

# Stanford

---



## Theodore Roth

- Affiliate, Department Funds
- Resident in Pathology

Curriculum Vitae available Online

### Bio

---

#### BIO

Theo Roth, MD PhD, was born in St. Louis, Missouri and grew up in Birmingham, Alabama before completing his undergraduate degree in Biology with Honors at Stanford University, along with a coterminal Master's degree in Biomedical Informatics. He completed his MD/PhD training in the Medical Scientist Training Program at the University of California, San Francisco. During his PhD work at UCSF with Dr. Alex Marson, he developed non-viral genome targeting, a new efficient method for large scale genetic engineering of diverse primary human immune cell types without the need for complex viral vectors. He further developed pooled knock-in screening, enabling rapid discovery of synthetic sequences to re-wire immune cell genomes and associate synthetic genotypes with high dimensional single cell phenotypes. Pooled screening of TCR and CAR T cell therapies has highlighted synthetic genetic perturbations with improved context dependent fitness profiles matched to specific solid tumor settings. After concluding his PhD, Theo co-founded ArsenalBio, and served as Arsenal's founding Chief Scientific Officer for a year before returning to UCSF to complete his MD. He is currently completing his residency in Clinical Pathology at Stanford University.

#### CLINICAL FOCUS

- Residency
- Clinical Pathology

#### PATENTS

- Theodore Roth. "United States Patent 11,033,584 Targeted replacement of endogenous T cell receptors", Regents of the University of California
- Theodore Roth. "United States Patent 9,308,163 Methods of Treating and Preventing Diseases and Disorders of the Central Nervous System", National Institutes of Health

#### INTERNET LINKS

- Google Scholar Profile: <https://scholar.google.com/citations?hl=en&user=Ue3WxuYAAAAJ>

### Research & Scholarship

---

#### CURRENT RESEARCH AND SCHOLARLY INTERESTS

Scalable technologies for engineering next generation cellular therapies

### Publications

---

#### PUBLICATIONS

- **Latent human herpesvirus 6 is reactivated in CAR T cells.** *Nature*  
Lareau, C. A., Yin, Y., Maurer, K., Sandor, K. D., Daniel, B., Yagnik, G., Peña, J., Crawford, J. C., Spanjaart, A. M., Gutierrez, J. C., Haradhvala, N. J., Riberdy, J. M., Abay, et al

2023

● **Modular pooled discovery of synthetic knockin sequences to program durable cell therapies.** *Cell*

Blaeschke, F., Chen, Y. Y., Apathy, R., Daniel, B., Chen, A. Y., Chen, P. A., Sandor, K., Zhang, W., Li, Z., Mowery, C. T., Yamamoto, T. N., Nyberg, W. A., To, et al  
2023; 186 (19): 4216-4234.e33

● **High-yield genome engineering in primary cells using a hybrid ssDNA repair template and small-molecule cocktails** *NATURE BIOTECHNOLOGY*

Shy, B. R., Vykunta, V. S., Ha, A., Talbot, A., Roth, T. L., Nguyen, D. N., Pfeifer, W. G., Chen, Y., Blaeschke, F., Shifrut, E., Vedova, S., Mamedov, M. R., Chung, et al  
2023; 41 (4): 521-+

● **RASA2 ablation in T cells boosts antigen sensitivity and long-term function.** *Nature*

Carnevale, J., Shifrut, E., Kale, N., Nyberg, W. A., Blaeschke, F., Chen, Y. Y., Li, Z., Bapat, S. P., Diolaiti, M. E., O'Leary, P., Vedova, S., Belk, J., Daniel, et al  
2022

● **A functional map of HIV-host interactions in primary human T cells** *NATURE COMMUNICATIONS*

Hiatt, J., Hultquist, J. F., McGregor, M. J., Bouhaddou, M., Leenay, R. T., Simons, L. M., Young, J. M., Haas, P., Roth, T. L., Tobin, V., Wojcechowskyj, J. A., Woo, J. M., Rathore, et al  
2022; 13 (1): 1752

● **The CD28-Transmembrane Domain Mediates Chimeric Antigen Receptor Heterodimerization With CD28** *FRONTIERS IN IMMUNOLOGY*

Muller, Y. D., Nguyen, D. P., Ferreira, L. R., Ho, P., Raffin, C., Valencia, R., Congrave-Wilson, Z., Roth, T. L., Eyquem, J., Van Gool, F., Marson, A., Perez, L., Wells, et al  
2021; 12: 639818

● **TCF-1 regulates HIV-specific CD8+ T cell expansion capacity.** *JCI insight*

Rutishauser, R. L., Deguit, C. D., Hiatt, J., Blaeschke, F., Roth, T. L., Wang, L., Raymond, K. A., Starke, C. E., Mudd, J. C., Chen, W., Smullin, C., Matus-Nicodemos, R., Hoh, et al  
2021; 6 (3)

● **XYZeq: Spatially resolved single-cell RNA sequencing reveals expression heterogeneity in the tumor microenvironment.** *Science advances*

Lee, Y., Bogdanoff, D., Wang, Y., Hartoularos, G. C., Woo, J. M., Mowery, C. T., Nisonoff, H. M., Lee, D. S., Sun, Y., Lee, J., Mehdizadeh, S., Cantlon, J., Shifrut, et al  
2021; 7 (17)

● **Epithelial miR-141 regulates IL-13-induced airway mucus production.** *JCI insight*

Siddiqui, S., Johansson, K., Joo, A., Bonser, L. R., Koh, K. D., Le Tonqueze, O., Bolourchi, S., Bautista, R. A., Zlock, L., Roth, T. L., Marson, A., Bhakta, N. R., Ansel, et al  
2021; 6 (5)

● **Genetic Disease and Therapy.** *Annual review of pathology*

Roth, T. L., Marson, A.  
2021; 16: 145-166

● **Comparative host-coronavirus protein interaction networks reveal pan-viral disease mechanisms** *SCIENCE*

Gordon, D. E., Hiatt, J., Bouhaddou, M., Rezelj, V. V., Ulferts, S., Braberg, H., Jureka, A. S., Obernier, K., Guo, J. Z., Batra, J., Kaake, R. M., Weckstein, A. R., Owens, et al  
2020; 370 (6521): 1181-+

● **Polymer-stabilized Cas9 nanoparticles and modified repair templates increase genome editing efficiency.** *Nature biotechnology*

Nguyen, D. N., Roth, T. L., Li, P. J., Chen, P. A., Apothy, R., Mamedov, M. R., Vo, L. T., Tobin, V. R., Goodman, D., Shifrut, E., Bluestone, J. A., Puck, J. M., Szoka, et al  
2020; 38 (1): 44-49

● **Editing of Endogenous Genes in Cellular Immunotherapies.** *Current hematologic malignancy reports*

Roth, T. L.  
2020; 15 (4): 235-240

● **Functional CRISPR dissection of gene networks controlling human regulatory T cell identity.** *Nature immunology*

Schumann, K., Raju, S. S., Lauber, M., Kolb, S., Shifrut, E., Cortez, J. T., Skartsis, N., Nguyen, V. Q., Woo, J. M., Roth, T. L., Yu, R., Nguyen, M. L., Simeonov, et al

2020; 21 (11): 1456-1466

● **A SARS-CoV-2 protein interaction map reveals targets for drug repurposing.** *Nature*

Gordon, D. E., Jang, G. M., Bouhaddou, M., Xu, J., Obernier, K., White, K. M., O'Meara, M. J., Rezelj, V. V., Guo, J. Z., Swaney, D. L., Tummino, T. A., Hüttenhain, R., Kaake, et al  
2020; 583 (7816): 459-468

● **CRISPR screen in regulatory T cells reveals modulators of Foxp3.** *Nature*

Cortez, J. T., Montauti, E., Shifrut, E., Gatchalian, J., Zhang, Y., Shaked, O., Xu, Y., Roth, T. L., Simeonov, D. R., Zhang, Y., Chen, S., Li, Z., Woo, et al  
2020; 582 (7812): 416-420

● **Pooled Knockin Targeting for Genome Engineering of Cellular Immunotherapies.** *Cell*

Roth, T. L., Li, P. J., Blaeschke, F., Nies, J. F., Apathy, R., Mowery, C., Yu, R., Nguyen, M. L., Lee, Y., Truong, A., Hiatt, J., Wu, D., Nguyen, et al  
2020; 181 (3): 728-744.e21

● **Large dataset enables prediction of repair after CRISPR-Cas9 editing in primary T cells.** *Nature biotechnology*

Leenay, R. T., Aghazadeh, A., Hiatt, J., Tse, D., Roth, T. L., Apathy, R., Shifrut, E., Hultquist, J. F., Krogan, N., Wu, Z., Cirolia, G., Canaj, H., Leonetti, et al  
2019

● **A large CRISPR-induced bystander mutation causes immune dysregulation.** *Communications biology*

Simeonov, D. R., Brandt, A. J., Chan, A. Y., Cortez, J. T., Li, Z., Woo, J. M., Lee, Y., Carvalho, C. M., Indart, A. C., Roth, T. L., Zou, J., May, A. P., Lupski, et al  
2019; 2: 70

● **Helios enhances the preferential differentiation of human fetal CD4+ naïve T cells into regulatory T cells.** *Science immunology*

Ng, M. S., Roth, T. L., Mendoza, V. F., Marson, A., Burt, T. D.  
2019; 4 (41)

● **Orthotopic replacement of T-cell receptor #- and # chains with preservation of near-physiological T-cell function.** *Nature biomedical engineering*

Schober, K., Müller, T. R., Gökmén, F., Grassmann, S., Effenberger, M., Poltorak, M., Stemberger, C., Schumann, K., Roth, T. L., Marson, A., Busch, D. H.  
2019; 3 (12): 974-984

● **CRISPR-Cas9 genome engineering of primary CD4+ T cells for the interrogation of HIV-host factor interactions.** *Nature protocols*

Hultquist, J. F., Hiatt, J., Schumann, K., McGregor, M. J., Roth, T. L., Haas, P., Doudna, J. A., Marson, A., Krogan, N. J.  
2019; 14 (1): 1-27

● **Reprogramming human T cell function and specificity with non-viral genome targeting NATURE**

Roth, T. L., Puig-Saus, C., Yu, R., Shifrut, E., Carnevale, J., Li, P., Hiatt, J., Saco, J., Krystofinski, P., Li, H., Tobin, V., Nguyen, D. N., Lee, et al  
2018; 559 (7714): 405--

● **Genetic engineering in primary human B cells with CRISPR-Cas9 ribonucleoproteins.** *Journal of immunological methods*

Wu, C. M., Roth, T. L., Baglaenko, Y., Ferri, D. M., Brauer, P., Zuniga-Pflucker, J. C., Rosbe, K. W., Wither, J. E., Marson, A., Allen, C. D.  
2018; 457: 33-40

● **Genome-wide CRISPR Screens in Primary Human T Cells Reveal Key Regulators of Immune Function.** *Cell*

Shifrut, E., Carnevale, J., Tobin, V., Roth, T. L., Woo, J. M., Bui, C. T., Li, P. J., Diolaiti, M. E., Ashworth, A., Marson, A.  
2018; 175 (7): 1958-1971.e15

● **Enhanced Genome Editing with Cas9 Ribonucleoprotein in Diverse Cells and Organisms.** *Journal of visualized experiments : JoVE*

Farboud, B., Jarvis, E., Roth, T. L., Shin, J., Corn, J. E., Marson, A., Meyer, B. J., Patel, N. H., Hochstrasser, M. L.  
2018

● **Light-activated cell identification and sorting (LACIS) for selection of edited clones on a nanofluidic device.** *Communications biology*

Mocciaro, A., Roth, T. L., Bennett, H. M., Soumillon, M., Shah, A., Hiatt, J., Chapman, K., Marson, A., Lavieu, G.  
2018; 1: 41

● **Discovery of stimulation-responsive immune enhancers with CRISPR activation.** *Nature*

Simeonov, D. R., Gowen, B. G., Boontanart, M. n., Roth, T. L., Gagnon, J. D., Mumbach, M. R., Satpathy, A. T., Lee, Y. n., Bray, N. L., Chan, A. Y., Litvinov, D. S., Nguyen, M. L., Gate, et al  
2017

● **Migratory and adhesive cues controlling innate-like lymphocyte surveillance of the pathogen-exposed surface of the lymph node.** *eLife*

Zhang, Y., Roth, T. L., Gray, E. E., Chen, H., Rodda, L. B., Liang, Y., Ventura, P., Villeda, S., Crocker, P. R., Cyster, J. G.  
2016; 5

- **Single-molecule imaging of Hedgehog pathway protein Smoothened in primary cilia reveals binding events regulated by Patched1.** *Proceedings of the National Academy of Sciences of the United States of America*  
Milenkovic, L., Weiss, L. E., Yoon, J., Roth, T. L., Su, Y. S., Sahl, S. J., Scott, M. P., Moerner, W. E.  
2015; 112 (27): 8320-8325
- **Inflammation and neuroprotection in traumatic brain injury.** *JAMA neurology*  
Corps, K. N., Roth, T. L., McGavern, D. B.  
2015; 72 (3): 355-62
- **A Rapid and Simple Method for DNA Engineering Using Cycled Ligation Assembly** *PLOS ONE*  
Roth, T. L., Milenkovic, L., Scott, M. P.  
2014; 9 (9)
- **Microglia development and function.** *Annual review of immunology*  
Nayak, D., Roth, T. L., McGavern, D. B.  
2014; 32: 367-402
- **Transcranial amelioration of inflammation and cell death after brain injury.** *Nature*  
Roth, T. L., Nayak, D., Atanasijevic, T., Koretsky, A. P., Latour, L. L., McGavern, D. B.  
2014; 505 (7482): 223-8
- **Type I interferon programs innate myeloid dynamics and gene expression in the virally infected nervous system.** *PLoS pathogens*  
Nayak, D., Johnson, K. R., Heydari, S., Roth, T. L., Zinselmeyer, B. H., McGavern, D. B.  
2013; 9 (5): e1003395