# Pranay Dogra

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I'm an immunologist with a strong background in T- and NK-cell biology and have significant experience in implementation of bioinformatics techniques for the analysis of high-dimensional datasets. I want to integrate my knowledge of virology, immunology, and my programming skills to develop a research program that is focused on the development of new and more potent cell-based immunotherapies.

## EDUCATION

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| PhD (Microbiology) | University of Tennessee (USA) | 2015 |
| M.Sc (Biotechnology) | Nagpur University (India) | 2009 |
| Diploma in Bioinformatics | Sai Bioinformatics Institute (India) | 2009 |
| B.Sc (Triple majors Botany/Chemistry/Biotechnology) | Nagpur University (India) | 2007 |

## RESEARCH EXPERIENCE

**Postdoctoral Fellow, Columbia University in the City of New York, 2017- present:**

- Characterizing Natural Killer (NK) cell distribution in humans
- Investigating the contribution of NK cells in response to CMV infection in humans
- Determining the impact of CMV NK cells on T cell response to CMV infection in humans
- Evaluating the potency of human tissue NK cells as potential immunotherapeutic agents

**Postdoctoral Fellow, St. Jude Children's Research Hospital, 2015-2017:**

- Identifying the DNA methylation signature of murine memory CD8 T cell subsets
- Investigating the contribution of DNA methylation programs in CD8 T cell exhaustion during chronic viral infections

**Doctor of Philosophy, University of Tennessee, 2010-2015:**

- Functional characterization of Cytomegalovirus (CMV) encoded chemokines *in vitro*
- Evaluating the role of CMV encoded chemokines in dissemination *in vivo*
- Testing heparan sulfate binding peptides as potential antivirals against herpes viruses

**Bachelor and Master of Science, Nagpur University, 2004-2009:**

- Assessing the antibacterial and anticancer activity of trifoliate plant extracts

## PUBLICATIONS

**Papers:**

1. **Dogra, P.,** Rancan, C., Ma, W., Toth, M., Senda, T., Carpenter, D.J., Kubota, M., Matsumoto, R., Thapa, P., Szabo, P.A., Poon, M.M.L., Li, J., Arakawa-Hoyt, J., Shen, Y., Fong, L., Lanier, L.L., and Farber, D.L. Tissue determinants of human NK cell development, function and residence. ***Cell*** (2020), https://doi.org/10.1016/j.cell.2020.01.022.

2. Weisberg, S.P., Carpenter, D.J., Chait, M., **Dogra, P**., Gartrell-Corrado, R.D., Chen, A.X., Campbell, S., Liu, W., Saraf, P., Snyder, M.E., *et al.* (2019). Tissue-Resident Memory T Cells Mediate Immune Homeostasis in the Human Pancreas through the PD-1/PD-L1 Pathway. ***Cell Rep*** *29*, 3916-3932 e3915.
3. Szabo, P.A., Levitin, H.M., Miron, M., Snyder, M.E., Senda, T., Yuan, J., Cheng, Y.L., Bush, E.C., **Dogra, P.**, Thapa, P., *et al.* (2019). Single-cell transcriptomics of human T cells reveals tissue and activation signatures in health and disease. ***Nature communications*** *10*, 4706.
4. Jackson, J. W., Hancock, T. J., LaPrade, E., **Dogra, P.**, Gann, E. R., Masi, T. J. and Sparer, T. E. (2019). The Human Cytomegalovirus Chemokine vCXCL-1 Modulates Normal Dissemination Kinetics of Murine Cytomegalovirus *In Vivo*. ***mBio***, *10*(3), e01289-01219. doi: 10.1128/mBio.01289-19
5. M. E. Snyder, M. O. Finlayson, T. J. Connors, **P. Dogra**, T. Senda, E. Bush, D. Carpenter, C. Marboe, L. Benvenuto, L. Shah, H. Robbins, J. L. Hook, M. Sykes, F. D'Ovidio, M. Bacchetta, J. R. Sonett, D. J. Lederer, S. Arcasoy, P. A. Sims, and D. L. Farber, 'Generation and Persistence of Human Tissue-Resident Memory T Cells in Lung Transplantation', ***Sci Immunol***, 4 (2019).
6. Jackson, J. W., Hancock, T. J., **Dogra, P.**, Patel, R., Arav-Boger, R., Williams, A. D., Sparer, T. E. Anticytomegalovirus peptides point to new insights for CMV entry mechanisms and the limitations of in vitro screenings. ***mSphere***. 2019 4(1), doi: 10.1128/mSphere.00586-18
7. Takashi Senda, **Pranay Dogra**, Tomer Granot, Kazuhiro Furuhashi, Mark E. Snyder, Dustin J. Carpenter, Peter A. Szabo, Puspa Thapa, Michelle Miron, Donna L. Farber. Microanatomical dissection of human intestinal immunity reveals site-specific changes in gut-associated lymphoid tissues over life. ***Mucosal Immunology***. 2019;12(2):378-389
8. Youngblood B, Hale JS, Kissick HT, Ahn E, Xu X, Wieland A, Araki Koichi, West EE, Ghoneim HE, Fan Y, **Dogra P**, Davis CW, Konieczny BT, Antia R, Cheng X, Ahmed R. Effector CD8 T cells dedifferentiate into long-lived memory cells. ***Nature***. 2017;552(7685):404-9
9. E Kaitlynn Allen, Adrienne G Randolph, Tushar Bhangale, **Pranay Dogra**, Maikke Ohlson, Christine M Oshansky, Anthony E Zamora, John P Shannon, David Finkelstein, Amy Dressen, John DeVincenzo, Miguela Caniza, Ben Youngblood, Carrie M Rosenberger, Paul G Thomas. SNP-mediated disruption of CTCF binding at the IFITM3 promoter is associated with risk of severe influenza in humans**.** ***Nature Medicine***, 2017; DOI: 10.1038/nm.4370
10. Hazem E. Ghoneim, Yiping Fan, Ardiana Moustaki, Hossam A. Abdelsamed, Pradyot Dash, **Pranay Dogra**, Robert Carter, Walid Awad, Geoff Neale, Paul G. Thomas, Ben Youngblood. De Novo Epigenetic Programs Inhibit PD-1 Blockade-Mediated T Cell Rejuvenation. ***Cell***, 2017; DOI: 10.1016/j.cell.2017.06.007
11. Hossam A. Abdelsamed, Ardiana Moustaki, Yiping Fan, **Pranay Dogra**, Hazem E. Ghoneim, Caitlin C. Zebley, Brandon M. Triplett, Rafick-Pierre Sekaly, Ben Youngblood. Human memory CD8 T cell effector potential is epigenetically preserved during *in vivo* homeostasis. ***Journal of Experimental Medicine***. May 2017, jem.20161760; DOI: 10.1084/jem.20161760
12. **Dogra P**, Miller-Kittrell M, Pitt E, Jackson JW, Masi T, Copeland C, et al. A Little Cooperation Helps Murine Cytomegalovirus Go a Long Way - Co-infection Between MCMVs Rescues A Viral Chemokine Salivary Gland Defect. ***Journal of General Virology***. 2016.

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13. Pitt, E.A., **Dogra, P.**, Patel, R.S., Williams, A., Wall, J.S., Sparer, T.E., The D-form of a novel heparan binding peptide decreases cytomegalovirus infection in vivo and in vitro, ***Antiviral Research*** (2016), doi: 10.1016/j.antiviral.2016.09.012.
14. **Dogra, P.**, Ghoneim, H. E., Abdelsamed, H. A. and Youngblood, B. (2016), Generating long-lived $CD8^+$ T-cell memory: Insights from epigenetic programs. ***Eur. J. Immunol***., 46: 1548–1562. doi:10.1002/eji.201545550
15. Gimenez, F., Bhela, S., **Dogra, P.**, Harvey, L., Varanasi, S.K., Jaggi, U. and Rouse, B.T., 2015. The inflammasome NLRP3 plays a protective role against a viral immunopathological lesion. ***Journal of leukocyte biology***, pp.jlb-3HI0715.
16. **Dogra P**, Martin EB, Williams A, Richardson RL, Foster JS, et al. (2015) Novel Heparan Sulfate-Binding Peptides for Blocking Herpesvirus Entry. ***PLoS ONE*** 10(5): e0126239. doi: 10.1371/journal.pone.0126239
17. Heo J, **Dogra P**, Masi TJ, Pitt EA, de Kruijf P, Smit MJ, et al. Novel Human Cytomegalovirus Viral Chemokines, vCXCL-1s, Display Functional Selectivity for Neutrophil Signaling and Function. ***J Immunol***. 2015. Epub 2015/05/20. doi: 10.4049/jimmunol.1400291. PubMed PMID: 25987741.
18. **Dogra, P**. and T. E. Sparer (2014). What We Have Learned From Animal Models of HCMV. ***Human Cytomegaloviruses***. A. D. Yurochko and W. E. Miller, Humana Press. 1119.
19. **Pranay Dogra** and Dilip Gore, Prediction of Enzymatic Function and Structure of H. influenzae Hypothetical Proteins - An *In silico* Approach. ***International Journal of Soft Computing and Bioinformatics***, 2010. **1**(2): p. 66-77.
20. **Pranay Dogra** *et al.* Study of Antibacterial and Anticancer Activity of Selected Trifoliate Plants. ***Biofrontiers*** **1**, Issue 2 (2009): 11-16.

**Abstracts:**

1. Tissue driven influences on human NK cell development, function and residence, J Immunol May 1, 2019, 202 (1 Supplement) 129.8
2. Human NK cell distribution memory and residence in tissue sites. Abstracts: Fourth CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference: Translating Science into Survival; September 30 - October 3, 2018; New York, NY
3. Mathematical Modeling of the Spread of Mouse Cytomegalovirus from Foot Pad to the Salivary Gland. Proceedings of C.E.M.P.H Research Symposium, University of TN, Knoxville (2011).
4. Study of Anticancer and Antimicrobial Activity of Trifoliate Plants; Proceedings of Symposium on Current Trends in Cellular Communication, 2008: 34.

## AWARDS AND HONORS

1. American Association of Immunologists poster award to attend AAI annual conference (2020).
2. American Association of Immunologists travel award to attend AAI annual conference (2019).
3. Cancer Research Institute Irvington Postdoctoral Fellowship (2018-2021).
4. Certificate of outstanding contribution in reviewing, molecular immunology (2017).
5. Department of Microbiology, UTK, Graduate Teaching Assistant Award for Excellence in Teaching 2015.
6. Graduate Student Senate Travel Award UTK to present work at $5^{th}$ International Congenital CMV conference 2015.

7. Graduate Student Senate Travel Award UTK to present poster at 4th International Congenital CMV conference 2012.
8. David C. White Memorial Travel Award for academic year 2010 – 2011, 2013 – 2014, 2014-2015.
9. Travel Scholarship from Yale University (PRIME), to attend the 6th Annual Summer School on Computational Immunology (2011).
10. Felicitated by Hislop College, Nagpur (India) for outstanding achievement (2008-09).
11. 2nd Prize at Inter University research festival (2008).
12. 2nd Prize in Inter College paper presentation.
13. 2nd in Biotechnology Department in college during undergraduate course (2007).
14. Best Student of the Year medal 2006-07 and 2008-09 by Hislop School of Biotechnology, Hislop College Nagpur, India.
15. Army Welfare Education Society (AWES) Scholarship for the year 2005-06 and 2006-07.
16. 1st in All India Senior School Certificate Examination (AISSCE) in School and top 10 in City (Jaipur, India).

## PRESENTATIONS

**Talks:**

1. Tissue-specific Maturation, Function and Residence Properties of Human NK Cells at HIPC project meeting 2019 (NIH).
2. Tissue driven influences on human NK cell development, function and residence at AAI 2019 (San Diego, CA).
3. Identification and characterization of synthetic heparan sulfate binding anti-viral peptide at SERVC 2014 (Emory University, Georgia).
4. Mouse model to evaluate the role of cmvIL-10 at SERVC 2012 (Emory University, Georgia).
5. Mathematical Modeling of the Spread of Mouse Cytomegalovirus from Foot Pad to the Salivary Gland at SERVC 2012 (Emory University, Georgia).
6. Mathematical Modeling of the Spread of Mouse Cytomegalovirus from Foot Pad to the Salivary Gland at the Comparative and Experimental Medicine and Public Health Research Symposium (2011).
7. Antenatal Diagnosis of Sickle Cell Disease by PCR at the Annual Conference of the Indian Medical Association Nagpur (2009).
8. Anticancer and antibacterial activities of selected trifoliate *plants* at "Anveshan 2009" Western Region Student Research Convention at R.G.P.V. Bhopal (2009).
9. Anticancer and antibacterial activities of some trifoliate plants at "Avishkar 2008" Inter University Research festival (State level) at Sant Gadge Baba Amravarti University (2008).
10. Anticancer and antibacterial activities of selected trifoliate plants at the Inter College paper presentation event organized by the Government Dental College, Nagpur (2007).
11. Proton Magnetic Resonance Spectroscopy at Inter College paper presentation competition organized at L.A.D College, Nagpur (2005).
12. Classroom seminar on *ELISA* to B.Sc. students, Hislop School of Biotechnology (2005).

**Poster:**

1. Enhanced functional properties of in vitro expanded lymph node derived human NK cells at HIPC project meeting 2020 (NIH).

2. Tissue driven influences on human NK cell development, function and residence sites at the 5th CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference, 2019 (Paris, France).
3. Human NK cell distribution memory and residence in tissue sites at the 4th CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference, 2018 (New York City, NY, USA).
4. Functional diversity of NK cells in human tissues at Department of Surgery Symposium, Columbia University in the City of New York, 2018 (New York City, NY, USA).
5. Novel Heparan Sulfate-Binding Peptides for Blocking Herpesvirus Entry at 5th International Congenital CMV conference, 2015 (Brisbane, QLD, Australia).
6. Synthetic Heparin-Binding Peptides Block CMV Infection at 26th Annual International Herpesvirus Workshop, 2013 (Grand Rapids, MI).
7. Mathematical Modeling of the Spread of Mouse Cytomegalovirus from Foot Pad to the Salivary Gland at CMV 2012, (San Francisco, CA).
8. Mathematical Modeling of the Spread of Mouse Cytomegalovirus from Foot Pad to the Salivary Gland at the Symposium on Systems Biology of Influenza, 2011 (Yale University, CT).
9. Anticancer and Antibacterial Activities of Selected Trifoliate Plants at UGC Sponsored State Level Symposium on Current Trends in Cellular Communication, (2008).

## CONFERENCES ATTENDED

1. Fifth CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference, Paris, France (2019)
2. Immunology 2019, Annual Meeting of AAI, San Diego, CA (2019).
3. Fourth CRI-CIMT-EATI-AACR International Cancer Immunotherapy Conference, New York City, NY (2018)
4. Department of Surgery Symposium, Columbia University in the City of New York, NYC (2018).
5. Cell Symposia Human Immunity, Banff, Canada (2017).
6. Immunology 2016, Annual Meeting of AAI, Seattle, WA (2016).
7. 5th International Congenital CMV Conference, Brisbane, Australia (2015).
8. International Herpes Virus Workshop, Grand Rapids, MI (2013).
9. 4th International Congenital CMV conference, San Francisco, CA (2012).
10. South Eastern Regional Virology Conference, Emory University, GA (2012, 2014).
11. Systems Biology of Influenza, Yale, CT (2011).
12. 2010 International Symposium on Molecular Biology, Nagpur (2010).
13. 33rd Annual Scientific Conference of ASEATTA on MHC Genomics and Human Health – Emerging Diagnostic and Therapeutic Applications, AIIMS, New Delhi (2009).
14. Application of Genomics in Biological Research, Government Dental College, Nagpur (2009)
15. Proteomics, Genomics and Biological Systems, IISC Bangalore (2008).
16. Current Trends in Cellular Communication, Hislop College Nagpur (2008).
17. Protein Engineering and Designing, L.N.I.T, Nagpur (2007).
18. National Symposia on Cancer organized by Hislop School of Biotechnology, Nagpur (2005).

## SUMMER SCHOOLS/WORKSHOPS ATTENDED

1. Columbia DSI/TRIPODS Deep Learning Workshop, Columbia University, NY (2019)
2. The 6th Annual Summer School on Computational Immunology, Yale University, CT (2011)
3. 6th International Summer School on Immunology and Immunogenetics, Delhi, India (2009)
4. Connect IT Workshop organized by NASSCOM foundation and Guide Star India (2009)
5. Downstream Processing, workshop by Millipore India, Bangalore, India (2008)
6. Workshop on "Fermentation Technology- Tools and Techniques" organized by Institute of Life and Environmental Science, Nasik, India (2006)
7. Plant Tissue culture Techniques at C.S.K Himachal Pradesh Agriculture University, India (2005)

## COMPUTATIONAL AND SOFTWARE SKILLS

1. Experienced in using Linux OS.
2. Proficient in the use of R and Python for data analysis and automation.
3. Working knowledge of HTML script.
4. Certification course in C++.
5. Proficient in the use of MS office suite (Word, Excel and PowerPoint).
6. Experience in using Adobe Photoshop and Illustrator.

## MEMBESHIP OF PROFESSIONAL SOCIETIES

1. American Association of Immunologists (2019-present)
2. American Association for the Advancement of Science (2019-present)

## REVIEWER ACTIVITIES

1. Ad hoc reviewer for Molecular Immunology (2016-present)

## TEACHING ACTIVITIES

1. Graduate teaching assistant at department of microbiology, University of Tennessee, Knoxville (2010-2015)
2. Instructor, Immunology and Infectious Diseases for Columbia University Science Honors Program (Fall 2019)

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