Eui-Cheol Shin, M.D., Ph.D.

EDUCATION:

1990-1996:	M.D., Yonsei University College of Medicine, Seoul, Korea
1996-2001:	Ph.D. (in Microbiology and Immunology), Yonsei University College of Medicine, Seoul, Korea

CAREER:

2002-2007:	Research Fellow, Immunology Section, Liver Diseases Branch, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), National Institutes of Health (NIH), Bethesda, MD, USA
2007-present:	Assistant Professor, Associate Professor, and Professor, Laboratory of Immunology and Infectious Diseases, Graduate School of Medical Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea
2018-present:	Adjunct Professor, Yonsei University College of Medicine, Severance Biomedical Science Institute, Seoul, Korea
2019-present:	Member, The Korea Academy of Science and Technology
2020-2021:	Director, The Center for Epidemic Preparedness, KAIST, Daejeon, Korea
2021-present:	Director, The Center for Viral Immunology, Korea Virus Research Institute, Institute for Basic Science, Daejeon, Korea

RESEARCH INTERESTS: Viral Immunology, Hepatitis Viruses, Immune Aging, Tumor Immunology, Human Immune Monitoring

SELECTED PUBLICATIONS:

1. Kang W, Sung PS, Park SH, Yoon S, Chang DY, Kim S, Han KH, Kim JK, Rehermann B, Chwae YJ, **Shin EC**. Hepatitis C virus attenuates interferon-induced MHC class I expression and decreases $CD8^+$ T cell effector functions. *Gastroenterology* 146:1351-1360, 2014
2. Choi YS, Lee J, Lee HW, Chang DY, Sung PS, Jung MK, Park JY, Kim JK, Lee JI, Park H, Cheong JY, Suh KS, Kim HJ, Lee JS, Kim KA, **Shin EC**. Liver injury in acute hepatitis A is associated with decreased frequency of regulatory T cells caused by Fas-mediated apoptosis. *Gut* 64:1303-1313, 2015
3. Sung PS, Cheon HJ, Cho CH, Hong SH, Park DY, Seo HI, Park SH, Yoon SK, Stark GR, **Shin EC**. Roles of unphosphorylated ISGF3 in HCV infection and interferon responsiveness. *Proc Natl Acad Sci USA* 112:10443-10448, 2015
4. Kim JH, Choi YJ, Lee BH, Song MY, Ban CY, Kim J, Park J, Kim SE, Kim TG, Park SH, Kim HP, Sung YC, Kim SC, **Shin EC**. Programmed cell death-ligand 1 alleviates psoriatic inflammation by suppressing IL-17A production from PD-1^{hi} T cells. *J Allergy Clin Immunol* 137:1466-1476, 2016
5. **Shin EC**, Sung PS, Park SH. Immune responses and immunopathology in acute and chronic viral hepatitis. *Nat Rev Immunol* 16:509-523, 2016
6. Choi YS, Jung MK, Lee J, Choi SJ, Choi SH, Lee HW, Lee JJ, Kim HJ, Ahn SH, Lee DH, Kim W, Park SH, Huh JR, Kim HP, Park JY, **Shin EC**. Tumor necrosis factor-producing regulatory T cells are associated with severe liver injury in patients with acute hepatitis A. *Gastroenterology* 154:1047-1060, 2018
7. Kim J, Chang DY, Lee HW, Lee H, Kim JH, Sung PS, Kim KH, Hong SH, Kang W, Lee J, Shin SY, Yu HT, You S, Choi YS, Oh I, Lee DH, Lee DH, Jung MK, Suh KS, Hwang S, Kim W, Park SH, Kim HJ, **Shin EC**. Innate-like cytotoxic function of bystander activated $CD8^+$ T cells is associated with liver injury in acute hepatitis A. *Immunity* 48:161-173, 2018
8. Kim KH, Cho J, Ku BM, Koh J, Sun JM, Lee SH, Ahn JS, Cheon J, Min YJ, Park SH, Park K, Ahn MJ,

Shin EC. The first-week proliferative response of peripheral blood PD-1$^+$CD8$^+$ T cells predicts the response to anti-PD-1 therapy in solid tumors. *Clin Cancer Res* 25:2144-2154, 2019

9. Park J, Kwon M, Kim KH, Kim TS, Hong SH, Kim CG, Kang SG, Moon JH, Kim EH, Park SH, Chang JH, **Shin EC**. Immune checkpoint inhibitor-induced reinvigoration of tumor-infiltrating CD8$^+$ T cells is determined by their differentiation status in glioblastoma. *Clin Cancer Res* 25:2549-2559, 2019
10. Kim CG, Jang M, Kim Y, Leem G, Kim KH, Lee H, Kim TS, Choi SJ, Kim HD, Han JW, Kwon M, Kim JH, Lee AJ, Nam SK, Bae SJ, Lee SB, Shin SJ, Park SH, Ahn JB, Jung I, Lee KY, Park SH, Kim H, Min BS, **Shin EC**. VEGF-A drives TOX-dependent T-cell exhaustion in anti-PD-1-resistant microsatellite stable colorectal cancers. *Sci Immunol* 4:eaay0555, 2019
11. Kwon M, Kim CG, Lee H, Cho H, Kim Y, Lee EC, Choi SJ, Park J, Seo IH, Bogen B, Song IC, Jo DY, Kim JS, Park SH, Choi I, Choi YS, **Shin EC**. PD-1 blockade reinvigorates bone marrow CD8$^+$ T cells from patients with multiple myeloma in the presence of TGF-β inhibitors. *Clin Cancer Res* 26:1644-1655, 2020
12. Rha MS, Kim SW, Chang DY, Lee JK, Kim J, Park SH, Khamulratova R, Lim HS, Eun KM, Hong SN, Kim DW, **Shin EC**. Superantigen-related Th2 CD4$^+$ T cells in non-asthmatic chronic rhinosinusitis with nasal polyps. *J Allergy Clin Immunol* 145:1378-1388, 2020
13. Kim JH, Han JW, Choi YJ, Rha MS, Koh JY, Kim KH, Kim CG, Lee YJ, Kim AR, Park J, Kim HK, Min BS, Seo SI, Kang M, Park HJ, Han DH, Kim SI, Kim MS, Lee JG, Lee DH, Kim W, Park JY, Park SH, Joo DJ, **Shin EC**. Functions of human liver CD69$^+$CD103$^-$CD8$^+$ T cells depend on HIF-2α activity in healthy and pathologic livers. *J Hepatol* 72:1170-1181, 2020
14. Han JW, Sung PS, Hong SH, Lee H, Koh JY, Lee H, White S, Maslow JN, Weiner DB, Park SH, Jeong M, Heo J, Ahn SH, **Shin EC**. IFNL3-adjuvanted HCV DNA vaccine reduces regulatory T-cell frequency and increases virus-specific T-cell responses. *J Hepatol* 73:72-83, 2020
15. Rha MS, Han JW, Kim JH, Koh JY, Park HJ, Kim SI, Kim MS, Lee JG, Lee HW, Lee DH, Kim W, Park JY, Joo DJ, Park SH, **Shin EC**. Human liver CD8$^+$ MAIT cells exert TCR/MR1-independent innate-like cytotoxicity in response to IL-15. *J Hepatol* 73:640-650, 2020
16. Lee JS, Park S, Jeong HW, Ahn JY, Choi SJ, Lee H, Choi B, Nam SK, Sa M, Kwon JS, Jeong SJ, Lee HK, Park SH, Park SH, Choi JY, Kim SH, Jung I, **Shin EC**. Immunophenotyping of COVID-19 and influenza highlights the role of type I interferons in development of severe COVID-19. *Sci Immunol* 5:eabd1554, 2020
17. Lee JS, **Shin EC**. The type I interferon response in COVID-19: implications for treatment. *Nat Rev Immunol* 20:585-586, 2020
18. Rha MS, Jeong HW, Ko JH, Choi SJ, Seo IH, Lee JS, Sa M, Kim AR, Joo EJ, Ahn JY, Kim JH, Song KH, Kim ES, Oh DH, Ahn MY, Choi HK, Jeon JH, Choi JP, Kim HB, Kim YK, Park SH, Choi WS, Choi JY, Peck KR, **Shin EC**. PD-1-expressing SARS-CoV-2-specific CD8$^+$ T cells are not exhausted, but functional in patients with COVID-19. *Immunity* 54:44-52, 2021
19. Koh JY, **Shin EC**. Landscapes of SARS-CoV-2-reactive CD8$^+$ T cells: heterogeneity of host immune responses against SARS-CoV-2. *Signal Transduct Target Ther* 6:146, 2021
20. Noh JY, Jeong HW, **Shin EC**. SARS-CoV-2 mutations, vaccines, and immunity: implication of variants of concern. *Signal Transduct Target Ther* 6:203, 2021
21. Jung JH, Rha MS, Sa M, Choi HK, Jeon JH, Seok H, Park DW, Park SH, Jeong HW, Choi WS, **Shin EC**. SARS-CoV-2-specific T cell memory is sustained in COVID-19 convalescent patients for 10 months with successful development of stem cell-like memory T cells. *Nat Commun* 12:4043, 2021
22. Seo IH, Eun HS, Kim JK, Lee H, Jeong S, Choi SJ, Lee J, Lee BS, Kim SH, Rou WS, Lee DH, Kim W, Park SH, **Shin EC**. IL-15 enhances CCR5-mediated migration of memory CD8$^+$ T cells by upregulating CCR5 expression in the absence of TCR stimulation. *Cell Rep* 36:109438, 2021
23. Leem G, Cheon S, Lee H, Choi SJ, Jeong S, Kim ES, Jeong HW, Jeong H, Park SH, Kim YS, **Shin EC**. Abnormality in the NK cell population is prolonged in severe COVID-19 patients. *J Allergy Clin Immunol* 148:996-1006, 2021
24. Rha MS, **Shin EC**. Activation or exhaustion of CD8$^+$ T cells in patients with COVID-19. *Cell Mol*

Immunol 18:2325-2333, 2021
25. Noh JY, Jeong HW, Kim JH, **Shin EC**. T cell-oriented strategies for controlling the COVID-19 pandemic. *Nat Rev Immunol* 21:687-688, 2021
26. Lee H, Jeong S, **Shin EC**. Significance of bystander T cell activation in microbial infection. *Nat Immunol* 23:13-22, 2022
27. Kim TS, Rha MS, **Shin EC**. IFN-γ induces IL-15 trans-presentation by epithelial cells via IRF1. *J Immunol* 208:338-346, 2022
28. Leem G, Jeon M, Kim KW, Jeong S, Choi SJ, Lee YJ, Kim ES, Lee JI, Ha SY, Park SH, Shim HS, Lee JG, Kang SM, **Shin EC**. Tumour-infiltrating bystander $CD8^+$ T cells activated by IL-15 contribute to tumour control in non-small cell lung cancer. *Thorax* 77:769-780, 2022
29. Rha MS, Yoon YH, Koh JY, Jung JH, Lee HS, Park SK, Park SH, Kim YM, Rha KS, **Shin EC**. IL-17A-producing sinonasal MAIT cells in patients with chronic rhinosinusitis with nasal polyps. *J Allergy Clin Immunol* 149:599-609, 2022
30. Rha MS, Han JW, Koh JY, Lee HS, Kim JH, Cho K, Kim SI, Kim MS, Lee JG, Park SH, Joo DJ, Park JY, **Shin EC**. Impaired antibacterial response of liver sinusoidal $V\gamma9^+V\delta2^+$ T cells in patients with chronic liver disease. *Gut* 71:605-615, 2022
31. Choi SJ, Kim DU, Noh JY, Kim S, Park SH, Jeong HW, **Shin EC**. T cell epitopes in SARS-CoV-2 proteins are substantially conserved in the Omicron variant. *Cell Mol Immunol* 19:447-448, 2022
32. Jeong S, Jeon M, Lee H, Kim SY, Park SH, **Shin EC**. IFITM3 is upregulated characteristically in IL-15-mediated bystander-activated $CD8^+$ T cells during influenza infection. *J Immunol* 208:1901-1911, 2022
33. Koh JY, **Shin EC**. KIRs mark killers suppressing autoimmunity. *Immunity* 55:735-737, 2022
34. Jung MK, Jeong SD, Noh JY, Kim DU, Jung S, Song JY, Jeong HW, Park SH, **Shin EC**. BNT162b2-induced memory T cells respond to the Omicron variant with preserved polyfunctionality. *Nat Microbiol* 7:909-917, 2022
35. Jung S, Jung JH, Noh JY, Kim WJ, Yoon SY, Jung J, Kim ES, Kim HB, Cheong HJ, Kim WJ, Park SH, Song KH, Song JY, **Shin EC**. The generation of stem cell-like memory cells early after BNT162b2 vaccination is associated with durability of memory $CD8^+$ T cell responses. *Cell Rep* 40:111138, 2022
36. Koh JY, Rha MS, Choi SJ, Lee HS, Han JW, Nam H, Kim DU, Lee JG, Kim MS, Park JY, Park SH, Joo DJ, **Shin EC**. Identification of a distinct NK-like hepatic T-cell population activated by NKG2C in a TCR-independent manner. *J Hepatol* 77:1059-1070, 2022
37. Choi YJ, Lee H, Kim JH, Kim SY, Koh JY, Sa M, Park SH, **Shin EC**. CD5 suppresses IL-15-induced proliferation of human memory $CD8^+$ T cells by inhibiting mTOR pathways. *J Immunol*, in press
38. Lee YJ, Kim JY, Jeon SH, Nam H, Jung JH, Jeon M, Kim ES, Bae SJ, Ahn J, Yoo TK, Sun WY, Ahn SG, Jeong J, Park SH, Park WC, Kim SI, **Shin EC**. $CD39^+$ tissue-resident memory $CD8^+$ T cells with a clonal overlap across compartments mediate anti-tumor immunity in breast cancer. *Sci Immunol* 7:eabn8390, 2022

SHORT BIOGRAPHY:

Prof. Eui-Cheol Shin received his M.D. (1996) and Ph.D. (2001) from Yonsei University College of Medicine, Seoul, Republic of Korea, and his postdoctoral training from NIDDK, National Institutes of Health, Bethesda, Maryland, USA. Then he joined Graduate School of Medical Science and Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Republic of Korea in 2007, where he is currently a professor. He is also the director of the Center for Viral Immunology, Korea Virus Research Institute, Institute for Basic Science (IBS), Daejeon, Republic of Korea, since 2021. His laboratory performs researches on T cell responses in human viral disease and cancer. In particular, they currently focuses on 'T cell-mediated immunopathogenesis', 'senescence of T cells', 'reinvigoration of exhausted T cells', 'human immune monitoring' and 'immune responses in SARS-CoV-2 infection and

COVID-19'. Prof. Shin was elected as a member of The Korea Academy of Science and Technology in 2019.