

# DR. VAKIL TAKHAVEEV

Biological impact of DNA damage  
Cancer, aging, toxicology, metabolism, cell cycle  
[Google Scholar](#) [ORCID](#) [Twitter](#) [LinkedIn](#)  
**Academic age: 4 years and 3 months** (as of 28.11.2024)



Postdoc, Lecturer, ETH Zurich  
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*Date and place of birth:* 22.09.1993, Siberia  
*Gender:* male  
*Familial status:* one daughter (2022)  
*Nationality:* Russian Federation  
*Residence:* Aarau, Switzerland (Permit B)

## EDUCATION

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**PhD**, University of Groningen, the Netherlands 08/2015 – 01/2020  
Molecular systems biology  
Prof. Matthias Heinemann, European training network MetaRNA  
*Dissecting the temporal dynamics of eukaryotic metabolism in single cells* (29/06/2020)  
**Combined MSc and BSc (specialist)** 09/2010 – 06/2015  
Lomonosov Moscow State University, Russian Federation  
Bioengineering and bioinformatics  
*Effects of biological ageing on RNA processing*. Graduated with highest distinction

## RESEARCH EXPERIENCE

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**Postdoc, Lecturer**, ETH Zurich, Switzerland 02/2021 – Present  
Prof. Shana J. Sturla, Department of Health Sciences and Technology  
*Collaboration with Prof. Orlando D. Schärer and Prof. Mark Rubin*

- Genomics of DNA damage in cancer, aging and environmental exposures
- Developing DNA-modification sequencing methods

**Postdoc**, University of Groningen, the Netherlands 02/2020 – 01/2021  
Prof. Matthias Heinemann, Molecular Systems Biology lab

- Stoichiometric-thermodynamic modelling of metabolism
- Single-cell microscopy data analysis

**MSc thesis internship** in bioinformatics 09/2014 – 05/2015  
Prof. Peter-Bram 't Hoen, Leiden University Medical Center, the Netherlands

- RNA-Seq data analysis in aging. Excellent mark for the thesis

**Student internships** in bioinformatics and structural biology 09/2011 – 05/2014  
Prof. Vytas Švedas, Belozersky Institute of Physico-Chemical Biology, Moscow, Russia  
**Student internship** in proteomics 07/2013  
Prof. Magnus Palmblad, Leiden University Medical Center, the Netherlands

## PUBLICATIONS AND PREPRINTS (# – SHARED FIRST AUTHORSHIP)

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13) [Takhaveev, V.#](#), [Püllen, N.J.L.#](#), [Singh, N.K.](#), [Huber, S.M.](#), [Schauer, K.S.](#), [Gahlon, H.](#), [Poetsch, A.R.](#) and [Sturla, S.J.](#), 2024. Click-chemistry-aided quantitation and sequencing of oxidized guanines and apurinic sites uncovers their transcription-linked strand bias in human cells. *bioRxiv*, 2024.07.21.604463. Under review in *Nature Chemical Biology*. **Patent filed** to protect the sequencing technology.

12) [Son, K.#](#), [Takhaveev, V.#](#), [Mor, V.](#), [Yu, H.](#), [Dillier, E.](#), [Zilio, N.](#), [Püllen, N.J.L.](#), [Ivanov, D.](#), [Ulrich, H.](#), [Sturla, S.J.](#) and [Schärer, O.D.](#), 2024. Trabectedin derails transcription-coupled nucleotide excision repair to induce DNA breaks in highly transcribed genes. *Nature Communications*, 15:1388.

- 11) Büchel, J., Mingard, C., Takhaveev, V., Reinert, P.B., Keller, G., Kloter, T., Huber, S.M., McKeague, M. and Sturla, S.J., 2023. Single-nucleotide-resolution genomic maps of O6-methylguanine from the glioblastoma drug temozolomide. *bioRxiv*, 2023.12.12.571283. Under review in *Nucleic Acids Research*.
- 10) Mingard, C., Battey, J.N., Takhaveev, V., Blatter, K., Hürlimann, V., Sierro, N., Ivanov, N.V. and Sturla, S.J., 2023. Dissection of cancer mutational signatures with individual components of cigarette smoking. *Chemical Research in Toxicology*, 36 (4), pp. 714-123.
- 9) Jiang, Y., Mingard, C., Huber, S.M., Takhaveev, V., McKeague, M., Kizaki, S., Schneider, M., Ziegler, N., Hürlimann, V., Hoeng, J., Sierro, N., Ivanov, N.V. and Sturla, S.J., 2023. Quantification and mapping of alkylation in the human genome reveal single nucleotide resolution precursors of mutational signatures. *ACS Central Science*, 9(3), pp.362-372.
- 8) Takhaveev, V., Özsezen, S., Smith, E.N., Zylstra, A., Chaillet, M.L., Chen, H., Papagiannakis, A., Miliadis-Argeitis, A. and Heinemann, M., 2023. Temporal segregation of biosynthetic processes is responsible for metabolic oscillations during the budding yeast cell cycle. *Nature Metabolism*, 5(2), pp.294-313.
- 7) Ortega, A.D.#, Takhaveev, V.#, Vedelaar, S.R., Long, Y., Mestre-Farràs, N., Incarnato, D., Ersoy, F., Olsen, L.F., Mayer, G. and Heinemann, M., 2021. A synthetic RNA-based biosensor for fructose-1,6-bisphosphate that reports glycolytic flux. *Cell Chemical Biology*, 28(11), pp.1554-1568.
- 6) Monteiro, F., Hubmann, G., Takhaveev, V., Vedelaar, S.R., Norder, J., Hekelaar, J., Saldida, J., Litsios, A., Wijma, H.J., Schmidt, A. and Heinemann, M., 2019. Measuring glycolytic flux in single yeast cells with an orthogonal synthetic biosensor. *Molecular systems biology*, 15(12), p.e9071.
- 5) Leupold, S., Hubmann, G., Litsios, A., Meinema, A.C., Takhaveev, V., Papagiannakis, A., Niebel, B., Janssens, G., Siegel, D. and Heinemann, M., 2019. *Saccharomyces cerevisiae* goes through distinct metabolic phases during its replicative lifespan. *Elife*, 8, p.e41046.
- 4) Takhaveev, V. and Heinemann, M., 2018. Metabolic heterogeneity in clonal microbial populations. *Current opinion in microbiology*, 45, pp.30-38.
- 3) Filer, D., Thompson, M.A., Takhaveev, V., Dobson, A.J., Kotronaki, I., Green, J.W., Heinemann, M., Tullet, J.M. and Alic, N., 2017. RNA polymerase III limits longevity downstream of TORC1. *Nature*, 552(7684), pp.263-267.
- 2) Suplatov, D., Kirilin, E., Arbatsky, M., Takhaveev, V. and Švedas, V., 2014. pocketZebra: a web-server for automated selection and classification of subfamily-specific binding sites by bioinformatic analysis of diverse protein families. *Nucleic acids research*, 42(W1), pp.W344-W349.
- 1) Suplatov, D., Kirilin, E., Takhaveev, V. and Švedas, V., 2014. Zebra: a web server for bioinformatic analysis of diverse protein families. *Journal of Biomolecular Structure and Dynamics*, 32(11), pp.1752-1758.

## RESEARCH GRANTS

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- 3) **USD 300'000.** Takhaveev, V. and Sturla, S.J., 2023. Developing mechanistic and responsive biomarkers of aging based on genome-wide maps of DNA breaks and oxidation. *Impetus Foundation*. 3.3% acceptance rate and 1050 applications in total.
- 2) **USD 175'000.** Takhaveev, V., Sturla, S.J. and Ocampo A, 2022. Connecting genome-wide landscapes of DNA oxidation with multiple aging mechanisms in human blood. *Impetus Foundation*. 1 of 14 funded projects.
- 1) **EUR 50'000.** Takhaveev, V. and Heinemann, M, 2019. Do cancer cells have a thermodynamic Achilles' heel? *Dutch Research Council, Open Competition Domain Science – XS*.

## AWARDS

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- 12) The winner of the best oral presentation award, *Swiss Chemical Society Fall Meeting 2024, Medicinal Chemistry & Chemical Biology*, 05/09/2024, Fribourg, Switzerland
- 11) Outstanding oral presentation, *American Chemical Society Fall Meeting, Division of Chemical Toxicology*, 15/08/2023, San Francisco, USA
- 10) Best scientific poster, *9<sup>th</sup> Annual Aging Research and Drug Discovery Meeting (ARDD)*, 29/08/2022 – 02/09/2022, Copenhagen, Denmark
- 9) Best scientific poster, *Dutch Biophysics conference*, 10/2018, Eindhoven, the Netherlands

- 8) Winner, *3 Minute Thesis competition*, 03/2018, Groningen, the Netherlands
- 7) Best scientific poster, *Groningen Biomolecular Sciences and Biotechnology Institute (GBB) symposium*, 08/2017, Groningen, the Netherlands
- 6) National finalist, *FameLab*, 05/2017, Utrecht, the Netherlands
- 5) Regional winner, *FameLab*, 05/2017, Groningen, the Netherlands
- 4) Best scientific poster, *Groningen Biomolecular Sciences and Biotechnology Institute (GBB) symposium*, 08/2016, Groningen, the Netherlands
- 3) 7 excellence scholarships for studies, 2012 – 2014, Moscow, Russia
- 2) Winner, 4 country-wide olympiads in maths, biology & chemistry for high-school students, 2010, Russia
- 1) Winner in the national (Russia) selection for *Youth G8/G20 Summit* in Canada, 2010

## TEACHING

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- 3) *ETH Zurich*: in charge of and giving lectures in Food Toxicology course for MSc students, Spring 2025
- 2) *ETH Zurich*: Q&A sessions for Carcinogenesis lectures of Molecular Disease Mechanisms course for MSc students, Spring 2022
- 1) *University of Groningen*: Computer practical courses in biochemical kinetic modelling, metabolism (flux balance analysis), and Python for BSc and MSc students, every year during 2015 –2020

## MENTORING

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*ETH Zurich*: 6 PhD students (as 2<sup>nd</sup> supervisor), 4 BSc and MSc students  
*University of Groningen*: 8 BSc and MSc students

## CONFERENCE ORAL PRESENTATIONS AND SEMINARS

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- 14) Click-chemistry-aided quantitation and sequencing of oxidized guanines and apurinic sites in human cells. *Swiss Society of Toxicology Annual Meeting*, Basel, Switzerland, 14/11/2024
- 13) **Invited**: Sequencing the chemical modifications of DNA: Key to deciphering the codes of cancer and aging. *32nd Groningen Biomolecular Sciences and Biotechnology Institute (GBB) Symposium*, Groningen, the Netherlands, 13/09/2024
- 12) Trabectedin derails transcription-coupled nucleotide excision repair to induce DNA breaks in highly transcribed genes. *Swiss Chemical Society Fall Meeting 2024*, Fribourg, Switzerland, 05/09/2024
- 11) Sequencing oxidized guanines, abasic sites and DNA breaks in the human genome: towards mechanistic biomarkers of aging. *11<sup>th</sup> Aging Research and Drug Discovery Meeting (ARDD)*, Copenhagen, Denmark, 28/08/2024
- 10) **Invited**: From small molecules to genome-wide maps of DNA modification in cancer and aging. *Toxicology triumphs: 20 years of cross-disciplinary discovery*, ETH Zurich, Switzerland, 03/06/2024
- 9) Age-related evolution of pervasive DNA damage across the human genome. *American Chemical Society Fall Meeting*, Division of Chemical Toxicology, San Francisco, USA, 15/08/2023
- 8) **Invited**: In search of the root of aging: Genome-wide exploration of DNA damage landscapes. *Spring Meeting of the Swiss Society of Pharmacology and Toxicology*, Bern, Switzerland, 20/04/2023
- 7) Temporal segregation of biosynthetic processes is responsible for metabolic oscillations during the budding yeast cell cycle. *Abcam Cell Cycle Conference*, Virtual (London, the UK), 07/03/2023
- 6) The natural-product anticancer drug ET-743 induces strand-specific DNA breaks in the transcribed regions and promoters of active genes. *Institute for Basic Science Conference for Genomic Integrity*, Ulsan, Republic of Korea, 19/10/2022
- 5) What causes metabolic oscillations in the eukaryotic cell? *Yeasterday conference (Benelux)*, Groningen, the Netherlands, 17/06/2019
- 4) **Invited**: RNA-based sensor for glycolytic flux. *Chalk talk at Groningen Biomolecular Sciences and Biotechnology Institute*, Groningen, the Netherlands, 12/2018
- 3) **Invited**: What causes metabolic oscillations in the eukaryotic cell? *Seminar at Groningen Biomolecular Sciences and Biotechnology Institute*, Groningen, the Netherlands, 11/2018,

2) What causes metabolic oscillations in the eukaryotic cell? *19<sup>th</sup> International Conference on Systems Biology*, Lyon, France, 30/10/2018

1) What causes metabolic oscillations in the eukaryotic cell? *MetaRNA symposium at the Francis Crick Institute*, London, the United Kingdom, 02/07/2018

#### CONFERENCE POSTER PRESENTATIONS (SINCE 2022)

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6) Fluoroclick and click-code-seq: novel methods to quantify and sequence DNA damage. *ToxAcademy Tox Future/Now*, **Roche**, Basel, Switzerland, 03/04/2024

5) Novel sequencing methods to reveal age dynamics of pervasive DNA damage in human genome. *10th Annual Aging Research and Drug Discovery Meeting (ARDD)*, Copenhagen, Denmark, 28/08/2023 – 01/09/2023

4) Quantification and mapping of alkylation in the human genome reveal single nucleotide resolution precursors of mutational signatures. *American Chemical Society Fall Meeting*, Division of Chemical Toxicology, San Francisco, USA, 14 – 15/08/2023

3) The natural-product anticancer drug ET-743 induces strand-specific DNA breaks in the transcribed regions and promoters of active genes. *Swiss Society of Toxicology (SST) Annual Meeting 2022*, Basel, Switzerland, 17/11/2022

2) The natural-product anticancer drug ET-743 induces strand-specific DNA breaks in the transcribed regions and promoters of active genes. *Institute for Basic Science Conference for Genomic Integrity*, Ulsan, Republic of Korea, 19/10/2022

1) Mapping DNA oxidation genome-wide to build a novel aging clock. *9th Annual Aging Research and Drug Discovery Meeting (ARDD)*, Copenhagen, Denmark, 29/08/2022 – 02/09/2022

#### MEMBERSHIP IN SCIENTIFIC SOCIETIES

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Swiss Society of Toxicology (2023 – Present)

Swiss Chemical Society (2024 – Present)

American Chemical Society (2023 – 2024)

#### LANGUAGES

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**English:** Fluent

**Russian:** Native

**German:** B1

**Dutch:** A2

**Tatar:** A1

#### PRESS AND COMMENTARIES

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9. Press release: How a natural compound from sea squirts combats cancer. **EurekAlert!** 2024 [[Link](#)]

8. Press release: Where do toxins from tobacco attack DNA? **ETH News**. 2023 [[Link](#)]

7. Commentary: Huang, A.T. and Tang, W., 2023. Smoking-related DNA alkylation events are mapped at single-nucleotide resolution. **ACS Central Science** [[Link](#)]

6. Press release: Cells avoid multitasking. **EurekAlert!** 2023 [[Link](#)]

5. Commentary: Lowe, D., 2023. Waves of activity inside the cell. **Science**. [[Link](#)]

4. Commentary: Careaga, M.B.L., 2023. Waves of macromolecule production during the cell cycle. **The Scientist**. [[Link](#)]

3. Commentary: Takhaveev, V., 2023. Behind the paper: Temporal segregation of biosynthetic processes is responsible for metabolic oscillations during the budding yeast cell cycle. **Microbiology Springer Nature Community**. [[Link](#)]

2. Commentary: Karloff, D.B., Heemstra, J.M., 2021. Sweet sensation: Developing a single-cell fluorescent reporter of glycolytic heterogeneity. **Cell Chemical Biology**, 28(11), pp.1539-1541. [[Link](#)]

1. Commentary: Edgar, B.A. and Grewal, S.S., 2017. Longer life through an odd Pol enzyme. **Nature**. [[Link](#)]