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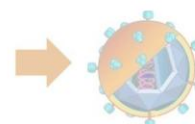
Ph D, D Sci (Chem), assist. Professor



Head
Res. Center for Biomodulators
& Drug Systems, Health RDF
Principal Scientist
Lab. Polyelectrolyte Chemistry
and Biomed. Polymers, TIPS RAS



Design ↔ Synthesis ↔ Evaluations ↔ Modeling
of Macromolecular Drug Systems
for nano-competent Poly-Antivirals Development



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Curriculum Vitae extract
June, 2023

Education

- 1981 – M.S.** Chemical Technology. Graduated with honor. Lomonosov Inst. of Fine Chemical Technology, Moscow, Russia; Honorary diploma of the Student Research Society membership.
- 1987 – Ph.D.** Chemistry. A.V.Topchiev Institute of Petrochemical Synthesis, Russian Academy of Science, Moscow, Russia. *Thesis: Biologically active copolymers based on furane and maleic anhydride.*
- 2005 – Dr.Sci.** Chemistry, *ibid.*, *Thesis: The ways to develop a combined antiviral activity via bio-selective polymeric systems.*
- 2013 – Associate Professor**

Employment

- 1983-2023 – Chief Researcher from 2017;** Leading Researcher from **2007;** Senior Researcher from **1997;** Research Fellow from **1990;** Junior Researcher from **1987;** Engineer from **1985;** Research collaborator (Postgraduate student from **1983**), A.V. Topchiev Institute of Petrochemical Synthesis, RAS, Moscow,
- 1996-2022 – Head of Research Center** (Department) for Biomodulators and Drug Systems (BDRC), Health Research & Development Foundation (Health RDF), Moscow, Russia;
- 1992-1996 – Director,** Synthetic Biomodulators Research Center of Urban Ecology Union Ltd. (SBRC UEU Ltd.), which has been reorganized to establish the BDRC Health RDF,
- 1989-1993 – Director,** Department for Systematic Studies, UNIO-INVEST, Moscow,
- 1981-1983 – Research collaborator,** The Lomonosov Institute of Fine Chemical Technology, Moscow;

Membership in the Global Science Communities

- 1998 - present day,** The QSAR and Modeling Society - The Cheminformatics and QSAR Society (member of the Russian branch).
- 2011 - American Nano Society** (2013 - Russian Local Section)
- 1993, 1999 - 2015,** The International Society for Antiviral Research (ISAR).

Research interests and expertise

Development of the medically relevant biomodulators and drugs

Design, synthesis and evaluations of new immunomodulators, antitumour and antiviral agents including inhibitors of HIV, influenza, herpes, encephalitic, rabies, cytomegalo- and other viral infections. Redesigning of small molecule bioactive substances toward the novel (non-toxic, high effective, resistance preventing) macromolecular systems for nano-competent/selective therapeutic interventions in viral life cycles.

The used experimental techniques: SAR & QSAR Computer-aided modeling and prediction of bioactive compounds and medicines; organic, peptide and polymeric syntheses, analytic chemistry, NMR-, IR-, UV-visible, Mass- spectroscopy, cytotoxic and antiviral assays, preclinical research.

Scientific Projects

- 1982-1985** (Russia, TIPS USSR AS – Virology Inst. RAMS Project #91) “*In search for the novel interferon inductors*”; Engineer-Investigator
(Russia, TIPS USSR AS Project #0182.7019872) “*Synthesis of water-soluble copolymers on the basis of maleic anhydride*”, Engineer-Investigator
- 1986-1987** (Russia, TIPS USSR AS – Virology Inst. USSR AMS Project #98) “*In search for the novel interferon inductors among the maleic anhydride copolymers*”, Junior Researcher;
- 1987** (Russia, TIPS USSR AS, Project #76) “*Exploring a reactive capacity of alkenyl monomers in en-synthesis reactions purposed for production of materials with complex of special properties*”, Junior Researcher;
- 1986-1990** (Russia, TIPS USSR AS Project) “*Development of methodology for molecular constructing the water-soluble heteroatomic polymers capable of an immune stimulating activity purposed for design of drugs aimed to combat diseases of various infections etiology*”, Researcher;
- 1990** (Russia, TIPS USSR AS Project) “*Design of macromolecular therapeutic systems against the virus of AIDS (New generation of anti-AIDS drugs)*”, Researcher;
- 1991-1993** (Russia, TIPS RAS Project) “*Development of scientific principles for constructing the antiviral acting macromolecular therapeutic systems (MTS)*”, Researcher;
- 1991-1995** (Russia, TIPS RAS – Oncology Center USSR AMS Project) “*Design of new generation of preparations (the macromolecular therapeutic systems) for treatment of malignant neoplasm*”, Researcher;
- 1992-1994** (Russia, TIPS RAS Project 3.7.) “*Development of principles for constructing the novel polycarboxylic-based polymeric drugs to combat the viral and oncologic diseases*”, Researcher;
- 1994-1996** (Russia, TIPS RAS - Virology Inst. RAMS - SBRC UEU Ltd. Project) “*Amplifying the antiviral vaccines via immune-adjuvant properties of polycarboxylic polymers*”, Researcher and SBRC UEU Ltd. coordinator;
- 2001-2005** (Russia – USA) International Science and Technology Center Project # 2175p, “*A Therapeutic HIV Vaccine*”, Sub-manager within the Health RDF,
- 2006-2009** (Russia – USA) International Science and Technology Center Project # 3272, “*New generation of Anti-HIV-1 Compounds*”, Sub-manager from the Health RDF,
- 2006-2009** (Russia – Holland) RFBR/NWO Project # 047.011.2005.009, “*Polymers in nanomedicine: design, synthesis and study of inter-polymer and polymer-virus complexes in search for novel pharmaceutical strategies*”. Coordinator of Russian Institutions, Head of research group from BDRC, Health RDF,
- 2013-2017** (Russia, TIPS RAS Project # 01201353041) “*Polymers and polymeric materials for medicine and biology*” Scientific leadership of the Project.
- 1995-2021** *Managing scholarships for PhD students (5)*, projects/theses: “*Biologically active membrane-tropic polymers on the basis of maleic anhydride*”; “*Modification of the polymeric carboxy- and sulfonic acids’ structure and bio-selectivity by alicycles functional derivatives*”; “*Synthesis and properties of anionic polyelectrolytes contained the fragments of HIV amino acids and nano-structured capsid proteins*”; “*Computer-aided modeling the nano-bio-selective polymeric systems based on hetero-functional polyelectrolytes*”; “*Modeling the synthesis and regulative processes of structure-isomeric basis of the “DIVEMA” series biomedical copolymers*”.

Selected publications and patents

- *Burstein M.E., Serbin A.V., Khakhulina T.V. et al., Inhibition of HIV-1 replication by newly developed adamantane-containing polyanionic agents. Antiviral Research* **1999**; 41 (3):135-144; PMID: 10320046, DOI: 10.1016/S0166-3542(99)00006-6
- *Serbin A.V., Kasyan L.I., Bourchteine M.E., and Boukrinskaya A.G. Norbornene containing antivirals: synthesis and evaluation of new polyanionic derivatives. Antiviral Research.* **1999**; 41(2):46
- *Bourchteine M., Serbin A., Khakhulina T., Bukrinskaya A. Different adamantane derivatives inhibit HIV-1 replication in vitro. Antiviral Research* **2000**, 46 (1): A44
- *Timofeev I.V., Bakulina A.Yu., Serbin A.V., et al. Chemokine receptor CCR5: biotechnological study of function, spatial organization, and role in AIDS pathogenesis. Biotechnology in Russia,* **2002**; (4): 11-23.
- *Timofeyev I.V., Serbin A.V., Timofeyev D.I., et al., Analysis of the chemokine receptor CXCR4 structure-function arrangement, and development of new approaches to the HIV inf. therapy. Biotechnology (Russ.).* **2003**;(4):3-21.
- *Serbin A.V., Alikhanova O.L., Timofeev I.V., et al., An approach to development of anti-HIV agents with double antiviral protection. Antiviral Research* **2003**; 57(3):50.
- *Kozeletskaia KN, Stotskaia LL, Serbin AV et al., Structure and antiviral activity of adamantane-containing polymer preparation. Vopr Virusol.* **2003**;48(5):19-26
- *Timofeev DI, Perminova NG, Serbin AV, Kiseleva Ia Iu, Nekliudov VV, Vatolin G Iu, Kas'ian LI, Grebinik TS,*

Timofeev IV [HIV-inhibiting activity of polyanion matrices and related substances containing adamantane and norbornene pharmacophores] *Antibiot Khimioter.* **2003**;48(5):33-41. PMID: 12968467

- Timofeev D.I., Perminova N.G., Serbin A.V., et al., Membranotropic substances and drugs acting on the earliest stages of HIV infection. // *Antibiotics and Chemotherapy (Russia)* **2004**; 48(2):29-41, PMID: 12803048
- Serbin A.V., Timofeyev I.V., Alikhanova O.L., et al., Synthetic polymeric antagonists for receptors of HIV-1 entry into human cells. *Antiviral Research*, **2004**, 62(2):35
- Kiseleva I.I., Perminova N.G., Iasunova O.A., Timofeev D.I., Serbin A.V. et al. Antiviral action of membranotropic compounds modified by adamantane and norbornene pharmacophores exerted on different HIV-1 strains. *Mol Gen Mikrobiol Virusol.* **2005**;(2):33-6. PMID: 15954475
- Egorov Y., Serbin A., Kasyan L., Tarabara I., Alikhanova O. Intramolecular alicyclic synergists for polyanionic antivirals. *Antiviral Research.* **2006.** 70(1):42.
- Burshtein M., Serbin A., Bukrinskaya A. Effect of different adamantane and norbornene derivatives on HIV-1 infection in vitro. *Antiviral Research.* **2006.** 70(1):45.
- Bukrinskaya A, Serbin A., Vorkunova G., Burshtein M. Two forms of HIV-1 matrix Proteins as targets for antiviral compounds. *Antiviral Research.* **2006.** 70(1):85.
- Serbin A., Egorov Y., Tykvinski S., Alikhanova O. Nano-responsible multifunctional antivirals. *Antiviral Research.* **2006.** 70(1):86.
- Egorov Y., Serbin A., Alikhanova O., et al. A Raft-tropic Antivirals: I. Synthesis and anti-HIV-1 Evaluation of Cholesterol-containing Polyanions. *Antiviral Research.* **2007.** 74(3):49
- Serbin A., Egorov Y., Alikhanova O. Poly-cooperation of ionic and non-ionic antiviral vectors. *Antiviral Research.* 2007. 74(3):A51
- Kas'yan L. I., Serbin A. V., Kas'yan A. O., Karpenko D. V., Golodaeva E. A. Reactions of Bi-, Tri-, and Tetracyclic Amines with Succinic Anhydride. *Russian Journal of Organic Chemistry (English transl. Springer)* **2008**; 44(3):340-347;
- Pavlova M.V., Fedorova N.E., Serbin A.V., et al. Antiviral activity of polycarboxylic substances modified by cage hydrocarbon and sulfoacid pharmacophors against cytomegalovirus infection in vitro. *Antibiotics and Chemotherapy (Russia)* **2008**; 53(7-8):8-14; PMID: 19227117
- Pavlova M.V., Fedorova N.E., Serbin A.V., Klimova E.V., Karaseva E.N., Golyshev S.A., Kushch A.A. [Influence of membrane-active polyanions on various stages of the human cytomegalovirus life cycle in vitro] *Antibiot Khimioter.* **2008**;53(11-12):3-10. PMID: 19441649
- Vorkunova G.K., Kalnina L.B., Burshtein M.E., Serbin A.V., Rodionov I.L., Pavlova M.V., Bukrinskaya A.G. [Effects of novel antiviral agents on HIV-1 replication] *Vopr Virusol.* **2009** Mar-Apr;54(2):27-31. Russian. PMID: 19459409
- Pavlova M., Serbin A., Fedorova N., Karaseva E., Klimova E., Kushch A. Anti-Cytomegalovirus Activity of Membranotropic Polyacidic Agents: Effects in vitro. *Antiviral Research.* **2009.** 82(2):A50-51. DOI: 10.1016/j.antiviral.2009.02.115
- Karaseva E., Serbin A., Rodionov I., Vasiliev A., Abramov V., Alikhanova O. HIV-1 Gag Matrix Protein Fragments and Polyacid Conjugates Designed for the HIV Inhibition. *Antiviral Research.* **2009.** 82(2):A59. DOI: 10.1016/j.antiviral.2009.02.140
- Serbin A., Karaseva E., Egorov Y., Dunaeva I., Pavlova M., Kushch A. A Macromolecular Basis for Microbicides Dual Protecting against HIV and Cytomegalovirus Infection. *Antiviral Research.* **2009.** 82(2):A66. DOI: 10.1016/j.antiviral.2009.02.160
- Serbin A., Karaseva E., Chernikova E., Dunaeva I., Krutko E., Filatova M., Zevin A. Graft and RAFT Reactive Macro Reagents: 3. Bis-[copoly-(divinyl ether-alt-maleic anhydride)]-trithiocarbonate. *Macromolecular Symposia*, **2010**, 296 (1):80-91. DOI: 10.1002/masy.201051013
- Serbin A.V., Karaseva E.N., Tsvetkov V.B., Alikhanova O.L., Rodionov I.L. Hybrid Polymeric Systems for Nano-Selective Counter Intervention in Virus Life Cycle. *Macromolecular Symposia*, **2010**, 296 (1):466-477; DOI: 10.1002/masy.201051063
- Serbin A. V., Karaseva E. N., Dunaeva I. V., Krut'ko E. B., Talyzenkov Yu. A., Filatova M. P., and Chernikova E. V. Controlled Free-Radical Copolymerization of Maleic Anhydride and Divinyl Ether in the Presence of Reversible Addition-Fragmentation Chain-Transfer Agents. *Polymer Science, Ser. B*, **2011**, Vol. 53, Nos. 3–4, pp. 116–124.
- Tsvetkov V., Veselovski A., Serbin A. Polymer-Coupled Systems for Blocking the Viral Fusion I. Modeling in silico the in vitro HIV-1 Entry Inhibitors. *Antiviral Research* **2011**, 90(2):A46; DOI: 10.1016/j.antiviral.2011.03.075
- Serbin A., Karaseva E., Alikhanova O., Tsvetkov V. Polymer-Cooperative Approach to multi-Blocking the Viruses. *Antiviral Research* **2011**, 90(2):A76; DOI: 10.1016/j.antiviral.2011.03.164
- Serbin A.V., Veselovsky A.V., Tsvetkov V.B. In vitro and in silico investigation of interferonogenic analogues of nucleic acids, artificially programmed to block the initial stages of HIV infection of cells. *Applied Biochemistry and Microbiology* – **2012.** - N 9. – P. 723-739. DOI: 10.1134/S0003683812090049
- Tsvetkov V.B., Serbin A.V. A Novel View of Modelling Interactions between Synthetic and Biological Polymers via Docking. *Journal of Computer-Aided Molecular Design* – **2012** – 26(12):1369-1388, DOI:

10.1007/s10822-012-9621-7

- Serbin A.V., Karaseva E.N., Alikhanova O.L., and Tsvetkov V.B. Drug resistance preventive antivirals based on nano-responsible poly-ligands // in Book: *Worldwide Research Efforts in the Fighting Against Microbial Pathogen. From Basic Research to Technological Developments* - Ed. by A. Méndez-Vilas, – Brown Walker Press – Boca Raton, Florida – USA, **2013**, p.139-144
- Tsvetkov V. B., Veselovsky A.V. and Serbin A.V. Molecular dynamics of synthetic polymers interference with viral biopolymer targets pretested via docking // *ibid* **2013**, p. 199-203
- Tsvetkov V. B., Serbin A. V. Molecular Dynamics Modeling the Synthetic and Biological Polymers Interactions Pre-Studied via Docking. Anchors Modified Polyanions Interference with the HIV-1 Fusion Mediator // *Journal of Computer-Aided Molecular Design* – **2014** – 28(6):647-673; DOI: 10.1007/s10822-014-9749-8; PMID: 24862639, PMCID: PMC4050303
- Bolshchikov B.D., Tsvetkov V.B., Serbin A.V. Practical procedure for a theoretical investigation of thermodynamics and kinetics aspects of different-scale radical reactions from addition and cyclization to cyclocopolymerization involving maleic anhydride and divinyl ether. *Polymer*. **2018**. 146, 429-445. DOI: 10.1016/j.polymer.2018.05.032
- Bolshchikov B.D., Tsvetkov V.B., Alikhanova O.L., Serbin A.V. [Modeling and theoretical analysis of ring specific mimicry in view of isomerism within medicinal promising oligomers of "DIVEMA"] *Biomedicinskaya Khimia*. **2019**, 65 (2) 133-151, DOI: 10.18097/PBMC20196502133
- Bolshchikov B.D., Tsvetkov V.B., Alikhanova O.L., Serbin A.V. How to Fight Kinetics in Complex Radical Polymerization Processes: Theoretical Case Study of Poly(divinyl ether-alt-maleic anhydride). *Macromolecular Chemistry and Physics*. **2019**, V. 220, Issue 23, 1900389, p. 1-20, DOI: 10.1002/macp.201900389

Patents

- Iordanskaya L.I., Serbin A.V., Stotskaya L.L., et al. Copolymers of maleic anhydride with 1,4-di-isopropoxybuten-2 and their derivatives possessing antiviral properties. **SU 1684290, 1991**
- Iordanskaya L.I., Stotskaya L.L., Ulogova Yu.V., Serbin A.V., et al. Complex compound of cis-diamino platinum (II) with copolymer of maleic acid sodium salt and furane possessing immune-stimulating and antitumor activity within broad interval of therapeutic doses with low nephrotoxicity. **RU 2033998, 1995**
- Boukrinskaia A.G., Serbin A.V., Bogdan O.P., et al. Polymeric Adamantane Analogues. // *United States Patent US 005880154A, 1999*
- Timofeyev I.V., Serbin A.V., Perminova N.G., et al. Complex anti-HIV compound. **RU 2270690, 2006**
- Bukrinskaya A.G., Burshtein M.E.,... Serbin A.V., et al. Polyanionic derivatives of norbornane, method for obtaining thereof, and inhibitors of human immunodeficiency virus reproduction based on them. **RU 2281297 2006**
- Timofeyev I.V., Perminova N.G., Serbin A.V., et al. Complex of membrane-tropic compounds for the HIV infection prevention and treatment. **RU 2315617, 2008**

Alexander V. Serbin, 2023