# CURRICULUM VITAE

**Marina Roginskaya, Ph.D.**

Department of Chemistry Box 70695
East Tennessee State University
Johnson City TN 37614-0581
Tel: (423) 439-4928 (office)
Email: roginska@etsu.edu

## Education

| | |
|---|---|
| 2006 | Ph. D. in Biophysics (Honors), Department of Biochemistry and Biophysics, University of Rochester, NY.<br>Thesis title: 'Oxidative damage to DNA by ionizing radiation: pathways and radioprotection'.<br>Advisor: Dr. William A. Bernhard |
| 1990 | B. S. in Chemistry (Honors), Department of Chemistry, Moscow State University, Moscow, Russia.<br>Thesis title: 'Reactions of ethylene sulfide on the surface of chemically activated silica gel'.<br>Advisor: Dr. Michael Melnikov |

## Academic Positions

| | |
|---|---|
| 2017-present | Associate Professor, Department of Chemistry, ETSU, Johnson City, TN. |
| 2011-2017 | Assistant Professor, Department of Chemistry, ETSU, Johnson City, TN. |
| 2009-2011 | Chemistry Lecturer, Department of Chemistry, ETSU, Johnson City, TN. |
| 2008-2009 | Postdoctoral Fellow, Department of Biochemistry and Molecular Biology, East Tennessee State University, Johnson City, TN. |
| 2007 | Postdoctoral Fellow, Department of Physiology, East Tennessee State University, Johnson City, TN. |
| 2006 | Postdoctoral Fellow, Department of Biochemistry and Molecular Biology, East Tennessee State University, Johnson City, TN. |
| 1998-2006 | Ph.D. student in Biophysics, Department of Biochemistry and Biophysics, School of Medicine and Dentistry, University of Rochester, Rochester, NY. |
| 1996-1998 | Ph.D. student in Biomedical Chemistry, Department of Chemistry, Oakland University, Rochester, MI. |
| 1990-1996 | Research Fellow, Department of Chemistry, Moscow State University, Moscow, Russia. |

## Teaching Experience

| | |
|---|---|
| 2009-present | Teaching undergraduate and graduate courses at Department of Chemistry, East Tennessee State University, Johnson City, TN |

<u>Undergraduate</u>:
General Chemistry I - lecture
General Chemistry II – lecture
Organic Chemistry II - laboratory
Introduction to Integrated Laboratory -laboratory
Principles of Physical Chemistry – lecture
Seminar in Chemistry – lecture/seminar

Graduate:
Chemical Thermodynamics – lecture
Chemical Kinetics –lecture
Special Topics in Physical Chemistry: Photochemistry and Radiation Chemistry – lecture
Special Topics in Physical Chemistry: Free Radicals in Chemistry and Biology - lecture
Graduate Seminar – seminar

**Research Experience**

My present research interests focus on chemical mechanisms of oxidative damage to DNA under conditions mimicking oxidative stress. Free radical damage to DNA by reactive oxygen species (ROS) overproduced in living organisms due to the effects of ionizing radiation, UV-light, tobacco smoking, and infections has been unequivocally linked to a number of debilitating conditions as cancer, cardiovascular and neurodegenerative diseases, and aging. Therefore, cures for these diseases rely on a better understanding of underlying mechanisms of DNA damage. The aim of my research is to deepen the understanding of chemical mechanisms of reactions of ROS with DNA essential for prediction of long-term biological consequences of these processes and for future elaboration of preventive measures aimed at controlling DNA damage by free radicals.

Our research group has carefully elaborated a set of HPLC-based techniques of quantitative analysis of low-molecular characteristic products of DNA oxidative damage as a well-established, powerful, and convenient method of studying mechanisms of oxidative damage to DNA. In combination with LC-MS, GC-MS, and NMR techniques, these techniques allow for deciphering intermingling mechanisms of DNA damage.

Current Research Projects

- Investigating structures, mechanisms of formation, and further conversions of novel intermediate products of one-electron oxidation of guanine in native highly polymerized DNA and in guanosine (2′-deoxyguanosine) and in short oligomers as models.
- Studies of low-molecular-weight products of highly polymerized DNA irradiated with heavy beams (Ne-22 irradiation) at different doses (a collaborative work with the research group of Dr. Amitava Adhikary, Oakland University, MI).

Selected Past Research Projects

- Investigating mechanisms of formation and reactions of a biologically important DNA oxidized lesion 2,5-diamino-imidazolone (Iz) in highly polymerized native DNA and in model systems.
- Kinetic studies of reactions of carbonate radical anions and sulfate radical anions with DNA bases and 2-deoxyribose moiety
- Chemical modifications of pathways of DNA oxidative damage by DNA complex formation with natural (histones, natural polyamines) and model positively charged polycations as a potential mechanism of DNA protection against oxidative damage
- Effects of complex formation of DNA with polycations on the products of oxidative damage to DNA 2-deoxyribose by hydroxyl radicals
- Studies of the mechanism of protection of DNA against oxidative damage by natural indolamines such as melatonin
- Kinetic study of formation and reactions of 8-oxoguanine (8-oxoG) in DNA, a well-known biomarker of oxidative stress
- Measurements of relative contributions of C1′, C4′, and C5′ pathways to DNA backbone scission initiated by hydrogen abstraction from 2-deoxyribose

- Optimization of HPLC-based method of quantitative detection of characteristic low-molecular products of DNA
- Elaboration of a theoretical model of charge transport in DNA as one-dimensional diffusion and design of experiments to test the validity and limitation of this model

**Service Experience**

2022-present Member of the ETSU CAS Senate
2021 – present Chemistry URHP Program Coordinator & Advisor
2017-2019 Chemistry Graduate Program Coordinator
2011-2017 Coordinator of Integrated Laboratories

**Honors and Awards**

2023 Departmental travel award.to the ACS conference in Indianapolis, IN, Department of Chemistry, ETSU, Johnson City, TN
2006 George V. Metzger award for excellence of the Ph.D. thesis and in the research leading to the dissertation in the program in Biophysics, Department of Biochemistry and Biophysics, University of Rochester, Rochester, NY
2005 Radiation Research Society school-in-training travel award
2004 Radiation Research Society school-in-training travel award
2001-2002 Elon Huntington Hooker graduate fellowship for excellence in chemistry Department of Biochemistry and Biophysics, University of Rochester, Rochester, NY
1990 B.S. diploma with honors, Department of Chemistry, Moscow State University, Russia

**Membership in Professional Associations**

2012-2020 and 2023-present American Chemical Society
2004-2006 and 2021-present Radiation Research Society

**Selected List of Publications in Peer-Reviewed Journals**


1. Roginskaya, M.; Razskazovskiy, Y. Oxidative DNA Damage and Repair: Mechanisms, Mutations, and Relation to Diseases. *Antioxidants* **12**: 1623 (2023) https:// doi.org/10.3390/antiox12081623.
2. Razskazovskiy, Y, Campbell, E.B., Cutright, Z.D., Thomas, C. S, Roginskaya, M. One-electron oxidation of guanine derivatives: Detection of 2,5-diaminoimadazolone and novel guanine-guanine cross-links as major end products. *Radiat Phys Chem* **196**: 110099 (2022).
3. Thomas, C. S, Pollard, H. C., Razskazovskiy, Y, Roginskaya, M. Sources of 2,5 diaminoimidazolone lesions in DNA damage initiated by hydroxyl radical attack. *Free Radic Res* **54:** 517-524 (2020).
4. Razskazovskiy, Y, Tegomoh, M., Roginskaya, M. Association with polyamines and polypeptides increases the relative yield of 2-deoxyribonolactone lesions in radiation-damaged DNA. *Radiat Res* **192:** 324-330 (2019).
5. Roginskaya, M., Janson, H., Seneviratne, D. Razskazovskiy, Y. The reactivity of 2,5-diaminoimidazolone base modification towards primary amines: nucleophilic substitution at C5 as a potential source of abasic sites in oxidatively damaged DNA. *Res Chem Intermed 43*:1543-1555 (2017).
6. Roginskaya, M., Mohseni, R., Ampadu-Boateng, D., Razskazovskiy, Y. DNA damage by the sulfate radical anion: hydrogen abstraction from the sugar moiety versus one-electron oxidation of guanine. *Free Radic Res 50:*756-766 (2016).

7. Roginskaya, M., Moore, T. J., Ampadu-Boateng, D., Razskazovskiy, Y. Efficacy and site specificity of hydrogen abstraction from DNA 2-deoxyribose by carbonate radicals. *Free Radic Res 49:*1431-1437 (2015).
8. Roginskaya, M. Mohseni, R., Moore, T. J. Bernhard, W. A. and Razskazovskiy, Y. Identification of the C4′-oxidized abasic site as the most abundant 2-deoxyribose lesion in radiation-damaged DNA using a novel HPLC-based approach. *Radiat Res* **181:** 131-137 (2014).
9. Roginskaya, M., Razskazovskiy, Y. Selective radiation-induced generation of 2-deoxyribonolactone lesions in DNA mediated by aromatic iodonium derivatives. *Radiat Res* **171**, 342-348 (2009).
10. Roginskaya, M., Bernhard W.A, Razskazovskiy, Y. Protection of DNA against direct radiation damage by complex formation with positively charged polypeptides. *Radiat Res* **166**, 9-18 (2006).
11. Roginskaya, M., Bernhard, W. A., Razskazovskiy, Y. 2-Deoxyribonolactone lesions in X-irradiated DNA: Quantitative determination by catalytic 5-methylene-2-furanone release. *Ang Chem Int Ed* **44**, 6210-6213 (2005).

**Student Master Theses (MS)**

- Pollard, Hannah. Study of 2,5-diaminoimidazolone, a mutagenic product of oxidation of guanine in DNA. Master Thesis, November 2017.
- Tegomoh, Modeste. Effects of complex formation of DNA with positively charged polyamines and polypeptides on the products of oxidative damage to DNA 2-deoxyribose by hydroxyl radicals. Master Thesis, October 2015.
- Terence Joshua Moore. Mechanisms of oxidative damage to DNA by carbonate radicals. Master Thesis, October 2014.
- Derrick Ampadu-Boateng. Kinetics of formation and oxidation of 8-oxo-7,8-dihydroguanine (8-oxoG). Master Thesis, December 2013.

**Honors Student Theses (BS)**

- Evan Dunn. Mechanisms of formation of novel guanine-guanine cross-links as major end products during one-electron oxidation of guanine derivatives. Honors Thesis Presentation at the 2023 ETSU Boland Symposium, April 2023.
- Zachary Cutright. Reaction pathways initiated by one-electron oxidation of guanine: oxidation steps leading to stable end products. Honors Thesis Presentation at the 2021 ETSU Boland Symposium, April 2021.

**Presentations**

1. **Dunn, E.**, Razskazovskiy, Y., Roginskaya, M. Mechanisms of formation of novel guanine-guanine cross-links as major end products during one-electron oxidation of guanine derivatives. Oral Presentation at Boland Symposium, April 2023, ETSU.
2. **Osei Addae, S.**, Razskazovskiy, Y., Roginskaya, M., Analysis of Intermediate of Novel Guanine-Guanine Crosslinks Produced in Reactions of One-Electron Oxidation of Guanine Derivatives by Using 8-Substituted Guanosines as Analog Compounds. Poster Presentation at Appalachian Student Research Forum, April 2023, ETSU.
3. **Razskazovskiy, Y.**, Roginskaya, M., Dunn, E., Osei Addae, S. Guanine-Guanine cross-links induced by one electron oxidants in DNA and model compounds. International Congress for Radiation Research (ICRR).
4. **Roginskaya, M.**, Dunn, E., Osei Addae, S., Razskazovskiy, Y. Mechanisms of formation of novel guanine-guanine cross-links during one-electron oxidation of guanine derivatives. Oral

presentation at American Chemical Society (ACS) Symposium. Indianapolis, IN, March 30, 2023.

5. **Razskazovskiy, Y**., Roginskaya, M., Campbell, E., Cutright, Z. Formation, structure, and reactivity of novel guanine-guanine cross-links produced in reactions of guanine derivatives with one-electron oxidants. Poster presentation at Radiation Research Society Symposium (RRSS) (virtual). October 2021.
6. **Roginskaya, M.,** Campbell, E., Cutright, Z., Thompson, C.S., Razskazovskiy, Y. Oxidation of guanine derivatives initiated by one-electron transfer: Identification of 2,5-diaminoimidazalone and novel G-G cross links as major end products. Poster presentation at Radiation Research Society Symposium (RRSS) (virtual). October 2021.
7. **Dunn, E**. Razskazovskiy, Y., Roginskaya, M. Purification and structural analysis of products of oxidation of N1-methyl – 2′-deoxyguanosine. Oral Presentation at Chemistry Seminar Series. April 2021.
8. **Cutright**, **Z.D.**, Razskazovskiy, Y., Roginskaya, M., Reaction pathways initiated by one-electron oxidation of guanine: oxidation steps leading to stable end products. Oral Presentation at Boland Symposium, April 2021, ETSU.
9. **Thomas, C. S**., Razskazovskiy, Y., Roginskaya, M., Sources of 2,5-diaminoimidazolone and their relative contribution to oxidative damage to DNA. Poster presentation at SERMACS 2018, October 31-Nov 3, 2018, Savannah, GA.
10. **Campbell, E**., Razskazovskiy, Y., Roginskaya, M., Long-lived intermediates in oxidation of guanine by one-electron oxidants: kinetics of formation and lifetime under biologically relevant conditions. Poster presentation at SERMACS 2018, October 31-Nov 3, 2018, Savannah, GA.
11. **Pollard, H. C**., Roginskaya, M. Mechanisms of formation of 2,5-diaminoimidazolone, a mutagenic product of oxidation of guanine in DNA. 11 April 2017, ETSU.
12. **Tegomoh, M**., Roginskaya, M., Effects of complex formation of DNA with positively charged polypeptides and polyamines on the products of oxidative damage to DNA by hydroxyl radicals. Oral presentation at the 2015 Appalachian Student Research Forum (ASRF), April 2015
13. **Moore, T. J**., Shelton, S., Roginskaya, M., Razskazovskiy, Y. Oxidative damage to DNA 2-deoxyribose by carbonate radicals and mitigation of this damage via carbonate radical scavenging by indolamines. Oral presentation at the 2015 Appalachian Student Research Forum (ASRF) ($2^{nd}$ place award), April 2015.
14. **Roginskaya, M**., Moore, T. J., Ampadu-Boateng, D. Mechanisms of oxidative damage to DNA by carbonate radicals. Oral presentation at SERMACS 2014, October 16-19, 2014, Nashville, TN.
15. **Tegomoh, M**., Razskazovskiy, Y., Roginskaya, M., Effects of complex formation of DNA with protamine on the products of oxidative damage to DNA by hydroxyl radicals. Poster presentation at SERMACS 2014, October 16-19, 2014, Nashville, TN.

## Research Funding

Funded Proposals

- Marina Roginskaya 'Generation of novel guanine-guanine crosslinks by one-electron oxidants: the sources, structure, and abundance in native DNA and model systems'. $11,998, Major Grant Award, ETSU RDC July 2021-June 2022, 100% share.
- Elaina Campbell and Marina Roginskaya 'Identification of intermediates of guanine oxidation in DNA by one-electron oxidants using low-molecular-weight compounds'. $768, Graduate Student Research Grant Award, March 2019
- Marina Roginskaya 'Mechanisms of formation and reactivity of imidazolone, a natural product of oxidative DNA damage'. $9,900, Major Grant Award, ETSU RDC July 2017-June 2018, 100% share.
- Marina Roginskaya and Yuriy Razskazovskiy 'Complex formation with proteins protects

DNA against oxidative damage'. $9,750, Major Grant Award, ETSU RDC July 2014-June 2015, 90% share.

Declined Proposals

- Marina Roginskaya, 'Identification of novel G-G crosslinked dimers formed during oxidation of 2-deoxyguanosine and other DNA model compounds'. $9,990, Major Grant Award, ETSU RDC July 2020-June 2021, 100% share.
- Marina Roginskaya and Yue Zou, 'Mechanisms and consequences of 2-aminoimidazolone formation in oxidative DNA damage' $258,930.00, National Institutes of Health/National Cancer Institute (NIH/NCI) Academic Research Enhancement Award (AREA, Parent R15), October 2016-September 2019, 90% share.
- Marina Roginskaya, 'Polycyclic aromatic hydrocarbons and their oxidation products as photosensitizers of oxidative DNA damage, $70,000, American Chemistry Society/Petroleum Research Foundation (ACS/PRF), September 2017 – August 2020, 100% share.
- Marina Roginskaya, Scott J. Kirkby, David Close, and Yuriy Razskazovskiy, 'Interdisciplinary physicochemical analysis of mechanisms of DNA damage by oxidizing chemicals', $42,876.00, ETSU Research and Development Committee (RDC) Interdisciplinary Grant Program, July 2015-June 2016, 60% share.
- Marina Roginskaya, 'Chemical modifications of pathways of DNA oxidative damage by DNA complexing with positively charged polypeptides and polyamines: implication to mechanisms of DNA protection against oxidative damage in chromatin', ~ $50,000, Small Grant for Exploratory Research (SGER), Chemistry of Life Processes (CLP) of National Science Foundation (NSF). Pre-proposal, submitted in September 2015, 100% share.
- Marina Roginskaya 'Mechanisms of Oxidative Damage to DNA by Carbonate Radicals'. $96,115, Chemistry of Life Processes (CLP) of National Science Foundation (NSF). July 2014-June 2016, 100% share.