Zlatko Trajanoski

Biographical sketch

Zlatko Trajanoski is a professor for bioinformatics at the Division of Bioinformatics, Biocenter, Medical University of Innsbruck, Austria. Research in his laboratory focuses on deciphering tumour–immune cell interaction using computational approaches and developing analytical tools for precision immune-oncology. His work was instrumental for the elucidation of the role of the adaptive immune system in human colorectal cancer and has led to the development of a novel immune score for the stratification of patients. His recent work focuses on the identification of mechanisms of intrinsic and acquired resistance to immunotherapy in colorectal cancer using combined experimental/computational approaches.

Curriculum vitae

Biozentrum der Medizinischen Universität Innsbruck
Sektion für Bioinformatik
Innrain 80-82
A-6020 Innsbruck
Austria
Tel.: +43-512-9003-71401
Web: http://icbi.i-med.ac.at/
Email: Zlatko.trajanoski@i-med.ac.at
ORCID: 0000-0002-0636-7351

Place of Birth:	Skopje, Macedonia
Date of Birth:	February 2, 1964
Nationality:	Austrian
Acad. Degree:	Univ. Prof. Dipl.-Ing. Dr. techn. (Ph.D)

Education

1978 - 1982	High school, Skopje, Macedonia
1984 - 1990	Undergraduate studies, Graz University of Technology, Graz, Austria (biomedical engineering)
1990 - 1995	Ph.D. study in biomedical engineering, Graz University of Technology, Graz, Austria

Career History

1990 - 1992	Research Associate, Institute for Biomedical Engineering, Graz University of Technology, Graz, Austria
1997 - 1998	Postdoc, Department of Internal Medicine, Yale University, New Haven, CT/USA
1999	Tenure, (Habilitation, Venia Docendi) in "Biomedical Engineering"
2000 - 2001	Visiting Scientist, The Institute for Genomir Research (TIGR), Rockville, MD/USA and National Institutes of Health, Bethesda, MD/USA
2001 - 2003	Associate Professor, Institute for Biomedical Engineering, University of Technology, Graz, Austria
2003 - 2010	Full Professor for Bioinformatics and Head, Institute Genomics and Bioinformatics, University of Technology, Graz, Austria.

Since 2010 Full Professor for Bioinformatics and Head, Division for Bioinformatics, Medical University of Innsbruck, Austria

Publications 131 Publications (>670 impact points; average impact: 8,26). > 50 invited talks
Total number of citations: >10.900 (web of knowledge)
h-index: 39 (web of knowledge)

Research Interests Bioinformatics and computational biology, mathematical modeling, transcriptional regulation, cancer immunology, tumor-immune cell interaction

Funds obtained (in €, 5 most important ones)

ERC advanced grant, EPIC (Enabling Precision Immuno-oncology in colorectal cancer)	2.460.500	EU	2018-2023
Horizon2020, APERIM (Advanced bioinformatics tools for personalized cancer immunotherapy) (coordinator Z. Trajanoski)	500.000	EU	2015-2018
Doktoratskolleg (W11), Molecular Cell Biology and Oncology 3rd & 4rd funding period	207.400 & 205.000	FWF, Med. Uni. Innsbruck	2012-2018
SFB021 (F2117), Cell proliferation and cell death in tumors	365.000	FWF	2011-2013
GEN-AU Bioinformatics Integration Network, (Coordinator Z. Trajanoski)	2.300.000	bm:wfw	2002-2012

PhD students since 2013

PhD Student	**PhD Thesis**	**Start**	**Defense**	**Paper**
Andreas Dander	Integration of next-generation sequencing data and whole-slide bioimages for personalized oncology	2010	2014	6
Mihaela Angelova	Immunogenicity of human colorectal carcinoma	2011	2015	4
Mirjana Efremova	Investigating immunoediting of the cancer genome	2012	2017	4
Michaela Willi	Super-enhancers and genetic boundaries in the	2013	2017	4

	mammary gland			
Christina Plattner	Predicting drug combinations for precision oncology in colorectal cancer	2018	ongoing	0
Alexander Kirchmair	Metabolic reprogramming of T cells during differentiation	2018	ongoing	0

International collaborators

	Project	**Joint public.**	**lab for stay abroad**
Hans Clevers, Hubrecht Institute, NL	Tumoroid co-culture with immune cells	0	no
Johanna Olweus, University of Oslo, Norway	Immonogenicity of neoantigens	0	yes

Zlatko Trajanoski; 10 most important publications

1. Efremova M, Rieder D, Klepsch V, Charoentong P, Finotello F, Hackl H, Hermann-Kleiter N, Löwer M, Baier G, Krogsdam AM, **Trajanoski Z**. Targeting immune checkpoints potentiates immunoediting and changes the dynamics of tumor evolution. **Nat Commun**. 2018. 9:32
2. Charoentong P*, Finotello F*, Angelova M*, Mayer C, Efremova M, Rieder D, Hackl H, **Trajanoski Z**. Pan-cancer immunogenomic analyses reveal genotype-immunophenotype relationships and predictors of response to checkpoint blockade. **Cell Rep**. 2017. 18:248-262
3. Hackl H*, Charoentong P*, Finotello F*, **Trajanoski Z**. Computational genomics tools for dissecting tumor-immune cell interactions. **Nat Rev Genet**. 2016. 17:441-458
4. Angelova M, Charoentong P, Hackl H, Fischer M, Snajder R, Krogsdam AM, Waldner MJ, Bindea G, Mlecnik B, Galon J, **Trajanoski Z**. Characterization of the immunophenotypes and the antigenomes reveal distinct tumor escape mechanisms and novel targets for immunotherapy of colorectal cancers. **Genome Biol**. 2015. 16:64
5. Bindea G, Mlecnik B, Tosolini M, Kirilovsky A, Waldner M, Obenauf AC, Angell H, Frederiksen T, Lafontaine L, Berger A, Bruneval P, Fridman WH, Becker C, Speicher MR, **Trajanoski Z**, Galon J. Spatio-temporal dynamics of intratumoral cells reveal the immune landscape in human cancer. **Immunity**. 2013. 39:782-795
6. Prokesch A, Bogner-Strauss JG, Hackl H, Rieder D, Neuhold C, Walenta E, Krogsdam A, Scheideler M, Papak C, Wong WC, Vinson C, Eisenhaber F, **Trajanoski Z**. Arxes: retrotransposed genes required for adipogenesis. **Nucleic Acids Res**. 2011. 39(8):3224-39.
7. Pabinger S, Dander A, Fischer M, Snajder R, Sperk M, Efremova M, Krabichler B, Speicher MR, Zschocke J, **Trajanoski Z**. A Survey of tools for variant analysis of next-generation genome sequencing data. **Brief Bioinform**. 2014. 15:256-278.
8. Galon J, Costes A, Sanchez-Cabo F, Kirilovsky A, Mlecnik B, Lagorce-Pages C, Tosolini M, Camus M, Berger A, Wind P, Zinzindohoue F, Bruneval P, Cugnenc PH, **Trajanoski Z**, Fridman

WH, Pages F. Type, density, and location of immune cells within human colorectal tumors predict clinical outcome. **Science**. 2006. 313(5795):1960-4.

9. Hackl H, Burkard TR, Sturn A, Rubio R, Schleiffer A, Tian S, Quackenbush J, Eisenhaber F, **Trajanoski Z**. Molecular processes during fat cell development revealed by gene expression profiling and functional annotation. **Genome Biol**. 2005. 6(13):R108.

10. Pages F, Berger A, Camus M, Sanchez-Cabo F, Costes A, Molidor R, Mlecnik B, Kirilovsky A, Nilsson M, Damotte D, Meatchi T, Bruneval P, Cugnenc PH, **Trajanoski Z**, Fridman WH, Galon J. Effector memory T cells, early metastasis, and survival in colorectal cancer. **N Engl J Med**. 2005. 353(25):2654-66.

Zlatko Trajanoski; Publications since 2013

1. Klepsch V, Hermann-Kleiter N, Do-Dinh P, Jakic B, Offermann A, Efremova M, Sopper S, Rieder D, Krogsdam A, Gamerith G, Perner S, Tzankov A, **Trajanoski Z**, Wolf D, Baier G. Nuclear receptor NR2F6 inhibition potentiates responses to PD-L1/PD-1 cancer immune checkpoint blockade. **Nat Commun**. 2018. 2018. 9:1538

2. Finotello F, **Trajanoski Z**. Quantifying tumor-infiltrating immune cells from transcriptomics data. **Cancer Immunol Immunother**. 2018 doi: 10.1007/s00262-018-2150-z. [Epub ahead of print]

3. Gamerith G, Rainer J, Huber JM, Hackl H, **Trajanoski Z**, Koeck S, Lorenz E, Kern J, Kofler R, Kelm JM, Zwierzina H, Amann A. 3D-cultivation of NSCLC cell lines induce gene expression alterations of key cancer-associated pathways and mimic in-vivo conditions. **Oncotarget**. 2017 8(68):112647-112661

4. Efremova M, Rieder D, Klepsch V, Charoentong P, Finotello F, Hackl H, Hermann-Kleiter N, Löwer M, Baier G, Krogsdam AM, **Trajanoski Z**. Targeting immune checkpoints potentiates immunoediting and changes the dynamics of tumor evolution. **Nat Commun**. 2018. 9:32

5. Efremova M, Finotello F, Rieder D, **Trajanoski Z**. Neoantigens generated by individual mutations and their role in cancer immunity and immunotherapy. **Front Immunol**. 2017 8:1679.

6. Welters MJP, Ma W, Santegoets SJ, Goedemans R, Ehsan I, Jordanova K, van Ham V, van Unen V, Koning F, van Egmond S, Charoentong P, **Trajanoski Z**, van der Velden VA, van der Burg S. Intratumoral HPV16-specific T-cells constitute a type 1 oriented tumor microenvironment to improve survival in HPV16-driven oropharyngeal cancer. **Clin Cancer Res**. 2018, 24:634-647

7. Tappeiner E, Finotello F, Charoentong P, Mayer C, Rieder D, Trajanoski Z. TIminer: NGS data mining pipeline for cancer immunology and immunotherapy. **Bioinformatics**. 2017. 33:3140-3141

8. Finotello F, **Trajanoski Z**. New strategies for cancer immunotherapy: Targeting regulatory T cells. **Genome Med.** 2017. 9:10

9. Sopper S, Mustjoki S, White D, Hughes T, Valent P, Burchert A, Gjertsen BT, Gastl G, Baldauf M, **Trajanoski Z**, Giles FJ, Hochhaus A, Ernst T, Schenk T, Janssen J, Ossenkoppele GJ, Porkka K, Wolf D. Reduced CD62L expression on T cells and increased soluble CD62L levels predict molecular response to tyrosine kinase inhibitor (TKI) therapy in early Chronic Phase Chronic Myelogenous Leukemia (CML-CP). **J Clin Oncol**. 2017. 10:175-184

10. Charoentong P*, Finotello F*, Angelova M*, Mayer C, Efremova M, Rieder D, Hackl H, **Trajanoski Z**. Pan-cancer immunogenomic analyses reveal genotype-immunophenotype relationships and predictors of response to checkpoint blockade. **Cell Rep**. 2017. 18:248-262

11. Willi M, Yoo KH, Wang C, **Trajanoski Z**, Hennighausen L. Differential cytokine sensitivities of STAT5 enhancers depend on Stat5 autoregulation. **Nucleic Acids Res.** 2016. 44:10277-10291

12. Lammirato A, Patsch K, Feiereisen F, Maly K, Nofziger C, Paulmichl M, Hackl H, **Trajanoski Z**, Valovka T, Huber LA, Vietor I. TIS7 induces transcriptional cascade of methylosome components required for muscle differentiation. **BMC Biology**. 2016 14:95

13. Hackl H*, Charoentong P*, Finotello F*, **Trajanoski Z**. Computational genomics tools for dissecting tumor-immune cell interactions. **Nat Rev Genet**. 2016. 17:441-458

14. Al-Zoughbi W, Pichler M, Gorkiewicz G, Guertl-Lackner B, Haybaeck J, Jahn SW, Lackner C, Liegl-Atzwanger B, Popper H, Schauer S, Nusshold E, Kindt AS, **Trajanoski Z**, Speicher MR, Haemmerle G, Zimmermann R, Zechner Z, Vesely PW, Hoefler G. An unrevealed role of adipose triglyceride lipase in cancer. **Oncotarget**. 2016. 7(23):33832-40

15. Sebald J*, Willi M*, Schoberleitner I*, Krogsdam A, Orth-Höller D, **Trajanoski Z**, Lusser A. Intestinal microbiome composition and longevity is affected by the chromatin remodeling factor CHD1 in D. melanogaster. **PLoS One**. 2016. 11:e0153476

16. Mlecnik B*, Bindea G*, Angell, HK, Maby P, Angelova M, Tougeron D, Church S, Lafontaine L, Fischer M, Fredriksen T, Sasso M, Bilocq AM, Kirilovsky A, Obenauf AC, Hamieh M, Berger A, Bruneval P, Tuech JJ, Sabourin JC, Le Pessot F, Mauillon J, Rafii A, Laurent-Puig P, Speicher MR, **Trajanoski Z**, Michel P, Sesboüe R, Frebourg T, Pagès F, Valge-Archer V, Latouche JB, Galon J. Integrative Analyses of Colorectal Cancer Show Immunoscore Is a Stronger Predictor of Patient Survival Than Microsatellite Instability. **Immunity**. 2016. 44:698-711

17. Schlick B, Massoner P, Lueking A, Charoentong P, Blattner M, Schaefer G, Marquart K, Theek C, Amersdorfer P, Zielinski D, Kirchner M, **Trajanoski Z**, Rubin MA, Müllner S, Schulz-Knappe P, Klocker H. Serum Autoantibodies in Chronic Prostate Inflammation in Prostate Cancer Patients. **PLoS One**. 2016. 11:e0147739

18. Rieder D, Amort T, Kugler E, Lusser A, **Trajanoski Z**. meRanTK: methylated RNA analysis ToolKit. **Bioinformatics**. 2016. 32:782-785

19. Angelova M, Charoentong P, Hackl H, **Trajanoski Z**. The colorectal cancer immune paradox revisited. **Oncoimmunology** 2016: 5:e1078058

20. Pasqualini L, Bu H, Puhr M, Narisu N, Rainer J, Schlick B, Schäfer G, Angelova M, **Trajanoski Z**, Börno ST, Schweiger MR, Fuchsberger C, Klocker H. miR-22 and miR-29a as members of the androgen receptor transcriptome and modulators of LAMC1 and MCL1 proteins in prostate cancer. **Mol Endocrinol**. 2015 29: 1037-1054

21. Müller M, Schmidt O, Angelova M, Faserl K, Weys S, Kremser L, Pfaffenwimmer T, Dalik T, Kraft C, **Trajanoski Z**, Lindner H, Teis D. The coordinated action of the MVB pathway and autophagy ensures cell survival during starvation. **eLife**. 2015. E07736

22. Angelova M, Charoentong P, Hackl H, Fischer M, Snajder R, Krogsdam AM, Waldner MJ, Bindea G, Mlecnik B, Galon J, **Trajanoski Z**. Characterization of the immunophenotypes and the antigenomes reveal distinct tumor escape mechanisms and novel targets for immunotherapy of colorectal cancers. **Genome Biol**. 2015. 16:64

23. Wilflingseder D, Schroll A, Hackl H, Gallasch R, Frampton D, Pancino G, Sáez-Cirián A, Kellam P, **Trajanoski Z**, Geijtenbeek TB, Weiss G, Lass-Flörl C, Lambotte O, Weiss L, Posch W. Triggering CD11b/c on HIV-exposed DCs promotes immediate Th17 polarization. **J Infect Dis**. 2015; 212: 44-56

24. **Trajanoski Z**, Maccalli C, Mennonna D, Casorati G, Parmiani G, Dellabona P. Somatically mutated tumor antigens in the quest for a more efficacious patient-oriented immunotherapy of cancer. **Cancer Immunol Immunother**. 2015; 64:99-104

25. Dander A, Baldauf M, Sperk M, Pabinger S, Hiltpolt B, **Trajanoski Z**. Personalized Oncology Suite: integrating next-generation sequencing data and whole-slide bioimages. **BMC Bioinformatics**. 2014;15:306

26. Nasso S, Hartler J, **Trajanoski Z**, Di Camillo B, Mechtler K, Toffolo GM. 3DSpectra: A 3-dimensional quantification algorithm for LC-MS labeled profile data. **J Proteomics**. 2014; 112C:156-165

27. Schweiger D, **Trajanoski Z**, Pabinger S. SPARQLGraph: a web-based platform for graphically querying biological Semantic Web databases. **BMC Bioinformatics**. 2014;15:279.

28. Prokesch A, Smorlesi A, Perugini J, Manieri M, Ciarmela P, Mondini E, **Trajanoski Z**, Kristiansen K, Giordano A, Bogner-Strauss JG, Cinti S. Molecular aspects of adipoepithelial transdifferentiation in mouse mammary gland. **Stem Cells**. 2014; 32(10):2756-66

29. Tymoszuk P, Charoentong P, Hackl H, Spilka R, Müller-Holzner E, **Trajanoski Z**, Obrist P, Revillion F, Peyrat JP, Fiegl H, Doppler W. High STAT1 mRNA levels but not its tyrosine phosphorylation are associated with macrophage infiltration and bad prognosis in breast cancer. **BMC Cancer**. 2014: 14:257

30. Rieder D, Ploner C, Krogsdam AM, Stocker G, Fischer M, Scheideler M, Dani C, Amri EZ, Müller WG, McNally JG, **Trajanoski Z**. Co-expressed genes prepositioned in spatial neighborhoods stochastically associate with SC35 speckles and RNA polymerase II factories. **Cell Mol Life Sci**. 2014 71:1741-59

31. Pabinger S, Snajder R, Hardiman T, Willi M, Dander A, **Trajanoski Z**. MEMOSys 2.0: an update of the bioinformatics database for genome-scale models and genomic data. **Database** (Oxford). 2014 Feb 14;2014

32. Pabinger S, Dander A, Fischer M, Snajder R, Efremova M, Sperk M, Krabichler B, Speicher MR, Zschocke J, **Trajanoski Z**. A survey of tools for variant analysis of next-generation genome sequencing data. **Brief Bioinf**. 2014. 15(2):256-78

33. Dander A, Pabinger S, Sperk M, Fischer M, Stocker G, **Trajanoski Z**. SeqBench: integrated solution for the management and analysis of exome sequencing data. **BMC Res Notes**. 2014 Jan 20;7:43

34. Gallasch R, Efremova M, Charoentong P, Hackl H,**Trajanoski Z**. Mathematical models for translational and clinical oncology. **J Clin Bioinforma**. 2013 Nov 7;3(1):23

35. Kress M, Hüttenhofer A, Landry M, Kuner R, Favereaux A, Greenberg D, Bednarik J, Heppenstall P, Kronenberg F, Malcangio M, Rittner H, Uçeyler N, **Trajanoski Z**, Mouritzen P, Birklein F, Sommer C, Soreq H. microRNAs in nociceptive circuits as predictors of future clinical applications. **Front Mol Neurosci**. 2013 Oct 17;6:33

36. Bindea G, Mlecnik B, Tosolini M, Kirilovsky A, Waldner M, Obenauf AC, Angell H, Frederiksen T, Lafontaine L, Berger A, Bruneval P, Fridman WH, Becker C, Speicher MR, **Trajanoski Z**, Galon J. Spatio-temporal dynamics of intratumoral cells reveal the immune landscape in human cancer. **Immunity**. 2013. 39:782-795

37. Pabinger S, **Trajanoski Z**. Genome-scale model management and comparison. **Methods Mol Biol**. 2013. 985:3-16.

38. Snajder R, **Trajanoski Z**, Hackl H. GPViz: dynamic visualization of genomic regions and variants affecting protein domains. **Bioinformatics**. 2013. 29:2195-6

39. Greussing R, Hackl M, Charoentong P, Pauck A, Monteforte R, Hofer E, Scheideler M, Neuhaus M, Micutkova L, Mueck C, **Trajanoski Z**, Grillari J, Jansen-Dürr P. Identification of microRNA-mRNA functional interactions in UVB-induced senescence of human diploid fibroblasts. **BMC Genomics**. 2013. 14:224.

40. Duszka K, Bogner-Strauss JG, Hackl H, Rieder D, Neuhold C, Prokesch A, **Trajanoski Z**, Krogsdam AM. Nr4a1 is required for fasting-induced Pparg2 down regulation in white adipose. **Mol Endocrinol**. 2013. 27:135-149.