

Resume

Last name: **Pupov**
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EDUCATION

2010-present

Research Scientist, Institute of Molecular Genetics, Russian Academy of Sciences, Moscow, Russia.

2007 - 2010

Ph.D. student at the Moscow State University and the Institute of Molecular genetics. Ph.D. thesis on “Studies of the interactions of bacterial RNA polymerase with DNA and RNA at various stages of transcription” (Dr. A. Kulbachinskiy). Speciality – Molecular Biology.

2007

Diploma thesis on «Analysis of the effects of mutations in the active center of the *E. coli* RNA polymerase on substrate specificity», Moscow State University (Dr. A. Kulbachinskiy). Speciality – Biochemistry, specialization – Molecular Biology. Graduated with honours.

2002 – 2007

Studies at the Department of Molecular Biology, Moscow State University. Courses and subjects: Molecular Biology (general course and 7 special courses), Biochemistry (2 courses), Organic Chemistry, Physical Chemistry, Analytical Chemistry, Colloidal Chemistry, General and Inorganic Chemistry, Botany, Zoology, General Physics, Higher Mathematics.

Undergraduate project «Isolation and properties of *Serratia proteamaculans* 94 Cysteine Protease» (Dr. G. Rudenskaya, Faculty of Chemistry, Moscow State University).

RESEARCH EXPERIENCE

Nov 2006 – Present

Research work at the Laboratory of Molecular Genetics of Microorganisms, Institute of Molecular Genetics, Moscow, Russia (Dr. A. Kulbachinskiy).

2005-2006

Undergraduate work at the Laboratory of Protein Chemistry, Faculty of Chemistry, Moscow State University, Russia (Dr. G. Rudenskaya).

PROFESSIONAL SKILLS

Gene cloning and site-directed mutagenesis, protein expression and purification (FPLC, *in vitro* reconstitution methods), *in vitro* transcription, EMSA, permanganate footprinting, SELEX methods.

RESEARCH PROJECTS

My current research is focused on studies of molecular mechanisms of transcription in bacteria, including analysis of transcription regulation by DNA and RNA-encoded signals, protein transcription factors and small molecules. I also develop novel types of promoter substrates and RNA polymerase inhibitors based on highly specific aptamer ligands to bacterial RNA polymerase. My recent projects include:

- 1) investigation of the mechanisms of action of different transcription inhibitors, including rifampicin;
- 2) selection of aptamers to different epitopes of bacterial RNAP;
- 3) analysis of the mechanisms of nucleotide selection by RNAP;
- 4) analysis of general principles of transcription on single-stranded templates;
- 5) investigation of the roles of different regions of the sigma subunit in transcription initiation;
- 6) analysis of the roles of conserved DNA-interacting regions of RNAP at various stages of transcription.

PUBLICATIONS

1. Shikalov AB, Esyunina DM, **Pupov DV**, Kulbachinskiy AV, Petushkov IV. 2019. The σ 24 Subunit of Escherichia coli RNA Polymerase Can Induce Transcriptional Pausing in vitro. *Biochemistry (Mosc)*. 84(4):426-434
2. **Pupov D.**, Ignatov A., Agapov A., Kulbachinskiy A. 2019. Distinct effects of DNA lesions on RNA synthesis by Escherichia coli RNA polymerase. *Biochem Biophys Res Commun*. 510:122-127.
3. Esyunina D., **Pupov D.**, Kulbachinskiy A. 2019. Dual role of the σ factor in primer RNA synthesis by bacterial RNA polymerase. *FEBS Lett*. 593:361-368.
4. **Pupov D.**, Petushkov I., Esyunina D., Murakami K.S., Kulbachinskiy A. 2018. Region 3.2 of the σ factor controls the stability of rRNA promoter complexes and potentiates their repression by DksA. *Nucl. Acids Res*. 46:11477-11487.
5. Petushkov I., Esyunina D., Mekler V., Severinov K., **Pupov D.**, Kulbachinskiy A. 2017. Interplay between σ region 3.2 and secondary channel factors during promoter escape by bacterial RNA polymerase. *Biochem J*. 474: 4053–4064.
6. Agapov A., Esyunina D., **Pupov D.**, Kulbachinskiy A. 2016. Regulation of transcription initiation by Gfh factors from Deinococcus radiodurans. *Biochem J*. 473(23):4493-4505.
7. Esyunina D., Turtola M., **Pupov D.**, Bass I., Klimašauskas S., Belogurov G., Kulbachinskiy A. 2016. Lineage-specific variations in the trigger loop modulate RNA proofreading by bacterial RNA polymerases. *Nucl. Acids Res*. 44:1298-1308.
8. Petushkov I., **Pupov D.**, Bass I., Kulbachinsky A. 2015. Mutations in the CRE pocket of bacterial RNA polymerase affect multiple steps of transcription. *Nucl. Acids Res*. 43:5798-5809.
9. **Pupov D.**, Kulbachinskiy A. 2015. Single-stranded DNA aptamers for functional probing of bacterial RNA polymerase. *Methods in Molecular Biology*. 1276:165-83.
10. Basu R.S., Warner B.S., Molodtsov V., **Pupov D.**, Esyunina D., Fernandez-Tornero C., Kulbachinskiy A., Murakami K.S. 2014. Structural basis of transcription initiation by bacterial RNA polymerase holoenzyme. *J. Biol. Chem*. 289, 24549-24559.
11. **Pupov D.**, Kuzin I.A., Bass I., Kulbachinskiy A. 2014. Distinct functions of the RNA polymerase σ subunit region 3.2 in RNA priming and promoter escape. *Nucl. Acids Res*. 42:4494-4504.

12. **Pupov D.**, Esyunina D., Feklistov A. and Kulbachinskiy A. 2013. Single-strand promoter traps for bacterial RNA polymerase. *Biochem. J.* 452(2): 241-248
13. Miropolskaya N., Ignatov A., Bass I., Zhilina E., **Pupov D.**, Kulbachinskiy A. 2012. Distinct functions of regions 1.1 and 1.2 of RNA polymerase σ subunits from *Escherichia coli* and *Thermus aquaticus* in transcription initiation. *J. Biol. Chem.* 287: 23779-23789.
14. **Pupov D.**, Miropolskaya N., Sevostyanova A., Bass I., Artsimovitch I., Kulbachinskiy A. 2010. Multiple roles of the RNA polymerase β' SW2 region in transcription initiation, promoter escape, and RNA elongation. *Nucl. Acids Res.* 38: 5784-5796.
15. **Pupov D.V.**, Kulbachinskiy A.V. 2010. Structural dynamics of the active center of multisubunit RNA polymerases during RNA synthesis and proofreading. Review. *Mol. Biol. (Mosk).* 44: 573-590.
16. **Pupov D.V.**, Barinova N.A., Kulbachinskiy A.V. 2008. Analysis of RNA Cleavage by RNA Polymerases from *Escherichia coli* and *Deinococcus radiodurans*. *Biochemistry (Moscow)*, 73: 725-729.
17. Mozhina N.V., Burmistrova O.A., **Pupov D.V.**, Rudenskaya G.N., Dunaevsky Ya.E., Demiduk I.V., and Kostrov S.V. 2008. Isolation and properties of *Serratia proteamaculans* 94 Cysteine Protease. Russian Journal of Bioorganic Chemistry, Vol. 34, No. 3, p.274.
18. Rudenskaya G.N., **Pupov D.V.** 2008. Cysteine proteinases of microorganisms and viruses. Review. *Biochemistry (Moscow)*, Jan 73(1), p.1-13.

PARTICIPATION IN MEETINGS AND CONFERENCES

1. **Pupov D.**, Petushkov I., Esyunina D., Kulbachinskiy A. 2018. Regulation of the activity of ribosomal RNA promoters by region 3.2 of the RNA polymerase sigma subunit and DksA. *FEBS Open Bio*, 8 (Suppl. S1): page 130.
2. Oguienko A., **Pupov D.**, Esyunina D., Petushkov I., Kulbachinskiy A. 2018. Roles of sigma finger and DksA in transcription initiation by *Escherichia coli* RNA polymerase containing alternative sigma factors. *FEBS Open Bio*, 8 (Suppl. S1): page 129.
3. Esyunina D., Petushkov I., **Pupov D.**, Kulbachinskiy A. 2017. "New insights into prevalence and functions of sigma-dependent pausing in bacteria." SFB960 Conference "The Biology of RNA-protein Complexes". 11-14 October, 2017, Regensburg, Germany, page 13
4. **Pupov D.**, Esyunina D., Kulbachinskiy A. «Functions of the bacterial RNA polymerase sigma subunit region 3.2 in transcription initiation on ribosomal RNA promoters » 42 FEBS congress, September 10-14, 2017, Jerusalem, Israel. Published in *FEBS Journal*, 284 (Suppl. 1), page 210.
5. Petushkov I., **Pupov D.**, Kulbachinskiy A. «Interplay between sigma region 3.2 and secondary channel factors during promoter escape by bacterial RNA polymerase» 42 FEBS congress, September 10-14, 2017, Jerusalem, Israel. Published in *FEBS Journal*, 284 (Suppl. 1), page 206.
6. Esyunina D., Ignatov A., **Pupov D.**, Miropolskaya N., Kulbachinskiy A. «Transcription of damaged templates by *Escherichia coli* RNA polymerase and its mutant variants» 42 FEBS congress, September 10-14, 2017, Jerusalem, Israel. Published in *FEBS Journal*, 284 (Suppl. 1), page 210.
7. Esyunina D., Agapov A., **Pupov D.**, Kulbachinskiy A. «Catalytic properties and regulation of RNA polymerase from *Deinococcus radiodurans*», FASEB conference Mechanism and Regulation of Prokaryotic Transcription, June 21-26, 2015, Saxton River, VT, USA
8. **Pupov D.**, Esyunina D., Basu R.S., Murakami K.S., Kulbachinskiy A. «The mechanism of RNA priming in the active centre of bacterial RNA polymerase», 76th Harden Conference Total Transcription, September 1-5, 2014, Cambridge, UK, p. 33.
9. **Pupov D.**, Kulbachinskiy A. «Roles of the sigma subunit of bacterial RNA polymerase in RNA priming, abortive initiation and promoter escape», Molecular Machines: lessons from integrating structure, biophysics and chemistry, 18-21 May, 2014, Heidelberg, Germany, p. 117.

10. **Pupov D.**, Kuzin I., Bass I., Kulbachinskiy A. «Roles of sigma subunit region 3.2 in transcription initiation and promoter escape by bacterial RNA polymerase», FASEB conference Mechanism and Regulation of Prokaryotic Transcription, June 23-28, 2013, Saxton River, VT, USA, poster B9.
11. **Pupov D.**, Esyunina D., Kulbachinskiy A. «Highly specific transcription templates and sensors for RNA polymerase activity based on single-stranded DNA aptamers», 38 FEBS congress, July 6-11, 2013, Saint-Petersburg, Russia. Published in FEBS Journal, 280 (Suppl. 1), page 40.
12. **Pupov D.** «Allosteric inhibition of transcription initiation by rifampicin», EMBO/FEBS Advanced Courses Host-Microbe Interactions, August 31 – September 6, 2013, Spetses, Greece, page 72.
13. **Pupov D.**, Kuzin I., Kulbachinskiy A. «Multiple roles of the RNA polymerase sigma subunit region 3.2 in transcription initiation», 73rd Harden Conference - Machines on genes II - The central dogma at the interface of biology, chemistry and physics, 19-23 August 2012 Oxford, United Kingdom. p 40.
14. Kulbachinskiy A, Esynina D. and **Pupov D.** «Transcription initiation on single-stranded DNA promoters by bacterial RNA polymerase», 73rd Harden Conference - Machines on genes II - The central dogma at the interface of biology, chemistry and physics, 19-23 August 2012 Oxford, United Kingdom. p 40.
15. **Pupov D.V.**, Esyunina D. M. Kulbachinskiy A. V. "Aptamer based methods for screening and characterisation of novel inhibitors of bacterial RNA-polymerase", International Conference on Postgenomic Technology for Biomedicine. June 25-29, 2012, Novosibirsk, Russia, page 177.
16. Kulbachinskiy A., **Pupov D.**, Miropolskaya N., Esyunina D. Molecular mechanisms underlying fidelity of RNA synthesis by bacterial RNA polymerase. The 7th International Conference on Bioinformatics of Genom Regulation and Structure. June 20-27, 2010, Novosibirsk, Russia. page 153.
17. **Pupov D.** "Aptamers against bacterial RNA polymerase: selection, general properties and inhibition of RNA polymerase activity". Bilateral Franco-Russian Scientific Seminar «Transcription – from basic mechanisms to drugs». October 19-22, 2009, Montpellier, France.
18. Kulbachinskiy A., **Pupov D.**, Barinova N. "Analysis of promoter recognition by bacterial RNA polymerase using model DNA substrates". XX International Congress of Genetics. “Genetics – understanding living systems”. July 12-17, 2008, Berlin, Germany. page 292.
19. Kulbachinskiy A., **Pupov D.**, Barinova N. "Analysis of the RNA polymerase structure and the mechanisms of promoter recognition using aptamers". IV Meeting of the Russian Biochemical Society. May 11 – 15, 2008, Novosibirsk, Russia. page 66.