome c/cardiolipin complex. **Biochim. Biophys. Acta - Biomembranes**, 1848 (3), 767-774, **2015**.
15. Antonenko Y.N., Rokitskaya T.I., Huczyński A. Electrogenic and nonelectrogenic ion fluxes across lipid and mitochondrial membranes mediated by monensin and monensin ethyl ester. **Biochim. Biophys. Acta - Biomembranes**, 1848 (4), 995-1004, **2015**.
16. Antonenko Y.N., Nechaeva N.L., Baksheeva V.E., Rokitskaya T.I., Plotnikov E.Y., Kotova E.A., Zorov D.B. Intramitochondrial accumulation of cationic Atto520-biotin proceeds via voltage-dependent slow permeation through lipid membrane. **Biochim. Biophys. Acta - Biomembranes**, 1848 (6), 1277-1284, **2015**.
17. Omarova E.O., Nazarov P.A., Firsov A.M., Arkhipova A.Y., Moisenovich M.M., Agapov I.I., Strakhovskaya M.G., Ol'shevskaya V.A., Zaitsev A.V., Kalinin V.N., Kotova E.A., Antonenko Y.N. Carboranyl-chlorin e₆ as a potent antimicrobial photosensitizer, **PLoS ONE**, 10 (11), e0141990, DOI: 10.1371/journal.pone.0141990, **2015**.
18. Рокицкая Т.И., Фирсов А.М., Котова Е.А., Антоненко Ю.Н. Фотодинамическая инактивация грамицидиновых каналов в бислоистой липидной мембране: зависимость эффективности защитного действия тушителей синглетного кислорода от локализации фотосенсибилизатора. **Биохимия (Biochemistry (Moscow))**, том 80, № 6, с. 882-890, **2015**.
19. Antonenko Y.N., Gluhov G.S., Firsov A.M., Pogozheva I.D., Kovalchuk S.I., Pechnikova E.V., Kotova E.A., Sokolova O.S. Gramicidin A disassembles large conductive clusters of its

lysine-substituted derivatives in lipid membranes. **Phys. Chem. Chem. Phys.**, 17, 17461-17470, **2015**.

20. Хайлова Л.С., Назаров П.А., Сумбатян Н.В., Коршунова Г.А., Рокицкая Т.И., Дедухова В.И., **Антоненко Ю.Н.**, Скулачев В.П. Разобщающее и токсическое действие алкил-трифенилфосфониевых катионов на митохондрии и бактерии *Vacillus subtilis* в зависимости от длины алкильного фрагмента. **Биохимия (Biochemistry (Moscow))**, том 80, № 12, с. 1851-1860, **2015**.

21. Силачев Д.Н., Зорова Л.Д., Усатикова Э.А., Певзнер И.Б., Бабенко В.А., Гуляев М.В., Пирогов Ю.А., **Антоненко Ю.Н.**, Плотников Е.Ю., Зоров Д.Б. Митохондрии как мишень для нейропротекции. **Биологические мембраны**, том 32, № 5-6, с. 388-398, **2015**.

22. Serpionov G.V., Alexandrov A.I., **Antonenko Y.N.**, Ter-Avanesyan M.D. A protein polymerization cascade mediates toxicity of non-pathological human huntingtin in yeast **Scientific Reports** 5, 18407-18407, **2015**.

23. Rokitskaya T.I., Khailova L.S., Makarenkov A.V., Ol'shevskaya V.A., Kalinin V.N., **Antonenko Y.N.** Weak C-H acids as protonophores can carry hydrogen ions through lipid membranes and mitochondria: a case of o-carborane. **Phys.Chem.Chem.Phys.**, 18 (24), 16476-16482, **2016**.

24. Rokitskaya T.I., Murphy M.P., Skulachev V.P., **Antonenko Y.N.** Ubiquinol and plastoquinol triphenylphosphonium conjugates can carry electrons through phospholipid membranes. **Bioelectrochemistry**, 111, 23-30, **2016**.

25. **Antonenko Y.N.**, Denisov S.S., Silachev D.N., Khailova L.S., Jankauskas S.S., Rokitskaya T.I., Danilina T.I., Kotova E.A., Korshunova G.A., Plotnikov E.Y., Zorov D.B. A long-linker conjugate of fluorescein and triphenylphosphonium as mitochondria-targeted uncoupler and fluorescent neuro- and nephroprotector. **Biochim. Biophys. Acta - General Subjects**, 1860 (11), 2463-2473, **2016**.

26. Rokitskaya T.I., **Antonenko Y.N.** Fullerenol C60(OH)24 increases ion permeability of lipid membranes in a pH-dependent manner. **Biochim. Biophys. Acta - Biomembranes**, 1858 (6), 1165-1174, **2016**.

27. Firsov A.M., Kotova E.A., Orlov V.N., **Antonenko Y.N.**, Skulachev V.P. A mitochondria-targeted antioxidant can inhibit peroxidase activity of cytochrome *c* by detachment of the protein from liposomes. **FEBS Letters**, 590 (17), 2836-2843, **2016**.

28. Rokitskaya T.I., Kotova E.A., Naberezhnykh G.A., Khomenko V.A., Gorbach V.I., Firsov A.M., Zelepuga E.A., **Antonenko Y.N.**, Novikova O.D. Single channel activity of OmpF-like porin from *Yersinia pseudotuberculosis*. **Biochim. Biophys. Acta - Biomembranes**, 1858 (4), 883-891, **2016**.

29. **Antonenko Y.N.**, Lapashina A.S., Kotova E.A., Ramonova A.A., Moisenovich M.M., Agapov I.I. Application of peak intensity analysis to measurements of protein binding to lipid vesicles and erythrocytes using fluorescence correlation spectroscopy: dependence on particle size. **Journal of Membrane Biology**, 250 (1), 77-87, **2017**.

30. Chistyulin D.K., Rokitskaya T.I., Kovalchuk S.I., Sorochkina A.I., Firsov A.M., Kotova E.A., **Antonenko Y.N.** pH-Dependent properties of ion channels formed by N-terminally glutamate substituted gramicidin A in planar lipid bilayers. **Biochim. Biophys. Acta - Biomembranes**, 1859 (5), 896-902, **2017**.

31. **Antonenko Y.N.**, Denisov S.S., Khailova L.S., Nazarov P.A., Rokitskaya T.I., Tashlitsky V.N., Firsov A.M., Korshunova G.A., Kotova E.A. Alkyl-substituted phenylamino derivatives of 7-nitrobenz-2-oxa-1,3-diazole as uncouplers of oxidative phosphorylation and antibacterial agents: involvement of membrane proteins in the uncoupling action. **Biochim. Biophys. Acta - Biomembranes**, 1859 (3), 377-387, **2017**.

32. Nazarov P.A., Osterman I.A., Tokarchuk A.V., Karakozova M.V., Korshunova G.A., Lyamzaev K.G., Skulachev M.V., Kotova E.A., Skulachev V.P., **Antonenko Y.N.** Mitochondria-

targeted antioxidants as highly effective antibiotics. **Scientific Reports**, 7 (1), 1394. doi: 10.1038/s41598-017-00802-8, **2017**.

33. Rokitskaya T.I., Nazarov P.A., Golovin A.V., **Antonenko Y.N.** Blocking of single α -hemolysin pore by rhodamine derivatives. **Biophys. J.** 112 (11), 2327-2335, **2017**.

34. Rokitskaya T.I., Kosenko I.D., Sivaev I.B., **Antonenko Y.N.**, Bregadze V.I. Fast flip-flop of halogenated cobalt bis(dicarbollide) anion in a lipid bilayer membrane. **Phys.Chem.Chem.Phys.** 19 (36), 25122-25128, **2017**.

35. Хайлова Л.С., Рокицкая Т.И., Котова Е.А., **Антоненко Ю.Н.** Влияние цианида на деполяризацию митохондриальной мембраны под действием разобщителей. **Биохимия**, 82 (10), 1489-1496, **2017**.

36. Firsov A.M., Rybalkina I.G., Kotova E.A., Rokitskaya T.I., Tashlitsky V.N., Korshunova G.A., Rybalkin S.D., **Antonenko Y.N.** A conjugate of decyltriphenylphosphonium with plastoquinone can carry cyclic adenosine monophosphate, but not cyclic guanosine monophosphate, across artificial and natural membranes. **Biochim. Biophys. Acta - Biomembranes**, 1860 (2), 329-334, **2018**.

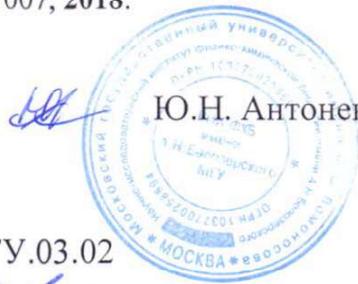
37. Firsov A.M., Kotova E.A., **Antonenko Y.N.** Calcein leakage as a robust assay for cytochrome c/H₂O₂-mediated liposome permeabilization. **Anal. Biochem.**, doi: 10.1016/j.ab.2017.03.014, **2018**.

38. Popova L.B., Nosikova E.S., Kotova E.A., Tarasova E.O., Nazarov P.A., Khailova L.S., Balezina O.P., **Antonenko Y.N.** Protonophoric action of triclosan causes calcium efflux from mitochondria, plasma membrane depolarization and bursts of miniature end-plate potentials. **Biochim. Biophys. Acta - Biomembranes**, 1860 (5), 1000-1007, **2018**.

Д.б.н., профессор, зав. лаб. НИИ ФХБ МГУ



Ученый секретарь Диссертационного Совета МГУ.03.02



Ю.Н. Антоненко

М.Г.Страховская