

## CURRICULUM VITAE

### A. PERSONAL:

#### NAME IN FULL:

Elena V. Batrakova

#### CAMPUS ADDRESS:

UNC Eshelman School of Pharmacy,  
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### B. EDUCATION AND DEGREES:

August 1978 to July 1983

Student, Faculty of Chemistry, MV Lomonosov Moscow State University (MSU), Moscow, Russia

Obtained M.Sc. in chemistry with distinction

November 1983 to May 1987

Ph.D. student, Department of Polymers, MV Lomonosov MSU, Moscow, Russia

Obtained Ph.D. in chemistry of polymers, advisor: D.Sc. Viktor Kabanov

### C. PROFESSIONAL EXPERIENCE:

July 2013 to present

Member of UNC Center for Nanotechnology in Drug Delivery, Chapel Hill, NC

July 2012 to present

Associate Professor, UNC Eshelman School of Pharmacy, University of North Carolina at Chapel Hill, Chapel Hill, NC

July 2010 to June 2012

Research Associate Professor (promoted through P&T process), Department of Pharmaceutical Sciences, College of Pharmacy (COP), University of Nebraska Medical Center (UNMC), Omaha, NE

July 2007 to June 2012

Director, CNS Drug Delivery Program, Center for Drug Delivery and Nanomedicine (CDDN), UNMC, Omaha, NE

July 2003 to June 2010

Research Assistant Professor, Department of Pharmaceutical Sciences, COP, UNMC, Omaha, NE

September 1995 to July 2003

Research Associate, Department of Pharmaceutical Sciences, COP, UNMC, Omaha, NE

September 1994 to August 1995

Senior Research Fellow at the Laboratory of Drug Delivery, Department of Polymers, MV Lomonosov MSU, Moscow, Russia

May 1994 to August 1995

Director of Research (half time), Moscow Institute of Biotechnology, Moscow, Russia

December 1987 to April 1994

Research Fellow and Senior Research Fellow at All-Russian Research Center of Molecular Diagnostics and Therapy, Moscow, Russia

November 1983 to May 1987

Post-Graduate Researcher and Ph.D. Student at the Laboratory of Polymerization Processes, Department of Polymers, MV Lomonosov MSU, Moscow, Russia

### D. HONORS:

2009

UNMC New Investigator Award

2010

Oldfield/Reagan Alzheimer's Research Award

2010

Top cited article in 2008-2010 Award in Journal of Controlled Release

2011

UNMC Innovation, Development and Engagement Award (IDEA)

2012/2013

UNC Academic Excellence Award in Research

2014

Editorial Board, Nanomedicine: Nanotechnology, Biology and Medicine (Elsevier)

2014	Highly cited of total 10 scientists at UNC 2014
2014	A Thomson Reuters Highly Cited Researcher
2014-2017	Editorial Board, Journal of Drug Delivery
2014	Top 1% highly cited researcher in Pharmaceutics and Toxicology; <a href="http://highlycited.com/">http://highlycited.com/</a>
2013/2014	UNC Academic Excellence Award in Research
2014	Research Innovation Award, UNMC
2015	The most downloaded article in Journal of Controlled Release corresponding author
2015	Scientific Advisory Board for the neurosensory and Neuroregenerative Research Foundation
2015	Editorial board, International Journal of Pharmaceutical Sciences Research
2015	Editorial board, Journal of Bioanalytical Techniques
2016	Editorial board, Mathews Journal of Cancer Science
2016	Editorial board, Journal of Clinical Pharmacology (JCP)
2016	Award for outstanding contributions to the PharmD Program UNC, Chapel Hill, NC
2016	UNC Academic Excellence Award in Research
2016	Leader for Scientific Advisory Board for the Neurosensory and Neuroregenerative Research Foundation (NNRF)
2016	Author of the Top Ten WNAN Article accessed in 2016
2017	Editorial Board, Alzheimer's and Parkinsonism: Research Therapy
2017	Editorial board, International Journal of Neurodegenerative Disorders
2017	Author of the Top 25% most cited PlosOne articles

#### E. BIBLIOGRAPHY:

*Original Articles with 12,808 unique citations with h-index 54, and i10-index 81*

<https://scholar.google.com/citations?user=Lw0vpA8AAAAJ&hl=en&citsig=AMstHGTYmnHcDbNZ21GY87HNOSkS PLxIQ>

- Wayne E.C., Li Y., Long C., Haney M.J., Batrakova E.V., Leisner T.M., Parise L.V., and Kabanov A.V. (2019) Targeted Delivery of CIB1-siRNA to TNBC Breast Tumor Cells Using Macrophages as Drug Carriers. *Advanced Science*. Under review.
- Zhao Y., Haney M.J., Jin Y.S., Uvarov O., Vinod N., Lee Y.Z., Fine J.P., Kabanov A.V., and Batrakova E.V. (2019) Long-Term Sustained Therapeutic Effects of GDNF-expressing Macrophages in Transgenic Parkin Q311X Mice. *Advanced Therapeutics*. Under review. **Senior/Corresponding author**
- Klyachko N.L., Haney M.J., Batrakova E.V., and Kabanov A.V. (2019) Cationized-modified Exosomes for Gene Delivery. *Advanced Materials*. Under review.
- Zhao Y., Alakhova D.Y., Zhao X., Band V., Batrakova E.V., and Kabanov A.V. (2019) Eradication of Cancer Stem Cells in Triple Negative Breast Cancer Using Pluronic SP1049C Polymeric Micelles Loaded with Doxorubicin. *ACS NANO*. Under review.
- Haney M.J., Klyachko N.L., Harrison E.B., Zhao Y., Kabanov A.V., and Batrakova E.V. (2019) TPP1 Delivery to Lysosomes with Extracellular Vesicles and their Enhanced Brain Distribution in the Animal Model of Batten Disease. *Adv. Health Mater.* Apr 18:e1801271. doi: 10.1002/adhm.201801271. [Epub ahead of print] PMID: 0997751. **Senior/Corresponding author**
- Buglak N., Batrakova E.V., Mota R. and Bahnson E. (2018) Insights on Localized and Systemic Delivery of Redox-Based Therapeutics. *Oxidative Medicine and Cellular Longevity*, vol. 2018, Article ID 2468457, 23 pages, 2018. doi:10.1155/2018/2468457. PMID: 29636836.
- Kim M.S., Haney M.J., Zhao Y., Yuan D., Klyachko N.L., Kabanov A.V., and Batrakova E.V. (2018) Engineering Exosomes for Targeted Paclitaxel Delivery to Pulmonary Metastases: *in vitro* and *in vivo* Evaluations. *Nanomedicine*. 2018 Jan;14(1):195-204. doi: 10.1016/j.nano.2017.09.011. Epub 2017 Oct 2. PMID: 28982587. **Senior/Corresponding author.**
- Yuan D, Zhao Y, Banks WA, Bullock KM, Haney M, Batrakova E, Kabanov AV. (2017) Macrophage exosomes as natural nanocarriers for protein delivery to inflamed brain. *Biomaterials*. 2017 Oct;142:1-12. doi: 10.1016/j.biomaterials.2017.07.011. Epub 2017 Jul 10. PMID: 28715655.
- Batrakova E.V. (2017) Using Immune Cells for Transport of Therapeutics to Brain Tumors. *Mathews Journal of Cancer Science*. March; 2(1), 008. **Senior/Corresponding author.**

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11. Rodriguez M., Lapierre J., Ojha C., Dever S., Kaushik A., Batrakova E.V., Kashanchi F., Nair M., and El-Hage N. (2017) Intranasal drug delivery of small interfering RNA targeting Beclin1 encapsulated with polyethylenimine (PEI) in mouse brain to achieve HIV attenuation, *Scientific Reports*. May 12;7(1):1862. doi: 10.1038/s41598-017-01819-9. PMID: 28500326.
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13. Kim M.S., Haney M.J., Zhao Y., Gupta R., Mahajan V., Inskoe E., Piroyan A., Sokolsky M., Okolie O., Hingtgen S.D. Kabanov A.V., and Batrakova E.V. (2016) Development of Exosome-encapsulated Paclitaxel to Overcome MDR in Cancer cells, *Nanomedicine*, Apr;12(3):655-64. doi: 10.1016/j.nano.2015.10.012. Epub 2015 Nov 14, **Senior/Corresponding author.** PMID: 26586551.
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15. Roy U., Hong Ding H., Kanthikeel S.P., Raymond A., Atluri V., Yndart A., Kaftanovskaya E.M., Batrakova E.V., Nair M. (2015) Preparation, Characterization and Efficacy of Anti-HIV Nanodrug Targeting to Microfold cell (M cell) of the Gut-associated lymphoid Tissue (GALT), *Int J Nanomedicine*. 18;10:5819-35. doi: 10.2147/IJN.S68348. PMID: 26425084.
16. Batrakova E.V. and Kim M.S. (2015) Using naturally-equipped nanocarriers, exosomes, for drug delivery, *J. Control Release*, pii: S0168-3659(15)30042-0. doi: 10.1016/j.jconrel.2015.07.030. [Epub ahead of print]. PMID:26241750; NIHMS #713725. **Senior/Corresponding author.**
17. Roy U., Barber P., Tse-Dinh Y.C., Batrakova E.V., Mondal D., and Nair M. (2015) Role of MRP Transporters in Regulating Antimicrobial Drug Inefficacy and Oxidative Stress-induced Pathogenesis during HIV-1 and TB Infections, *Front Microbiol.* Sep 17;6:948. doi: 10.3389/fmicb.2015.00948. PMID:26441882, [PubMed] PMID: PMC4585023.
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21. Batrakova E.V., and Kabanov A.V. (2013) Cell-Mediated Drug Delivery to the brain. *J. Drug Del. Sci. Tech.*, 23 (5) 419-433. **Senior/Corresponding author.**
22. Klyachko N.L., Haney M.H., Zhao Y., Manickam D.S., Mahajan V., Suresh P., Shawn D. Hingtgen Mosley R.L., Gendelman H.E., Kabanov A.V., Batrakova E.V. (2013) Macrophages Offer a Paradigm Switch for CNS Nanozyme Delivery, *Nanomedicine (Lond)*. 2013 Nov 18. [Epub ahead of print]; PMID: 24237263; NIHMS542061, **Senior/Corresponding author.**

23. Haney M.J., Suresh P., Zhao Y., Kanmogne G.D., Kadiu I., Sokolsky-Papkov M., Klyachko N.L., Mosley R.L., Kabanov A.V., Gendelman H.E., Batrkova E.V. (2012) Blood-Borne Macrophage-Neural Cell Hitchhike Endosome Networks for Cell-Based Nanozyme Brain Delivery. *Nanomedicine (Lond)*, *Nanomedicine (Lond)* 7:815-33. PMID: 22236307. **Senior/Corresponding author.**
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#### **SELECTED ABSTRACTS:**

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39. E.V. Batrakova, A.M. Brynskikh, M.J. Haney, Y. Zhao, S. Li, R. L. Mosley, M.D. Boska, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman (2011) "Living cells as drug delivery vehicles for Parkinson's Disease

- Therapy”, International Conference on Biomaterials Science (ICBS), Tsukuba, Japan, March 15-18.
40. E.V. Batrakova, M.J. Haney, Y. Zhao, P. Suresh, J.A. Vetro, N.L. Klyachko, R.L. Mosley, A.V. Kabanov, and H.E. Gendelman (2011) “Living Cells as Drug Delivery Vehicles for Treatment of Neurodegenerative Disorders”, Molecular Mechanisms of Neurodegeneration, Milano, Italy, May 13-15.
  41. E.V. Batrakova, A.M. Brynskikh, M.J. Haney, Y. Zhao, S. Li, R. L. Mosley, M.D. Boska, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman (2011) “Living cells as drug delivery vehicles for Parkinson's Disease Therapy”, IDeA Central Regional Meeting, Omaha, NE, May 23-25.
  42. E.V. Batrakova, M.J. Haney, Y. Zhao, P. Suresh, N.L. Klyachko, S. Li, J.A. Vetro, R. L. Mosley, A.V. Kabanov, and H.E. Gendelman (2011) “Using living cells for targeted drug transport across blood brain barrier”, Pharmaceutics and Novel Drug delivery Systems, Las Vegas, June 6-8.
  43. E.V. Batrakova, M.J. Haney, Y. Zhao, P. Suresh, N.L. Klyachko, S. Li, J.A. Vetro, R. L. Mosley, A.V. Kabanov, and H.E. Gendelman (2011) “Development of nanoformulations of Therapeutic proteins for brain delivery in macrophages”, First International Conference on Small Science, Sydney, Australia, August 15-18.
  44. E.V. Batrakova, M.J. Haney, Y. Zhao, P. Suresh, A.M. Brynskikh, R. L. Mosley, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman (2011) “Macrophages as Trojan Horses for Brain Delivery of Redox Enzymes”, 2<sup>nd</sup> International School on Nanomaterials and Nanotechnology in Living Systems, Safety and Nanomedicine, Moscow, Russia, September 19-24.
  45. E.V. Batrakova, M.J. Haney, Y. Zhao, N.L. Klyachko, R.L. Mosley, A.V. Kabanov, and H.E. Gendelman (2011) “Using Exosomes for Drug Transport in Macrophage-mediated Drug Delivery”, Conference for Exosomes and Microvesicles, Orlando, FL, October 15-17.
  46. E.V. Batrakova, A.M. Brynskikh, S. Li, Y. Zhao, R.L. Mosley, A.V. Kabanov, and H.E. Gendelman (2010) “Polymer therapeutics for delivery of antioxidants in Parkinson’s disease” Symposium on Biomedical Polymers for Drug Delivery, Salt Lake City, Utah, March 26-28.
  47. E.V. Batrakova, A.M. Brynskikh, Y. Zhao, S. Li, R.L. Mosley, Michael D. Boska, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman (2010) “Cell-mediated Delivery of Catalase Nanoparticles to Treat Parkinson's Disease” First World Conference on nanomedicine and Drug Delivery (WCN-2010), Kottayam, Kerala, India, April 16-18.
  48. E.V. Batrakova, A.M. Brynskikh, S. Li, R. L. Mosley, A.V. Kabanov, and H.E. Gendelman (2010) “CNS Delivery of Antioxidants in Monocytes for Parkinson’s Disease” 8<sup>th</sup> International; Symposium on Polymer Therapeutics: From Laboratory to Clinical Practice, Valencia, Spain, May 24-26.
  49. R. Luxenhofer, A. Schulz, C. Roques, Li S., T.K. Bronich, E.V. Batrakova, R. Jordan, A.V. Kabanov (2010) “Doubly-Amphiphilic poly(2-Oxazoline)s with Unusual Microenvironment as High-capacity Drug Delivery Systems” 8<sup>th</sup> International; Symposium on Polymer Therapeutics: From Laboratory to Clinical Practice, Valencia, Spain, May 24-26.
  50. D.Yu. Alakhova, N.Y. Rapoport, E.V. Batrakova, A.A. Timoshin, S. Li, V.Yu. Alakhov, and A.V. Kabanov (2010) “Effect of Pluronic Amphiphilic Copolymers on Cancer Stem Cells in Multidrug Resistant Models” 8<sup>th</sup> International; Symposium on Polymer Therapeutics: From Laboratory to Clinical Practice, Valencia, Spain, May 24-26.
  51. E.V. Batrakova, A.M. Brynskikh, S.Li, R.L. Mosley, M.D. Boska, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman (2010) “Development of Cell-mediated Drug Delivery of Antioxidants for Parkinson's Disease Therapy” First Annual World Congress of NeuroTalk-2010, Singapore, June 25-28.
  52. E.V. Batrakova, A.M. Brynskikh, Y.Zhao, M.Haney, R.L. Mosley, S. Li, M.D. Boska, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman (2010) “Macrophages as Drug carriers for Antioxidant Enzymes in Parkinson’s Disease” Drug carriers in Medicine and Biology, Gordon Research Conference, Waterville Valley, NH, August 15-20.
  53. E.V. Batrakova, A.M. Brynskikh, Y.Zhao, M.Haney, R.L. Mosley, S. Li, M.D. Boska, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman, (2010) “Cell-mediated drug delivery for Parkinson's disease therapy” 8th International Nanomedicine and Drug Delivery Symposium (NanoDDS), Omaha, NE, October 3-5.
  54. E.V. Batrakova, A.M. Brynskikh, Y. Zhao, S.Li, R.L. Mosley, M.D. Bosk5, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman, (2010) “Nanoformulated Catalase for Parkinson's Disease Therapy”, 2nd International Nanotechnology Conference & Exhibition, Tel Aviv, Israel, November 8-9.
  55. E.V. Batrakova, Anna M. Brynskikh, Shu Li, R. Lee Mosley, Alexander V. Kabanov, and Howard E. Gendelman (2009) “Therapeutic Proteins Delivered by Monocytes to the Brain in Parkinson’s Disease”

Protein & Peptide Conference-2009, Seoul, Korea, April 1-4.

56. E.V. Batrakova, A.M. Brynskikh, S. Li, R.L. Mosley, M. D. Boska, N.L. Klyachko, A.V. Kabanov, and H.E. Gendelman (2009) "A Macrophage-based Delivery System of Antioxidant Enzymes for Parkinson's Disease: Therapeutic Effect in vivo" NIH IDEa Central Region Conference, Oklahoma City, OK, May 28-29.
57. E.V. Batrakova, D.Yu. Alakhova, G. Sahay, A.K. Sharma, S. Li, M. Boska, R.L. Mosley, H.E. Gendelman, V.Yu. Alakhov, and A.V. Kabanov (2009) "A new polymer-based nanoformulation for overcoming multi-drug resistance in cancer" Second World Cancer Congress 2009, Beijing, China, June 22-25.
58. E.V. Batrakova, A.M. Brynskikh, D.S. Manickam, Y. Zhao, S. Li, R.L. Mosley, A.V. Kabanov, and H.E. Gendelman (2009) "Living Cells as Drug Delivery Vehicles for Protein Transport to the Brain" 1st International Summer School on Nanomaterials and Nanotechnology in Living Systems, Moscow, Russia, June 29 – July 4.
59. D.S. Manickam, N.L. Klyachko, E.V. Batrakova, T.K. Bronich and A.V. Kabanov (2009) "Polyelectrolyte complexes of redox enzymes and block copolymers – physicochemical characterization and cellular uptake mechanisms" 7<sup>th</sup> International Nanomedicine and Drug Delivery Symposium (NanoDDS), Indianapolis, IN, October 4-5.
60. A.M. Brynskikh, E.V. Batrakova, H.E. Gendelman, A.V. Kabanov (2009) "Development of Antioxidant Nanozymes for Parkinson's disease Therapy" 7<sup>th</sup> International Nanomedicine and Drug Delivery Symposium (NanoDDS), Indianapolis, IN, October 4-5.
61. E.V. Batrakova, A.M. Brynskikh, Y. Zhao, S. Li, R.L. Mosley, A.V. Kabanov, and H.E. Gendelman (2009) "CNS delivery of therapeutic proteins in living cells" 3rd BBBB-Bosphorus International Conference on Pharmaceutical Sciences, Turkey, Antalya, October 26-28.
62. Brynskikh A., Kabanov A.V., Howard E. Gendelman H.E., Batrakova, E.V. (2008) Development of Antioxidant Nanozymes for Parkinson's Disease Therapy, 6<sup>th</sup> International Nanomedicine and Drug Delivery Symposium (NanoDDS), Toronto, Canada.
63. Batrakova E.V., Brynskikh A.M., Li S., Reynolds A.D., Mosley R.L., Kabanov A.V., and Howard E. Gendelman H.E. (2008) "Monocytes for Delivery of Antioxidants in Parkinson's Disease" 7<sup>th</sup> International Symposium on Polymer Therapeutics, Spain, Valencia.
64. Batrakova E.V., Brynskikh A.M., Li S., Reynolds A.D., Mosley R.L., Kabanov A.V., and Howard E. Gendelman H.E. (2008) "Building a Trojan Horse for Delivery of Therapeutic Peptides to the Brain" 5<sup>th</sup> Barriers on the CNS Gordon Research Conference, Tilton, NH.
65. M.A. Erickson, E.V. Batrakova, A.V. Kabanov, S. Vinogradov, and W.A. Banks (2008) "Transport of Superoxide Dismutase-nanozyme across the Blood-brain Barrier" 5<sup>th</sup> Barriers on the CNS Gordon Research Conference, Tilton, NH.
66. E.V. Batrakova, D.Yu. Alakhova, G. Sahay, A.K. Sharma, S. Li, M. Boska, R.L. Mosley, H.E. Gendelman, V.Yu. Alakhov, A.V. Kabanov (2008) "Polymer Micelles from Bench to Bedside" NCI Translational Science Meeting, Washington DC.
67. N.L. Klyachko, E.V. Batrakova, L.S. Shlyakhtenko, V. Kurova, and A.V. Kabanov (2008) "SOD/catalase conjugated with block ionomer - antioxidant delivery system" Bioencapsulation, Dublin, Ireland, Sept. 3-7.
68. Batrakova E., Li S., Shlyakhtenko L., Reynolds A., Thomas M., Gendelman H.E., and Kabanov A. (2007) "Inflammatory response cells for protein delivery to the brain" Immunochemistry and Immunobiology Gordons Research Conference, Ventura, CA.
69. Batrakova E., Li S., Shlyakhtenko L., Reynolds A., Thomas M., Gendelman H.E., and Kabanov A. (2007) "Cell-mediated delivery of therapeutic polypeptides in nanoparticles across the BBB" International Symposium on Polymer Therapeutics, FU, Berlin.
70. Batrakova E., Li S., Sharma A.K., Li Y., Boska M., Valery Yu. Alakhov V.Yu., and Kabanov A. (2007) "Mechanism of Pluronic P85 sensitization effects in MDR tumors in vivo" 6<sup>th</sup> International Symposium on Polymer Therapeutics, FU, Berlin.
71. Batrakova E.V., Li S., Reynolds A.D., Mosley R.L., Bronich T.K., Kabanov A.V., and Gendelman H.E. (2007) "Cell-mediated Delivery of Nanozymes" 5<sup>th</sup> International Nanomedicine and Drug Delivery Symposium, Boston, MA.
72. Alakhova D.Yu., Rapoport N.Y., Batrakova E.V., Timoshin A.A., Li S., Alakhov V.Yu., and Kabanov A.V. (2007) "Targeting Metabolic Pathways by an Amphiphilic Block Copolymer to Sensitize Multidrug Resistant Cells", 5<sup>th</sup> International Nanomedicine and Drug Delivery Symposium, Boston, MA.
73. Yi X., Vinogradov S., Batrakova E.V., Kabanov A.V. (2007) "Modification of a Protein with Pluronic Block

Copolymers for Cellular Delivery”, Fifth International Nanomedicine and Drug Delivery Symposium, Boston, MA.

74. Zhang X., Batrakova E.V., and Kabanov A.V. (2007) “Effect of Pluronic P85 on Organic Anion Transport across the Blood Brain Barrier”, 5<sup>th</sup> International Nanomedicine and Drug Delivery Symposium, Boston, MA.
75. Sahay G., Batrakova E.V., and Kabanov A.V. (2007) “Nanomaterials influencing trafficking Mechanism”, 5<sup>th</sup> International Nanomedicine and Drug Delivery Symposium (NanoDDS), Boston, MA.
76. Batrakova E., Li S., Reynolds A., Thomas M., Gendelman H.E., and Kabanov A. (2006) Inflammatory Cells for Transport of Therapeutic Polypeptides across the BBB. 4<sup>th</sup> Barriers on the CNS Gordon Research Conference, Tilton, NH.
77. Batrakova E., Li S., Reynolds A., Thomas M., Gendelman H.E., and Kabanov A. (2006) Trojan Horses for CNS Drug Delivery. Drug Carriers in Medicine & Biology Gordon Research Conference. Big Sky, MT.
78. Zhang X., Batrakova E.V., Li S., Yang Z., Li Y., Zhang L., and Kabanov A.V. (2006) Effect of Pluronic P85 on Amino Acid Transporters in the Blood Brain Barrier. Pharm Res, Poster # W5113, AAPS Annual Meeting and Exposition, San Antonio, TX.
79. Sharma A.K., Zhang L., Li S., Alakhov V.Yu., Batrakova E.V., and Kabanov AV. (2006) Formulation of Doxorubicin with Pluronic P85 prevents development of Drug resistance *in vitro* and *in vivo*. Pharm Res, Poster # T2101, 2006 AAPS Annual Meeting and Exposition, San Antonio, TX.
80. Batrakova E., Li S., Reynolds A., Thomas M., Gendelman H.E., and Kabanov A. (2006) “Nanozymes” for cell-mediated delivery across the Blood-Brain Barrier. 4<sup>th</sup> International Nanomedicine and Drug Delivery Symposium, Omaha, NE.
81. Sahay G., Batrakova E., Zhang X., Sriadibhatala S., Li S., and Kabanov A. (2006) Pluronic P85 Modulated Endocytosis in Brain Endothelial Cells. 4<sup>th</sup> International Nanomedicine and Drug Delivery Symposium, Omaha, NE.
82. Zhang X., Batrakova E., Li S., Yang Z., and Kabanov A. (2006) Effect of Pluronic P85 on Amino Acid Transport across Blood Brain Barrier. 4<sup>th</sup> International Nanomedicine and Drug Delivery Symposium, Omaha, NE.
83. Sharma A.K., Zhang L., Li S., Alakhov V.Yu., Batrakova E.V., and Kabanov A.V. (2006) Formulation of Doxorubicin with Pluronic P85 prevents development of Drug resistance to Doxorubicin. 4<sup>th</sup> International Nanomedicine and Drug Delivery Symposium, Omaha, NE.
84. Sahay G., Batrakova E.V., Zhang X, Sriadibhatala S.S, Li S and Kabanov A.V. (2006) Pluronic P85 modulates endocytosis in Brain Endothelial Cells. Poster Presentation at Globalization of Pharmaceuticals and Education Network (GPEN), Lawrence, Kansas.
85. Sahay G, Batrakova E., Zhang X, Li S and Kabanov AV. (2006) Effect of Pluronic on fluid phase endocytosis in Blood Brain Barrier. Pharmaceutics Graduate Student Research Meeting (PGSRM) Minneapolis, Minnesota.
86. Batrakova E.V., Kabanov A.V., Li S., Li Y., Yang Zhihui, Kelly D.L., Sherman S. and Alakov V.Yu. (2005) Polymer Genomics: Effect of Amphiphilic Block Copolymers on Genetic Responses to a Drug in Cancer Cells. Oncogenomics 2005: Dissecting Cancer through Genome Research. San Diego, CA.
87. Batrakova E.V., Kabanov A.V., Minko T., Li S., Li Y., Pakunlu R., and Alakhov V.Yu. (2005) Pluronic Block Copolymer Formulation with Doxorubicin Induces Apoptosis in Drug-Resistant Cancer Cells. 32<sup>nd</sup> Annual Meeting & Exposition held by the CRS Conference, Miami, FL.
88. Vinogradov S.V., Kohli E., and Batrakova E.V. (2005) Cytotoxic Drug Formulations in Polymer Nanogels. The AAPS Journal Vol. 7, No. S2, Abstract M1186; 2005 AAPS Annual Meeting, Nashville, TN, Nov.5-10.
89. E. Batrakova, S. Li, Y. Li, V. Alakhov, W. Elmquist, and A. Kabanov (2004) Formulations of a micelle-forming Block Copolymer, Pluronic P85, for Chemotherapy of drug-resistant tumors. In Proceedings of 6<sup>th</sup> International Symposium on Polymer Therapeutics, The Welsh school of Pharmacy, Cardiff, UK.
90. A. Kabanov, E. Batrakova, D. Kelly, and V. Alakhov (2004) Polymer Genomics for Polymer Therapeutics. In Proceedings of 6<sup>th</sup> International Symposium on Polymer Therapeutics, The Welsh school of Pharmacy, Cardiff, UK.
91. A.V. Kabanov, E.V. Batrakova, S. Sriadibhatla, D.L. Kelly, and V.Yu. Alakov (2004) Polymer Genomics: Shifting the Gene and Drug Delivery Paradigm. 8<sup>th</sup> European Symposium on Controlled Drug Delivery, Enschede, Netherlands.
92. Q. Yu, E. Batrakova, L. Jerome, K. Banerjee, S. Li, Y. Li, V. Page, A. Kabanov and B. Leyland-Jones (2004) Reversal of multidrug resistance by Pluronic block copolymers correlates with inhibition of drug efflux

- transporters and depletion of intracellular ATP and GSH levels. 95<sup>th</sup> Annual Meeting of American association for Cancer Research, Orlando, FL.
93. Batrakova E., Zhang Y, Li S., Li Y., Alakhov V., Miller D., and Kabanov A. (2004) Effects of Pluronic P85 on GLUT-1 and MTC1 Transporters in the Blood Brain Barrier. 3<sup>rd</sup> Barriers on the CNS Gordon Research Conference, Tilton, NH.
  94. Kabanov A.V., Batrakova E.V., Sriadibhatla S., Yang Z., Kelly D., and Alakhov V.Yu. (2004) Polymer genomics: shifting the drug delivery paradigm. 228<sup>th</sup> National ACS Meeting, Philadelphia, PA.
  95. Batrakova E.V., Li S., Li Y., Alakhov V.Yu., and Kabanov A.V. (2004) Pluronic Block Copolymers as a Novel Drug Delivery System for Overcoming Drug Resistance in Cancer. Drug Carriers in Medicine & Biology Gordon Research Conference. Big Sky, MT.
  96. Kabanov A.V., Batrakova E.V., Sriadibhatla S., Kelly D.L., and Alakhov V.Yu. (2004) Polymer Genomics: A Paradigm Shift in Drug and Gene Delivery. 7<sup>th</sup> Symposium on Biomaterials Science. New Brunswick, NJ.
  97. Batrakova E.V., Kabanov A.V., Li S., Li Y., Kelly D.L., and Alakhov V.Yu. (2004) Amphiphilic Block Copolymers Alter genetic Responses to a Drug. 7<sup>th</sup> Symposium on Biomaterials Science. New Brunswick, NJ.
  98. Batrakova E., Li S., Alakhov V., and Kabanov A. (2003) Mechanism of Sensitization of cells Overexpressing Multidrug Resistant Protein by Pluronic P85. Multi-drug Efflux Systems Gordon Research Conference, Ventura, CA.
  99. Kabanov A., Li S., Alakhov V., and Batrakova E. (2003) Kinetic Considerations of Pluronic Block Copolymer P85 Effects on Drug Efflux Transporters. Multi-drug Efflux Systems Gordon Research Conference, Ventura, CA.
  100. S. Vinogradov, E. Batrakova, and A. Kabanov (2003) Nanosized Polymer Formulation of Phosphorylated Cytotoxic Nucleoside Analogues. 30<sup>th</sup> Annual Meeting of Controlled Release Society, Glasgow, Scotland United Kingdom.
  101. E.Batrakova, V. Alakhov, and A. Kabanov (2003) An Essential Relationship between ATP Depletion and Chemosensitizing Activity of Pluronic Block Copolymers. 30<sup>th</sup> Annual Meeting of Controlled Release Society, Glasgow, Scotland United Kingdom.
  102. Batrakova E., Li S., Alakhov V., Miller D., and Kabanov A. (2002) Mechanism of Pluronic effect on P-glycoprotein efflux system in blood brain barrier. In Proceedings of 5<sup>th</sup> International Symposium on Polymer Therapeutics, The Welsh school of Pharmacy, Cardiff, UK.
  103. Batrakova E., Li S., Alakhov V., Miller D., and Kabanov A. (2002) Evaluation the optimal structure of Pluronic block copolymers revealing the maximal biological response in BBMEC monolayers. 2nd Barriers on the CNS Gordon Research Conference, Tilton, NH.
  104. Kabanov A.V., Batrakova E.V., Li S., and Alakhov V.Yu. (2001) Selective energy depletion and sensitization of multiple drug-resistant cancer cells by Pluronic block copolymer, Boston, MA.
  105. Prabha S., Batrakova E., and Vinogradov S. (2000) Study of intracellular uptake of Pluronic P85 in drug resistant MCF7/ADR cell line. 32<sup>nd</sup> Annual Scientific Research meeting, June, Columbus, OH.
  106. Batrakova E., Li S., Alakhov V., Elmquist W., Miller D., and Kabanov A. (2000) Pluronic block copolymers for drug delivery to the brain. In Proceedings of 4<sup>th</sup> International Symposium on Polymer Therapeutics, London, England.
  107. Batrakova E.V., Li S., Alakhov V.Yu., and Kabanov A.V. (2000) Selective energy depletion and sensitization of multiple drug resistant cells by Pluronic block copolymers. Polym Prepr 41(2), 1639-1640.
  108. Vinogradov S., Batrakova E., and Kabanov A. (2000) Novel drug delivery systems: Nanogel networks.
  109. Kabanov A.V., Lemieux P., Vinogradov S.V., Nguyen H.-K., Batrakova E.V., Gebhardt, C.L., Ochietti B., Guerin N., and Alakhov V.Yu. (1999) Self-assembly and activity of polyplexes. In Structure and Design of Synthetic Gene Carriers, UCSF Molecular Design Institute, San Francisco, CA, USA.
  110. Batrakova E., Lee S., Miller D., and Kabanov A. (1998) Effects of Pluronic P85 on drug transport across blood brain and intestinal barriers. PharmSci Suppl 1, S-380; S-446.
  111. Kabanov A.V., Lemieux P., Vinogradov S.V., Nguyen H.-K., Batrakova E.V., Ochietti B., Guerin N., and Alakhov V.Yu. (1998) Taking polycation gene delivery systems from in vitro to in vivo. PharmSci Suppl 1, S-604-605.
  112. Kabanov A., Batrakova E.V., Miller D., and Alakhov V. (1997) Amphiphilic block copolymers in drug delivery. In Abstracts of Papers 214th ACS National Meeting, Part 2, Las Vegas, NV, COLL 0157.
  113. Vinogradov S., Bronich T., Batrakova E., Miller D., and Kabanov A. (1997) Cationic block copolymers for

- delivery of phosphorothioate oligonucleotides. *Pharm Res* 14, S-641.
114. Batrakova E., Miller D., Alakhov V., and Kabanov A. (1997) Effects of polyoxyethylated surfactants on drug transport in blood-brain barrier. *Pharm Res* 14, S-221.
  115. Alakhov V.Yu., Batrakova E.V., Dorodnich T., Li S., Venne A., and Kabanov A.V. (1996). Block copolymeric drug carriers: 1. Delivery of antineoplastic drugs. In Proceedings of 1st International Symposium on Polymer Therapeutics, London, England.
  116. Batrakova E., Fontane M., Alakhov V., Miller D., and Kabanov A. (1996) Block copolymer drug carriers: 2. Multiple mechanisms for drug transport in brain endothelial cells. *Pharm Res* 13, S-214.
  117. Alakhov V.Yu., Batrakova E.V., Klinsky E.Yu., Moskaleva E.Yu., and Kabanov A.V. (1995) Poly(oxyethylene)-poly(oxypropylene) block copolymer micelles as a delivery vehicle for cytotoxic drugs. Reversion of multiple drug resistance to carcinoma cells. In Abstracts of Seventh International Symposium on Recent Advances in Drug Delivery Systems, Salt Lake City, UT.

## **SYMPOSIUM PRESENTATIONS:**

1. “Macrophage-derived Extracellular Vesicles Target Inflamed Brain and Deliver Therapeutic Proteins for Treatment of Neurodegenerative Disorders” Invited talk at 25<sup>th</sup> Scientific Conference of the Society on Neuroimmune Pharmacology (SNIP), Portland, OR, USA, April 2019.
2. “Macrophage-derived Extracellular Vesicles Facilitate Brain Transport of Therapeutic Enzymes to Treat Neurodegenerative Disorders” Invited talk at NY Academy of Sciences conference; New York, NY, USA, February 2019.
3. “Extracellular vesicles as drug delivery vehicles for Potent Redox Enzyme Catalase to treat Parkinson’s disease” SfrBMB 25th Annual Meeting, Chicago, IL, USA, November 2018.
4. “Macrophage-derived Extracellular Vesicles Facilitate Brain Transport of Therapeutic Enzymes for Lysosomal Storage Disease Therapy”, NCL 2018 Annual meeting, London, Great Brittan, September 2018.
5. “Development of EV-based drug formulations for treatment of neurodegenerative disorders”, Gordon’s Research Conference, Extracellular Vesicles, Grand Summit Hotel at Sunday River, Newry, ME, USA, August 2018.
6. “Engineering Macrophage-derived Exosomes for Therapeutic Protein Delivery to the Brain”, Controlled Release Society Annual Meeting & Exposition, New York, NY, USA, July 2018.
7. “Macrophage-derived Exosomes for targeted drug delivery to the brain” PsychoNeuroImmunology Research Society (PNIRS) 25<sup>th</sup> Annual Scientific Meeting, Miami Beach, FL, USA, June 2018.
8. “Exosomes as drug delivery vehicles for therapeutic proteins to the brain”, International Society of Extracellular vesicles Meeting (ISEV2018), Barcelona, Spain, May 2018.
9. “Engineering Exosomes for Targeted Paclitaxel Delivery to Pulmonary Metastases”, Gordon’s Research Conference, Cancer Nanotechnology, USA, June 2017.
10. “Harnessing the Power of Extracellular Vesicles for Therapy of Brain Infectious Diseases”, Extracellular Vesicles and Infections, Potomac, USA, June 2017.
11. “Engineering Exosomes to Deliver a Potent Redox Enzyme Catalase to the Brain”, Gordon Research Conference on Oxidative Stress & Disease (GRC), Lucca (Barga) Italy, March 2017.
12. “Exosomes as drug delivery vehicles”, Moscow International Biotechnology Congress, Russia, February 2017.
13. “Development of exosome-encapsulated paclitaxel to overcome MDR in cancer cells”. Annual Meeting American Society of Exosomes and Microvesicles (ASEMV) Pacific Beach, CA, USA, October 2016.
14. “Autologous Macrophages as Active Biocompatible Drug Delivery vehicles for the Treatment of Neurodegenerative Disorders”, third Annual Personalized Nanomedicine Symposium Miami, FL, USA, May 2016.
15. “Cell-mediated Gene therapy for CNS Disorders”, Batten Disease: 2016 Update of Translational Research for Management of INCL/LINCL, Bethesda, MD, USA, March 2016.
16. “Exosomes as Drug Delivery Vehicles for Parkinson’s Disease Therapy”, Annual Meeting International Society of Exosomes and Microvesicles (ISEV), Washington D.C., USA, April 2015.
17. “Cell-mediated Delivery of Redox Enzymes for Treatment of Neurodegenerative Disorders”, 17<sup>th</sup> Biannual Meeting of Society for Free Radical Research International (FSRRI), Kyoto, Japan, March 2014.
18. “Carriers that Break Barriers” ASNM 4<sup>th</sup> Annual Meeting, Rockville, MD, USA, March 2014.



19. "Cell-mediated Delivery of Nanoformulated Antioxidants for Treatment of Neurodegenerative Disorders", 5<sup>th</sup> Annual Nanotechnology for Health Care Conference, Little Rock, AR, USA, April 2014.
20. "Carriers that Break Barriers", International Congress on Natural Sciences and Engineering, Kyoto, Japan, in May 2014, a keynote speaker.
21. "Treatment of Neurological Disorders with Nanoformulated Antioxidants Delivered to the Brain in Living Cells", ICEAS, Tokyo, Japan, 2013.
22. "Carriers that break barriers", Biocatalysis, Moscow, Russia, 2013.
23. "Blood-Borne Macrophages Hitchhike Endosome Networks for Brain Delivery of Antioxidant, Catalase", ASEM, Orlando, Florida, USA, 2013.
24. "Living Cells as Drug Delivery Vehicles for Transport of Nanoformulated Antioxidants to the Brain", Conference for Nanoscience, Lanzarote, Spain, 2012.
25. "Cells for Drug Delivery of Nanoformulated Antioxidants to the Brain", BU Symposium on "Therapeutic Innovation: The Next Generation of Discovery", Boston, MA, USA, 2012.
26. "Living cells as drug delivery vehicles for CNS delivery", Southeastern Regional Meeting of the ACS (SERMACS), Raleigh, NC, USA, 2012.
27. "Using Living Cells for Targeted Drug Transport across Blood Brain Barrier", Pharmaceuticals and Novel Drug delivery Systems, Las Vegas, USA 2011.
28. "Development of Nanoformulations of Therapeutic Proteins for Brain Delivery in Macrophages", First International Conference on Small Science, Sydney, Australia, 2011.
29. "Macrophages as Trojan Horses for Brain Delivery of Redox Enzymes", 2<sup>nd</sup> International School on Nanomaterials and Nanotechnology in Living Systems, Safety and nanomedicine, Moscow, Russia in 2011.
30. "Using Exosomes for Drug Transport in Macrophage-mediated Drug Delivery", Conference for Exosomes and Microvesicles, Orlando, FL, USA 2011.
31. "Cell-mediated Delivery of Catalase Nanoparticles to Treat Parkinson's Disease" First World Conference on nanomedicine and Drug Delivery (WCN-2010), Kottayam, Kerala, India, 2010.
32. "Development of Cell-mediated Drug Delivery of Antioxidants for Parkinson's Disease Therapy" First Annual World Congress of NeuroTalk-2010, Singapore, 2010.
33. "CNS Delivery of Antioxidants in Monocytes for Parkinson's Disease" 8<sup>th</sup> International; Symposium on Polymer Therapeutics: From Laboratory to Clinical Practice, Valencia, Spain, 2010.
34. "Therapeutic Proteins Delivered by Monocytes to the Brain in Parkinson's Disease" Protein & Peptide Conference-2009, Seoul, Korea, 2009.
35. "A new polymer-based nanoformulation for overcoming multi-drug resistance in cancer" 2<sup>nd</sup> World Cancer Congress, Beijing, China, 2009.
36. "Living Cells as Drug Delivery Vehicles for Protein Transport to the Brain" 1st International Summer School on Nanomaterials and Nanotechnology in Living Systems, Moscow, Russia, 2009.
37. "A Macrophage-based Delivery System of Antioxidant Enzymes for Parkinson's disease: Therapeutic Effect in vivo" NIH IDEa Central Region Conference, Oklahoma City, OK, USA, 2009.
38. "A new polymer-based nanoformulation for overcoming multi-drug resistance in cancer" 2<sup>nd</sup> World Cancer Congress, Beijing, China, 2009.
39. "Living Cells as Drug Delivery Vehicles for Protein Transport to the Brain" 1st International Summer School on Nanomaterials and Nanotechnology in Living Systems, Moscow, Russia, 2009.
40. "CNS Delivery of Therapeutic Proteins in Living Cells" 3rd BBBB-Bosphorus International Conference on Pharmaceutical Sciences, Turkey, Antalya, 2009.
41. "Monocytes for Delivery of Antioxidants in Parkinson's Disease" International Symposium on Polymer Therapeutics, 7<sup>th</sup> International Symposium on Polymer Therapeutics, Spain, Valencia, 2008.
42. "Nanomedicine: from Bench to Bedside" 14<sup>th</sup> International Pharmaceutical Technology Symposium, Turkey, Antalya, 2008.
43. "Cell-mediated delivery of therapeutic polypeptides in nanoparticles across the BBB" International Symposium on Polymer Therapeutics, FU, Berlin, 2007.
44. "Overcoming MDR using Block Copolymers" AAPS Annual Meeting and Exposition, San Diego, CA, USA, 2007.
45. "Nanozymes" for cell-mediated delivery across the Blood-Brain Barrier". 4<sup>th</sup> International Nanomedicine and Drug Delivery Symposium, Omaha, NE, USA, 2006.
46. "Effects of Pluronic P85 on GLUT-1 and MTC1 Transporters in the Blood Brain Barrier" on Gordon

Research Conferences, Tilton, NH, USA, 2004.

47. "Pluronic Block Copolymers as a Novel Drug Delivery System for Overcoming Drug Resistance in Cancer" on Gordon Research Conference "Drug Carriers in Medicine & Biology", Big Sky, MT, USA, 2004.
48. "Mechanism of Pluronic effect on P-glycoprotein efflux system in blood brain barrier" on 5<sup>th</sup> International Symposium on Polymer Therapeutics, The Welsh school of Pharmacy, Cardiff, UK, 2002.
49. "Selective energy depletion and sensitization of multiple drug resistant cells by Pluronic block copolymers" on ACS meeting in Washington, DC, USA, 2000.
50. "Effects of polyoxyethylated surfactants on drug transport in blood-brain barrier" on AAPS Annual Meeting in Boston, MA, USA, 1997.

#### **RESEARCH SEMINARS:**

1. "Engineering drug delivery systems by means of macrophages and macrophage-derived exosomes for treatment of neurodegenerative disorders" Seminar series at Johns Hopkins University, Baltimore, MD, May 2019.
2. "Cell-mediated and Exosome-mediated Drug Delivery Systems" Invited lecture at Moscow M.V. Lomonosov State University, Moscow, Russia, March 2019.
3. "Autologous Macrophages as Active Biocompatible Drug Delivery Vehicles for the Treatment of Neurodegenerative Disorders" Seminar series at Rush University, Chicago, IL, November 2018.
4. "Proteins and Peptides Drug Delivery" Invited lecture at Moscow M.V. Lomonosov State University, Moscow, Russia, October 2018.
5. "Back to Nature: Extracellular Vesicles for Drug Delivery", Invited lecture at Anatomy & Cell Biology Seminar Series, Western University, London, Canada, September 2018.
6. "Cell-mediated and exosome-mediated drug delivery", Invited lecture at Moscow M.V. Lomonosov State University, Russia, March 2018.
7. "Translational Applications in Exosome Research: From Biomarker Discovery to Drug Delivery", Science Webinar Series, Science/AAAS Custom Publishing Office, April 2017.
8. "Cell-mediated Drug Delivery", Invited lecture at Moscow M.V. Lomonosov State University, Russia, April 2017.
9. "Exosome-mediated Delivery of Therapeutic Proteins to the Brain", Seminar series at George Mason University, VA, April 2017.
10. "Exosomes for Drug Delivery to the Brain", The Nanoscale Science Program at Seminar series at Chemistry Department, UNC-Charlotte, NC, February 2017.
11. "Harnessing the Power of Exosomes for Drug Delivery", CNDD Colloquium, September 2015.
12. "Carriers that Break Barriers", MOPH division seminar program, Omaha, NE, February 2014.
13. "Trojan Horses of 21<sup>st</sup> Century: Delivery of Therapeutics in Macrophages", research seminar for UNMC Eppley Cancer Center, CGMR Program, Omaha, NE, March 2012.
14. "Cell-mediated Drug Delivery", Surgery division research forum, UNMC, Omaha, April 2012.
15. "New Developments in CNS Drug Delivery", Invited lectures, Moscow State University, Russia, November 2012.
16. "Living Cells as Delivery Vehicles Antioxidant Enzymes in Parkinson's Disease" Department of Pharmaceutical Sciences seminar, UNMC, Omaha, NE, January 2010.
17. "Cell-cell Interactions and Nanoparticles Transfer in Macrophage-mediated Drug Delivery. A love story", COP, UNMC, Omaha, NE, October 2010.
18. "Cell-mediated Drug Delivery for Parkinson's Disease Therapy", research seminar for Department of Internal Medicine, division of Geriatrics and Gerontology, UNMC, Omaha, December 2010.
19. "Cell-Mediated Transport of Nanozymes across the Blood-Brain Barrier", American Chemical Society Seminar, UNMC, Omaha, May 2008.
20. "Nanozymes" for Cell-mediated Delivery across the Blood-brain Barrier", Department of Anatomy and Physiology, Kansas State University, Manhattan, KS, April 2007.
21. "Polymer Genomics: Shifting Drug Delivery paradigm", 37<sup>th</sup> Annual Higuchi Research Seminar, Dept. of Pharm. Chemistry, University of Kansas, May 2004.
22. "Kinetic Considerations of Pluronic Effects on Drug Efflux Transporters", 36<sup>th</sup> Annual Higuchi Research Seminar, Dept. of Pharmaceutical Chemistry, University of Kansas, May 2003.

23. "Kinetic Considerations of Pluronic Effects on Drug Efflux transporters", College of Pharmacy, UNMC, Omaha, NE, May 2003.
24. "Pluronic Interactions in MDR Cancer Cells and Blood Brain Barrier", College of Pharmacy, UNMC, Omaha, NE, March 2000.
25. "Amphiphilic Block Copolymers in Drug Delivery", College of Pharmacy, UNMC, Omaha, NE, October 1998.

## **PATENTS:**

### US Patents:

1. "BIOLOGICAL AGENT-EXOSOME COMPOSITIONS AND USES THEREOF" U.S. Batrkova E.V., Kabanov A.V., Haney M., M. Sokolsky. National Phase Patent Application No. 16/089,833, filed September 28, 2018.
2. "Compositions for protein delivery and methods of use thereof", Kabanov A.V. Bronich T.K., Batrkova E.V., Gendelman, H.E., US application #16/021,537, filed on June 28, 2018.
3. "Biological Agent-exosome Compositions and Uses thereof", Batrkova E.V., Kabanov A.V., Yuan, D., Haney M.J. U.S. PCT Application No. PCT/US2017/024931; filed March 30, 2017. International application was published by WIPO on October 5, 2017 under publication number WO 2017/173034.
4. "Nucleic acids (e.g. DNA) compositions of exosomes and methods thereof", Kabanov A.V., Batrkova E.V., and Haney M.J. NIN OTD: 16-0112, March 2016.
5. "Biological agent compositions of exosomes and methods thereof", Batrkova E.V., Kabanov A.V., Yuan, D., Haney M.J. U.S. Provisional Patent Application No. 62/315,389; filed March 30, 2016
6. "Synthetically Functionalized Living cells for targeted Drug delivery", Polak R., Cohn R., Rubner M., Batrkova E.V., Haney M., Klyachko N.L., Zhao Y. US patent application, Case No.: 18547, March 2016.
7. "Compositions and Methods for Gene Therapy", Kabanov A.V., Batrkova E.V., Mahijan V., Haney M. US patent extension, Docket #12084PCT, No. PCT/US13/040577, 2014.
8. "Compositions and Methods for Gene Therapy", Kabanov A.V., Batrkova E.V., Mahijan V., Haney M. US patent, Docket #12084PCT, No. PCT/US13/040577, 2013.
9. "Drug-loaded exosomes released from inflammatory cells for treatment of neurodegenerative disorders", Batrkova E.V., Kabanov A.V., Haney M.J., Zhao Y. Provisional patent filing, UNC, 2013.
10. "Using inflammatory cells for transfection of neurons, brain microvessel endothelial cells (BMVEC), and astrocytes for treatment of neurodegenerative disorders", Batrkova E.V., Kabanov A.V., New Invention Notification (NIN) #11088, UNMC, 2012.
11. "Amphiphilic Polymer-Protein Conjugates and Methods Thereof", Batrkova, E.V., Vinogradov, S.V., Kabanov A.V. US Patent #8017151 A 2011.
12. "Treatment of Neurodegenerative Disorders", Batrkova E.V., Kabanov A.V., Gendelman, HE., US Patent #07006 A 2007.
13. "Compositions for Protein Delivery and Methods of Use Thereof", Kabanov A.V. Bronich T.K., Batrkova E.V., Gendelman, H.E., US Patent #07015 A 2007.
14. "Amphiphilic Polymer-Protein Conjugates and Methods of Use Thereof" Batrkova, E.V.; Vinogradov, S.V.; Kabanov A.V. US Patent #63203 A 2004.
15. "Copolymer compositions for oral delivery" Kabanov, A.V.; Alakhov, V.Y.; Batrkova, E.V. US Patent # 6387406 A 2002/05-14
16. "Copolymer compositions for oral delivery" Kabanov, A.V.; Alakhov, V.Yu.; Batrkova, E.V. US Patent # 6277410 A 2001/08-21
17. "Compositions for targeting biological agents" Kabanov, A.V.; Alakhov, V.Yu; Chekhonin, V.P.; Batrkova, E.V.; Kabanov, V.A. US Patent # 6153193 A 2000/11-28

### PCT and Foreign patents:

1. "Pharmaceutical compositions containing a biological agent and a poly (oxyethylene)-poly (oxypropylene) block copolymer" Kabanov, A.V.; Alakhov, V.Y.; Batrkova, E.V. WO 99-US2538 1999/0205
2. "Polyether block copolymer micellar compositions for targeting biological agents" Kabanov, A.V.; Alakhov, V.Yu.; Chekhonin, V.P.; Batrkova, E.V.; Kabanov, V.A. WO 96/40056 A1 1996/1219
3. "Preparation of aqueous dispersions of polymer vesicles from dialkylammonium halides" Zubov, V.P.;

## F. TEACHING ACTIVITIES:

### a. Lectures in Team-taught Courses for the past six years:

1. DPMP 738, “Nanomedicine”, 2019 (Spring).
2. BIOL 395/495/395H, “Undergraduate Research in Biology”, 2019 (Spring).
3. BIOC/PHCO 745, “Intercellular Signaling in Development and disease”, 2018 (Spring).
4. MOPH 862 “Advanced Physical Pharmacy”, 2018 (Spring).
5. DPMP 868 “Advanced Physical Pharmacy”, 2017 (Fall).
6. BIOC/PHCO 740-745 “Intercellular Signaling in Development and disease”, 2017 (Spring).
7. MOPH 862 “Advanced Physical Pharmacy”, 2017 (Spring).
8. PHRS 899 Seminar, UNC Eshelman School of Pharmacy, 2016 (Fall).
9. MOPH 868 “Advances in Drug Delivery and Nanomedicine”, UNC Eshelman School of Pharmacy, 2016 (Fall).
10. PHCY 512 “Pharmaceutics and Drug Delivery Systems”, UNC Eshelman School of Pharmacy, 2016 (Spring)
11. MOPH 862 “Advanced Physical Pharmacy”, UNC Eshelman School of Pharmacy, 2016 (Spring)
12. MOPH 864 “Advances in Drug Delivery”, UNC Eshelman School of Pharmacy, 2015 (Fall).
13. PHRS 899 Seminar, UNC Eshelman School of Pharmacy, Course Director, 2015 (Spring).
14. MOPH 738 “Nanomedicine”, UNC Eshelman School of Pharmacy, 2014 (Fall).
15. MOPH 864 “Advances in Drug Delivery”, UNC Eshelman School of Pharmacy, 2014 (Fall).
16. PHCY 410 Basic Pharmaceutics I, UNC Eshelman School of Pharmacy, 2013, 2014 (Fall).
17. MOPH 864 “Advances in Drug Delivery”, UNC Eshelman School of Pharmacy, 2013 (Fall).
18. MOPH 738 “Nanomedicine”, UNC Eshelman School of Pharmacy, 2012 (Fall).

### b. Mentorship/Students Supervision:

#### Graduate supervisory/advisory committees:

Amit Sharma	2004-2007
Zagit Gaymalov	2005-2010
Gaurav Sahay	2005-2010
Xiang Yi	2005-2010
Mark Ueda	2009-2011
Daria Alakhova	2004-2012
Anna Brynskikh	2007-2012
Yi Zhao	2008-2013
Erin G. Rosenbaugh	2009-2013
Poornima Suresh	2011-2013
Inmaculada Sánchez	2013 (member of PhD thesis examination panel)
James Huckle	2013-2014
Michaela L. Eggen	2011-2015
Gang Zhang	2011-2015
Zhijian He	2013-2015
Yuan, Dongfen	2014-2017
Jiang, Yuhang	2014-2016
Seo, Youn Gee	2014-2018
Rahhal, Tojan Bassam	2014-2016
Wan, Xiaomeng	2015-2018
Lei Miao	2015-2016
Srinivas, Nithya	2015-2018
Yeon Soo Jin	2017-present
Jimmy Fay	2018-present

#### Undergraduate visiting/summer students/unpaid interns:

Song Mu	1997
Haiquin Dai	1999
Swayam Prabha	1999-2000
Jason Jokerst	2003-2004
Aaron Mayo	2003-2004
Daria Alakhova	2004-2005
Stephanie L. Booth	2009-2010
Kelvin Chin	2011
Muna Pokhrel	2011
Tatyana Kasperovich	2011
Eli Inscoe	2013-2014
Richa Gupta	2013-2014
Phi Phua	2014-2015
Corey Pahel-Short	2015
Joseph Zhao	2015
Lena Cohen	2016
Oyesola Popoola	2017
Halle Lutz	2017
Yeon Soo Jin	2017-present
Carolyn Reuland	2017-2018*
*jointly with Dr. F. Church	
Sam Michael Li	2018-present

Graduate Students:

Jian Zhu	2004*
Amit Sharma	2004-2007*
Gaurav Sahay	2005-2010*
Xiang Yi	2005-2010*
Michelle Gasko	2007-2008*
Mark Ueda	2009-2011*
Daria Alakhova	2006-2011*
Anna Brynskikh	2007-2012*
Yi Zhao	2008-2013*
Poornima Suresh	2010-2013*
Myung Soo Kim	2013-2016
Jimmy Fay	2017-present*
*jointly with Dr. A.V. Kabanov	

Rotation Graduate Students:

Chaitali Passey	2008
Rajesh R. Wakaskar	2009
Hardeep S. Oberoi	2007
Emily B. Harrison	2011-2012
John P. Bohnsack	2012
Tojan Rahhal	2012-2013
Tejash Patel	2012-2013
Myung Soo Kim	2012-2013
Goodwin, Tyler Jay	2013-2014
Erin Wilson	2013
Olga Uvarov	2015

Postdoctoral/Visiting Scientists:

Li Zhang	2004-2005
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Mirjam Clemens-Hemmelmann	2012
Fiona Cooke	2015
Natalia Klyachko	2012-2015
Roberta Polak	2015

Research Technologists:

Shu Li	1998-2011
Yulili Li	2002-2005
Yuling Zhao	2009-present
Matthew Haney	2010-present

**G. GRANTS:**

1R01NS102412-01A1 (E. Batrakova) 06/01/18 – 05/31/23 50% effort  
 NIH / NINDS \$1,950,000  
 “Cell-based Platform for Gene Delivery to the Brain”  
 Principal Investigator  
 ACTIVE

UNC 38-124 (E. Batrakova) 06/01/18 – 01/01/20 5% effort  
 Eshelman Institute for Innovation (EII) \$50,000  
 “Developing Exosome-based Delivery of TPP1 for Batten Disease Therapy”  
 Principal Investigator  
 ACTIVE

1R21MH118985 (N. El-Hage) 03/01/19 – 04/30/21 3% effort  
 NIH / NIDA \$39,000  
 “Develop and evaluate efficacy of nanoformulated siBeclin1 delivered intranasally to eliminate HIV in brain”  
 Co-Investigator  
 ACTIVE

UNC RX03812420 (A. Kabanov) 06/01/18 – 06/01/20 1% effort  
 Eshelman Institute for Innovation (EII) \$200,000  
 “Nanoparticle delivery of Cas9 and therapeutic gRNAs to the brain”  
 Co-Investigator  
 ACTIVE

UNC RX03812408 (A. Kabanov) 06/01/18 – 05/31/19 1% effort  
 Eshelman Institute for Innovation (EII) \$50,000  
 Brain Drug Delivery: Optimizing miR-29 Nanoformulation for Neuroprotection”  
 Co-Investigator  
 ACTIVE

UNC RX03712415 (A. Kabanov) 06/01/17 – 01/01/20 1% effort  
 Eshelman Institute for Innovation (EII) \$375,000  
 “Systemic Targeting of Mononuclear Phagocytes for Parkinson’s Disease Gene Therapy”  
 Co-Investigator  
 ACTIVE

RR172267 (S. Whitehead) 11/01/18-03/31/20 2% effort  
 Canada 2017: AD-Related Diseases program \$300,000  
 “Evaluating the neuroprotective potential of CAT-SKL in a pre-clinical model of AD”  
 Collaborator  
 ACTIVE

NCI SBIR Phase II CA-221487 (R. Gupta) NIH / NIDS “Exosomal Drug Delivery” Paid Consultant ACTIVE	01/26/17 – 08/31/19 \$200,000	1% effort
RG-1607-25207 (G. Matsushima) NIH / NMSS “Function of microglia during remyelination” Co-Investigator ACTIVE	4/1/2017-3/31/2020 \$381,530	5% effort
EUP 17-4676 (E. Batrakova) Elsa U Pardee Foundation “Targeting the Triple Negative Breast Cancer with Paclitaxel-loaded Biomimetic Nanovesicles, Exosomes” Principal Investigator COMPLETED	10/01/17 – 03/31/19 \$159,024	25% effort
1R01 NS057748-01A2 (E. Batrakova) NIH / NINDS “Inflammatory Cells for Transport of Therapeutic Polypeptides across the Blood Brain Barrier” Principal Investigator COMPLETED	09/29/08 – 08/31/13 \$1,250,000	35% effort
UNC EII29-201 (E. Batrakova) Eshelman Institute for Innovation (EII) “Engineering 3D models of cancer metastasis with pro-inflammatory microenvironment for cancer immunotherapy” Principal Investigator COMPLETED	06/01/16 – 06/01/17 \$50,000	1% effort
UNC TEG15-4849 (E. Batrakova) NC Biotechnology Center “Use of Autologous Macrophages for Sustained Delivery of GDNF as Treatment of Parkinson’s Disease” Principal Investigator COMPLETED	09/01/15 – 06/30/17 \$50,000	5% effort
Oldfield Alzheimer’s Research Fund Award UNMC (E. Batrakova) Principal Investigator COMPLETED	06/01/10 – 06/01/11 \$20,000	5% effort
1P20 RR021937-01A2 (A. Kabanov) NIH / NCRR COBRE: “Nebraska Center for Nanomedicine” Project Leader COMPLETED	09/26/08 – 06/30/13 \$1,473,976	25 % effort
2 R01 NS051334 (A. Kabanov) NIH / NINDS “Polypeptide modification for enhanced brain delivery” Co-Investigator	01/01/10 – 03/31/16 \$1,750,000	5% effort

## COMPLETED

W81XWH11-1-0700 (A. Kabanov) 08/29/11 – 08/28/14 5% effort  
DoD \$190,794,000  
“Integrate Immune, Biomaterial & Stem Cell Platform for Neuroprotection in Battlefield Injuries”  
Co-Investigator  
COMPLETED

2RO1 CA89225 (A. Kabanov) 02/01/08 – 01/31/12 5% effort  
NIH / NCI \$1,250,000  
"Interactions of Pluronic block copolymers in drug resistant cancer"  
Co-Investigator  
COMPLETED

1R43GM062054-01 (F. Wang) 08/01/00 – 01/31/01 25% effort  
NIH / NCI \$99,961  
“Star polymer unimolecular micelles for drug delivery”  
Co-Investigator  
COMPLETED

## H. PROFESSIONAL SERVICE:

1. Seminar coordinator at the Center for Nanotechnology in Drug Delivery (CNDD) at North Carolina University (UNC) at Chapel Hill, Eshelman School of Pharmacy, 2019 (Spring, Fall).
2. Committee member of the Honors Program, UNC, School of Pharmacy, 2018 (Spring).
3. Seminar coordinator at the Center for Nanotechnology in Drug Delivery (CNDD) at North Carolina University (UNC) at Chapel Hill, Eshelman School of Pharmacy, 2018 (Spring, Fall).
4. Committee member of the Honors Program, UNC, School of Pharmacy, 2017 (Spring, Fall).
5. Committee member of the Honors Program, UNC, School of Pharmacy, 2016 (Spring, Fall).
6. MOPH Prospective Graduate Student Interviews, January 2015
7. Member of a search committee for Research Associate position, February 2015.
8. Committee member of the Honors Program, UNC, School of Pharmacy, 2015 (Spring, Fall).
9. BBSP Prospective Graduate Student Interviews, February 2015
10. Member of a search committee for a Research Associate position, Spring 2015.
11. Member of a search committee for a Research Specialist at the UNC Center for Nanotechnology in Drug Delivery (CNDD), Fall 2015.
12. MOPH Prospective Graduate Student Interviews, January 2014
13. BBSP Prospective Graduate Student Interviews, February 2014
14. Committee member of the Honors Program, UNC, School of Pharmacy, 2014 (Spring, Fall).
15. Judge of Catalent Institute-AAPS Academic Competition, April 2014.
16. Member of the Committee to Review the Governance Document of Graduate Program, September 2014.
17. Committee member of the Honors Program, UNC, School of Pharmacy, 2013 (Fall).
18. Chair of search committee for recruiting a Research Assistant Professor, 2013 (Fall).
19. Member of UNC Eshelman School of Pharmacy Technology and Pedagogy (TAP) sub-committee, 2012.
20. Chair, Pharmaceutical Sciences Graduate Program (PSGP) Committee, 2011-2012.
21. Member of UNMC Graduate Council, 2011-2012.

## EDITORIAL DUTIES AND REVIEW PANELS:

### Ad Hoc Reviewer:

1. AAPS PharmSciTech



2. ACS Nano
3. Acta Biomaterialia
4. Acta Pharmaceutica Sinica
5. Advanced Drug Delivery
6. American Journal of Drug Delivery
7. Bentham Science Publishers
8. Biochemistry
9. Biochemical Pharmacology
10. Biomacromolecules
11. Biomaterials
12. Brain, Behavior, and Immunity
13. Critical Reviews™ in Therapeutic Drug Carrier Systems
14. Current Pharmaceutical Design
15. Developmental neuroscience
16. Drug Targeting and Delivery
17. Drug Delivery
18. Exp. Biology and Medicine
19. Hundai Publishing Corporation
20. Journal of Controlled Release
21. Journal of Drug Targeting
22. Journal of Neuroimmune Pharmacology
23. Journal of Pharmaceutical Science
24. Journal of Pharmacy & Pharmaceutical Sciences
25. Langmuir
26. Life Sciences
27. Macromolecule Bioscience
28. Molecular Pharmaceutics
29. Molecular Therapy
30. Movement Disorders
31. Nanomedicine (London)
32. Nature Communications
33. Neuroscience Letters
34. Peptides
35. Pharmaceutical Research
36. Plos ONE
37. Therapeutic delivery
38. Wiley Interdisciplinary Reviews: Nanomedicine

**Editorial Board Member:**

39. Nanomedicine: Nanotechnology, Biology, and Medicine (Elsevier)
40. Journal of Bioanalytical Techniques
41. Mathews Journal of Cancer Science
42. Journal of Drug Delivery
43. Journal of Clinical Pharmacology (JCP)
44. Alzheimer's and Parkinsonism: Research Therapy
45. International Journal of Neurodegenerative Disorders

## **GRANT REVIEW AND STUDY SECTIONS:**

1. Grant reviewer to ZRG1 VH-D(02)M Special Emphasis Panel/Scientific Review Group “Vascular Regulation and Hematology”, June 2019.
2. Grant reviewer to ZRG1 IMST-H(55)R Special Emphasis Panel/Scientific Review Group “Innovative Research in Cancer Nanotechnology (IRC�)”, March 2019.
3. Grant reviewer to 2019/05 ZRG1 CB-D (71) R review Group, “Advancing Extracellular RNA (exRNA) Communication Research: Towards Single Extracellular Vesicle (EV) Sorting, Isolation, and Analysis of Cargo”, March 2019.
4. Grant reviewer to ZCA1 PCRB-G J1 S NCI R13/U13 conference grants review Group (PA-18-648), October 2018.
5. Grant reviewer to Transformational Research for the W. Garfield Weston Foundation: Canada 2018 program, August 2018.
6. Grant reviewer to 2018/10 ZRG1 F09B-M (20) L Special Emphasis Panel/Scientific Review Group, June 2018.
7. Grant reviewer to ZRG1 MDCN-T (50) Special Emphasis Panel/Scientific Review Group, May 2018.
8. Grant reviewer to NIH Shared Instrumentation for Animal Research (SIFAR) Grant Program (Internal review), April 2018.
9. Grant reviewer to Special Emphasis Oncological Sciences Fellowship Panel Panel/Scientific Review Group ZRG1 F09B-M 20 L, March 2018.
10. Grant reviewer to Special Emphasis Oncological Sciences Fellowship Panel Panel/Scientific Review Group 2018/01 ZRG1 F09B-M (20) L, November 2017.
11. Grant reviewer to Special Emphasis Panel/Scientific Review Group 2018/01 ZCA1 PCRB-G (J1) S, October 2017.
12. Grant reviewer to 2017/ NIH/CSR F09B Fellowship Study Section on Cancer Biology, March 2017.
13. Grant reviewer to 2017/05 ZCA1 TCRB-D (M2) S for NIH/UO1. Study section: Innovative Research in Cancer Nanotechnology (IRC�s) for NIH/NCI Study section, February 2017.
14. Grant reviewer to NIH Review Study, November 2016.
15. Grant reviewer to ZCA1 PCRB-G J1 S, for R13 Conference Grant Review, October 2016.
16. Grant reviewer to ZCA1 TCRB-6 (O1) Study section: Innovative Research in Cancer Nanotechnology (IRC�s) for NIH/NCI Study section, July 2016.
17. Grant reviewer to 2016 Peer Reviewed Breast Cancer Research Program (BCRP) for the Department of Defense Congressionally Directed Medical Research Programs (CDMRP) Nanotechnology (BCRP NT) study section, July 2016.
18. Grant reviewer to 2016 Spring UNC Lineberger Cancer Center Developmental Grants program, June 2016.
19. Grant reviewer to NIH 2015/05 ZCA1 PCRB-G (M1) S - R13 study section, February 2015.
20. Grant reviewer to Special Emphasis Panel/Scientific Review Group 2015/10 ZRG1 OTC-B (11) B, July 2015.
21. Judge for the 3rd Annual Catalent Institute Academic Competition, April 2014.
22. Grant reviewer to UNC Nutrition Obesity Research Center, February 2014.
23. Grant reviewer to NIH Special ZRG1 F05-R (20) L Fellowship: Cell Biology, Developmental Biology, and Bioengineering Panel, July 2014.
24. Grant reviewer to NIH Neural Oxidative Metabolism, Mitochondria and cell Death (NOMD) Study section, October 2014.
25. Grant reviewer to NIH Center for Scientific Review Vascular Cell and Molecular Biology (VCMB) Study Section, October 2014.

26. Grant reviewer to Technology Foundation STW (Innovation Research Incentives Scheme), Netherlands, January 2013.
27. R13/U13 Grant reviewer to Special Emphasis Panel/Scientific Review Group 2013/05 ZCA1 PCRB-G Study section, April 2013.
28. Grant reviewer to Biobehavioral Regulation, Learning and Ethology (BRLE) Study Section, June 2013.
29. Grant reviewer to P2RMIS Department of Defense program, August 2013.
30. Grant reviewer to NIH Small Business: Biological Chemistry, Biophysics, and Drug Discovery (SBIR/STTR) Study section, February 2012.
31. R13 Grant reviewer to NIH/NCI Study section, April 2012.
32. Vice-Chair of UNMC AY2012-13 Assistantship/Fellowship Competition, Bioinformatics Study Section, April 2012.
33. Grant reviewer to American Institute of Biological Sciences, January 2011.
34. Committee Member, NIH Gene and Drug Delivery Study section, June 2011.
35. R13 Committee Member, NIH/NCI Study section, June 2011.
36. Grant reviewer to NIH Small Business: Biological Chemistry, Biophysics, and Drug Discovery (SBIR/STTR) Study section, October 2011.
37. Grant reviewer to Edna Ittner Pediatric Research Support Fund, June 2010.
38. Grant reviewer to NIH Challenge Grants in Health and Science Research, RFA-09-003, July 2009.
39. Grant reviewer to Italian Ministry of Health grants, August 2009.

#### **PROFESSIONAL SOCIETIES:**

Controlled Release Society (CRS)  
 American Chemical Society (ACS)  
 American Association of Pharmaceutical Scientists (AAPS)  
 American Association of Cancer Research (AACR)  
 International Society of Exosomes and Microvesicles (ISEV)  
 American Society of Exosomes and Microvesicles (ASEMV)  
 NY Academy of Sciences (NYAS)

#### **OTHER:**

1. Moderator/Session Chair, International Society of Extracellular Vesicles Meeting (ISEV2019), Kyoto, Japan, April 25-28, 2019.
2. Speaker at public event "Spotlight on Rare Disease", April 25, 2018.
3. Participation in the hosting a delegation of pharmacy faculty from Moldova, April 2018.
4. Recording lecture for Carolina Nanoformulation Workshop "Exosome-mediated drug delivery", March 2018.
5. Speaker of webinar panel of Science magazine "Translational applications in exosome research: From biomarker discovery to drug delivery", April 19, 2017.
6. Recording lecture for Carolina Nanoformulation Workshop "Exosomes for Drug Delivery", July 2015.
7. Volunteer for two lectures "Brain and Polymers" at Ephesus Elementary School, Chapel Hill, December 2014.
8. Moderator/Session Chair, Eight Annual Chapel Hill Pharmaceutical Sciences Conference, May 28-29, 2014.
9. Volunteer for UNMC Skate-a-Thon for Parkinson's, January 2012.
10. Member of UNMC Translational Research Task Force group, 2012.
11. The first-in-man polymeric micelle drug SP1049C (now SKC1049) that was developed with my active participation received FDA's SPA for Phase III and is in clinical development by SoftKemo.