

## Curriculum Vitae

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정연석

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### Education and Degrees (교육 및 학위)

- Mar. 1993 - Feb. 1997 B. Sc. in Pharmacy, Seoul National University, Seoul, South Korea
- Mar. 1997 - Feb. 1999 M. S. in Pharmacy/Immunology, Seoul National University.  
Dissertation: Antigen feeding effects on different phases of the immune response. (Advisor: Dr. Chang-Yuil Kang)
- Mar. 1999 - Feb. 2003 Ph. D. in Immunology, Seoul National University.  
Dissertation: Mechanism of peripheral immune tolerance induced by oral Ag and its application to a murine model of asthma. (Advisor : Dr. Chang-Yuil Kang)

### Positions and Employment (경력)

- Mar. 2016 ~ present Associate professor, College of Pharmacy, Seoul National University
- Mar. 2014 ~ Feb. 2016 Assistant professor, College of Pharmacy, Seoul National University
- Mar. 2014 ~ present Adjunct professor, Institute of Molecular Medicine, The University of Texas-Medical School at Houston, Houston, TX, USA
- Jun. 2010 ~ Feb. 2014 Assistant professor (tenure track), Institute of Molecular Medicine, The University of Texas-Medical School at Houston, Houston, TX, USA
- Dec. 2009 ~ May. 2010 Instructor (faculty), Department of Immunology, MD Anderson Cancer Center, Houston, TX, USA (supervisor: Dr. Chen Dong)
- Feb. 2005 ~ Dec. 2009 Postdoctoral Fellow, Department of Immunology, MD Anderson Cancer Center, Houston, TX, USA (supervisor: Dr. Chen Dong)
- Mar. 2003 ~ Jan. 2005 Research Scientist, Institute of Pharmaceutical Sciences, College of Pharmacy, Seoul National University, South Korea

### Honors and Awards (수상 경력)

- 1999 Travel award for the annual meeting of the Japanese Society for Immunologist, Kyoto, Japan.
- 2004 Postdoctoral fellowship, Korea Science and Engineering Foundation (KOSEF).
- 2006 Bioneer award for the outstanding achievement in research, Korean-American Bio-Medical

Scientists Symposium, Houston, Texas.

- 2009 Best poster award (1<sup>st</sup> place), Immunology Graduate Program Retreat, The University of Texas Health Science Center, Houston, Texas.
- 2010 Seymour and Vivian Milstein Young Investigator Award, International Society for Interferon and Cytokine Research, Chicago, Illinois.
- 2010 Awardee, Scientist Development Program (National Center), American Heart Association, USA
- 2013 Early career junior faculty travel award, American Association of Immunologists, Immunology 2013, Honolulu, Hawaii.
- 2014 Herbert Tabor Young Investigator Award, International Cytokine & Interferon Society, Cytokines 2014, Melbourne, Australia

### **Professional Affiliation (학회 활동)**

- 2010- Member, International Society of Interferon and Cytokine Research (ISICR).
- 2010- Regular member, UT Graduate School of Biomedical Sciences (GSBS)
- 2012- Member, American Association of Immunologists (AAI).
- 2014- Member, Korean Association of Immunologists (KAI)
- 2014- Member & Chief scientific board of microbiology and immunology section, Pharmaceutical Society of Korea (PSK)

### **Patents (특허)**

- 2008 Use of a B cell-based vaccine loaded with natural killer T cell ligand and antigen. (South Korea, Patent Application No. 2006-0038119 filed on 04/27/06; Patent No. 10-0809873 registered on 02/27/08)
- 2011 Use of a B cell-based vaccine loaded with natural killer T cell ligand and antigen. (Japan, Patent Application No. 2008-513353 filed on 04/27/06; Patent No. 4713638 registered on 04/01/11)

### **Publications (논문)**

#### **Peer-reviewed Research Articles:**

- 62. Cho M, Lee JE, Lim H, Shin HW, Khalmuratova R, Choi G, Kim HS, Choi WS, Park YJ, Shim I, Kim BS, Kang CY, Kim JO, Tanaka S, Kubo M, **Chung Y**. Fibrinogen-cleavage products and TLR4 promote the generation of programmed cell death 1 ligand 2(PD-L2)+ dendritic cells in allergic asthma. J Allergy Clin Immunol. DOI:10.1016/j.jaci.2017.09.019
- 61. Kim BS, Lu H, Ichiyama K, Chen X, Zhang YB, Mistry NA, Tanaka K, Lee YH, Nurieva R, Zhang L, Yang X, **Chung Y**, Jin W, Chang SH, Dong C. Generation of ROR $\gamma$ t+ Antigen-Specific T Regulatory 17 Cells from Foxp3+ Precursors in Autoimmunity. Cell Rep. 2017. 21(1):195-207.
- 60. Na H, Lim H, Choi G, Kim BK, Kim SH, Chang YS, Nurieva RI, Dong C, Chang SH, **Chung Y**.

- Concomitant Suppression of Th2 and Th17 cell responses in allergic asthma by targeting ROR $\gamma$ t. J Allergy Clin Immunol. DOI: dx.doi.org/10.1016/j.jaci.2017.07.050
59. Choi G, Kim BS, Park YJ, Shim I, **Chung Y**. Clonal Expansion of Allergen-specific CD4+ T Cell in the Lung in the Absence of Lymph Nodes. Immune Netw. 2017;17:163-170.
  58. Lee JE, Lee JM, Park YJ, Kim BS, Jeon YT, **Chung Y**. Inhibition of autoimmune Th17 cell responses by pain killer ketamine. Oncotarget. 2017 May 31. doi: 10.18632/oncotarget.18324.
  57. Seo H, Jeon I, Kim BS, Park M, Bae EA, Song B, Koh CH, Shin KS, Kim IK, Choi K, Oh T, Min J, Min BS, Han YD, Kang SJ, Shin SJ, **Chung Y**, Kang CY. IL-21-mediated reversal of NK cell exhaustion facilitates anti-tumour immunity in MHC class I-deficient tumours. Nat Commun. 2017;8:15776.
  56. Kim YU, Kim BS, Lim H, Wetsel RA, **Chung Y**. Enforced Expression of CXCR5 Drives T Follicular Regulatory-Like Features in Foxp3+ T Cells. Biomol Ther. 2017;25:130.
  55. Choi G, **Chung Y**. Blockade of STAT3 in T Cells Inhibits Germinal Center Reactions against Intranasal Allergens. Biomol Ther. 2016. 24:244-51
  54. Lee JH, Park KM, Han DJ, Bang NY, Kim DH, Na H, Lim S, Kim TB, Kim DG, Kim HJ, **Chung Y**, Sung SH, Surh YJ, Kim S, Han BW. PharmDB-K: Integrated Bio-Pharmacological Network Database for Traditional Korean Medicine. PLoS One. 2015;10:e0142624
  53. Lee JS, Kang JH, Boo HJ, Hwang SJ, Hong S, Lee SC, Park YJ, Chung TM, Youn H, Mi Lee S, Jae Kim B, Chung JK, **Chung Y**, William WN Jr, Kee Shin Y, Lee HJ, Oh SH, Lee HY. STAT3-mediated IGF-2 secretion in the tumour microenvironment elicits innate resistance to anti-IGF-1R antibody. Nat Commun. 2015: 14:6:8499
  52. Jeon YT, Na H, Ryu H, **Chung Y**. Modulation of Dendritic Cell Activation and Subsequent Th1 Cell Polarization by Lidocaine. PLoS One. 2015;10:e0139845.
  51. Kim IK, Kim BS, Koh CH, Seok JW, Park JS, Shin KS, Bae EA, Lee GE, Jeon H, Cho J, Jung Y, Han D, Kwon BS, Lee HY, **Chung Y**, Kang CY. Glucocorticoid-induced tumor necrosis factor receptor-related protein co-stimulation facilitates tumor regression by inducing IL-9-producing helper T cells Nat Med. 2015: 21: 1010
  50. Zhang Y, Nguyen T, Tang P, Kennedy NJ, Jiao H, Zhang M, Reynolds JM, Jaeschke A, Martin-Orozco N, **Chung Y**, He WM, Wang C, Jia W, Ge B, Davis RJ, Flavell RA, Dong C. Regulation of Adipose Tissue Inflammation and Insulin Resistance by MAP Kinase Phosphatase 5. J Biol Chem. 2015. 290: 14875
  49. Lim H, Cho M, Choi G, Na H, **Chung Y**. Dynamic control of Th2 cell responses by STAT3 during allergic lung inflammation in mice. Int. Immunopharmacol. 2015;28:846-53.
  48. Kim YU, Lim H, Jung HE, Wetsel RA, **Chung Y**. Regulation of autoimmune germinal center reactions in lupus-prone BXD2 mice by follicular helper T cells. PLOS One. 2015;10:e0120294
  47. Tanaka S, Tanaka K, Magnusson F, **Chung Y**, Martinez GJ, Wang YH, Nurieva RI, Kurosaki T, Dong C. CCAAT/Enhancer-Binding Protein  $\alpha$  Negatively Regulates IFN- $\gamma$  Expression in T Cells. J Immunol. 2014 : 193: 1652
  46. Kim EK, Jeon I, Seo H, Park YJ, Song B, Lee KA, Jang Y, **Chung Y**, Kang CY. Tumor-derived osteopontin suppresses anti-tumor immunity by promoting extramedullary myelopoiesis. Cancer Research 2014: 74: 6705
  45. Lim H, Kim YU, Sun H, Lee JH, Reynolds JM, Hanabuchi S, Wu H, Teng B, and **Chung Y**.

- Proatherogenic conditions promote autoimmune T helper 17 cell responses in vivo. Immunity 2014; 40:153-65
44. Lim H, Kim YU, Yun K, **Chung Y**. Distinct regulation of Th2 and Th17 responses to allergens by pulmonary antigen presenting cells in vivo. Immunology Letters 2013; 156: 140.
  43. **Chung Y\***, Yamazaki T, Kim BS, Zhang Y, Reynolds JM, Martinez GJ, Chang SH, Lim H, Birkenbach M, Dong C\*. Epstein Barr virus-Induced 3 (EBI3) negatively regulates T helper 17-mediated immunity during *Listeria monocytogenes* infection. PLOS Pathogens 2013;9: e1003628 (\* corresponding authors)
  42. Lim H, Kim YU, Drouin SM, Mueller-Ortiz S, Yun K, Morschl E, Wetsel RA, **Chung Y**. Negative regulation of pulmonary Th17 responses by anaphylatoxin C3a during allergic inflammation in mice. PLOS One. 2012;7(12):e52666
  41. Reynolds JM, Martinez GJ, **Chung Y**, Dong C. Toll-like receptor 4 signaling in T cells promotes autoimmune inflammation. Proc Natl Acad Sci U S A. 2012; 109: 13064
  40. Lee YS, Lee KA, Yoon HB, Yoo SA, Park YW, **Chung Y**, Kim WU, Kang CY. The Wnt inhibitor secreted Frizzled-Related Protein 1 (sFRP1) promotes human Th17 differentiation. Eur J Immunol. 2012; 42: 2564
  39. **Chung Y**, Lee YH, Zhang Y, Martin-Orozco N, Yamazaki T, Zhou D, Kang CY, Hwu P, Kwak LW, Dong C. T cells and T cell tumors efficiently generate antigen-specific cytotoxic T cell immunity when modified with an NKT ligand. Oncoimmunology. 2012; 1: 141
  38. **Chung Y\***, Tanaka S, Chu F, Nurieva RI, Martinez GJ, Rawal S, Wang YH, Lim H, Reynolds JM, Zhou XH, Fan HM, Liu ZM, Neelapu SS, Dong C\*. Follicular regulatory T cells expressing Foxp3 and Bcl6 suppress germinal center reactions. Nature Medicine. 2011; 17: 983 (\* corresponding authors)
  37. Park HJ, Qin H, Cha SC, Sharma R, **Chung Y**, Schluns KS, Neelapu SS, Overwijk WW, Hwu P, Kwak LW. Induction of TLR4-dependent CD8+ T cell immunity by murine  $\beta$ -defensin2 fusion protein vaccines. Vaccine. 2011; 29: 3476–3482
  36. Chang SH, **Chung Y**, Dong C. Vitamin D suppresses Th17 cytokine production by inducing C/EBP homologous protein (CHOP) expression. J Biol Chem. 2010; 285: 38751
  35. Martinez GJ, Zhang Z, Reynolds JM, Tanaka S, **Chung Y**, Liu T, Robertson E, Lin X, Feng XH, Dong C. Smad2 positively regulates the generation of Th17 cells. J Biol Chem. 2010 17;285(38):29039-43.
  34. Nurieva RI, Zheng S, Jin W, **Chung Y**, Zhang Y, Martinez GJ, Reynolds JM, Wang SL, Lin X, Sun SC, Lozano G, Dong C. The E3 ubiquitin ligase grail regulate T cell tolerance and regulatory T cell function by mediating TCR-CD3 degradation. Immunity. 2010; 32: 670
  33. Yu HS, Angkasekwinai P, Chang SH, **Chung Y**, Dong C. Protease allergens induce IL-25 via Erk and p38 MAPK pathway. J Korean Med Sci. 2010;25:829.
  32. Reynolds JM, Pappu BP, Peng J, Martinez GJ, Zhang Y, **Chung Y**, Ma L, Yang XO, Nurieva RI, Tian Q, Dong C. Toll-like Receptor 2 Signaling in CD4<sup>+</sup> T Lymphocytes Promotes T Helper 17 Responses and Regulates the Pathogenesis of Autoimmune Disease. Immunity. 2010;32: 692
  31. Kim BS, Kim IK, Park YJ, Kim YS, Kim YJ, Chang WS, Lee YS, Kweon MN, **Chung Y**, and Kang CY. Conversion of Th2 memory cells into Foxp3+regulatory T cells suppressing Th2-mediated allergic asthma. Proc Natl Acad Sci U S A. 2010, 107: 8742
  30. Martinez GJ, Zhang Z, **Chung Y**, Reynolds JM, Lin X, Jetten AM, Feng XH, Dong C. Smad3 differentially regulates the induction of inflammatory and regulatory T cell differentiation. J Biol Chem. 2009; 284: 35283

29. Yang XO, Angkasekwinai P, Zhu J, Peng J, Liu Z, Nurieva R, Liu X, **Chung Y**, Chang SH, Sun B, Dong C. Requirement for the basic helix-loop helix transcription factor Dec2 in initial Th2 lineage commitment. Nat Immunol. 2009; 10: 1260
28. Martin-Orozco N, Muranski P, **Chung Y**, Yang XO, Yamazaki T, Lu S, Hwu P, Restifo NP, Overwijk WW, Dong C. T helper 17 cells promote cytotoxic T cell activation in tumor immunity. Immunity. 2009; 31: 787
27. Zhang Y, Reynolds JM, Chang SH, Martin-Orozco N, **Chung Y**, Nurieva RI, Dong C. MKP-1 is necessary for T cell activation and function. J Biol Chem. 2009; 284: 30815
26. Nurieva RI, **Chung Y**, Martinez GJ, Yang XO, Tanaka S, Matskevitch TD, Wang YH, Dong C. Bcl6 mediates the development of follicular helper T cells. Science. 2009; 325: 1001
25. Liu X, Alexiou M, Martin-Orozco N, **Chung Y**, Nurieva RI, Ma L, Tian Q, Kollias G, Lu S, Graf D, Dong C. A Critical Role of B and T Lymphocyte Attenuator in Peripheral T Cell Tolerance Induction. J Immunol. 2009; 182: 4516
24. **Chung Y**, Chang SH, Martinez GJ, Yang XO, Nurieva R, Kang HS, Li Ma L, Watowich SS, Jetten A, Tian Q, Dong C. Critical regulation of early Th17 cell differentiation by IL-1 signaling. Immunity 2009; 30: 576 (selected as 'featured article of the month')
23. Nurieva R\*, Yang XO\*, **Chung Y\***, Dong C. Cutting Edge: In vitro Generated Th17 Cells Maintain Their Cytokine Expression Program in Normal but Not Lymphopenic Hosts. J Immunol. 2009; 182: 2565 (\* first authors)
22. Martin-Orzco N, **Chung Y**, Chang SH, Wang YH, Dong C. Th17 cells promote pancreatic inflammation but only induce diabetes efficiently in lymphopenic hosts after conversion into Th1 cells. Eur J Immunol. 2009; 39: 216
21. Yamazaki T, Yang XO, **Chung Y**, Fukunaga A, Nurieva R, Pappu B, Martin-Orozco N, Kang HS, Ma L, Panopoulos AD, Craig S, Watowich SS, Jetten AM, Tian Q, and Dong C. CCR6 Regulates the Migration of Inflammatory and Regulatory T Cells. J. Immunol. 2008; 181:8391
20. Chang JH, Lee JM, Youn HJ, Lee KA, **Chung Y**, Lee AY, Kweon MN, Kim HY, Taniguchi M, Kang CY. Functional maturation of lamina propria dendritic cells by activation of NKT cells mediates the abrogation of oral tolerance. Eur J Immunol. 2008; 38: 2727
19. Yang XO, Nurieva RI, Martinez GJ, Kang HS, **Chung Y**, Pappu BP, Shah B, Chang SH, Schluns KS, Watowich SS, Feng XH, Jetten AM and Dong C. Molecular Antagonism and Plasticity of Regulatory and Inflammatory T Cell Programs. Immunity. 2008; 29: 44
18. Nurieva RI, **Chung Y**, Hwang D, Yang XO, Kang HS, Ma L, Wang YH, Watowich SS, Jetten AM, Tian Q and Dong C. Generation of follicular helper T cells is mediated by IL-21 but independent of TH1, TH2 or TH17 lineages. Immunity: 2008 : 29: 138
17. Kim YJ, Ko HJ, Kim YS, Kim DH, Kang S, Kim JM, **Chung Y** and Kang CY.
  - -Galactosylceramide-loaded, antigen-expressing B cells prime a wide spectrum of anti-tumor immunity. Int J Cancer. 2008: 122: 2774
16. **Chung Y**, Nurieva R, Esashi E, Wang YH, Zhou D, Gapin L and Dong C. A Critical Role of Costimulation During Intrathymic Development of Invariant NKT cells. J. Immunol. 2008: 180: 2276.
15. Yang XO, Pappu BP, Nurieva R, Akimzhanov A, Kang HS, **Chung Y**, Ma L, Shah B, Panopoulos AD, Schluns KS, Watowich SS, Tian Q, Jetten AM, and Chen Dong C. T helper 17 lineage differentiation is programmed by orphan nuclear receptors ROR $\gamma$ t and ROR $\alpha$ . Immunity 2008: 28: 29.
14. **Chung Y**, Qin H, Kang CY, Kim S, Kwak LW, Dong C. An NKT-mediated autologous vaccine generates CD4<sup>+</sup> T cell-dependent potent anti-lymphoma immunity. Blood. 2007: 110: 2013
13. **Chung Y\***, Chang JH\*, Kim BS, Lee JM, Kim HY, Kang CY. Anatomic location defines antigen

- presentation by dendritic cells to T cells in response to intravenous soluble antigens. Eur J Immunol. 2007;37:1453 (\*first authors)
12. **Chung Y**, Yang X, Chang SH, Tian Q, Dong C. Expression and regulation of IL-22 in the IL-17 producing CD4<sup>+</sup> T lymphocytes. Cell Research 2006 :16:902
  11. Zhang Y, **Chung Y**, Bishop C, Daugherty B, Chute H, Holst P, Kurahara C, Lott F, Sun N, Welcher AA, Dong C. Regulation of T cell activation and tolerance by PDL2. Proc Natl Acad Sci U S A. 2006 ;103:11695
  10. **Chung Y**, Kim BS, Kim YJ, Ko HJ, Ko SY, Kim DH, Kang CY. CD1d-restricted T cells license B cell to generate potent cytotoxic anti-tumor immunity. Cancer Research. 2006 ;66: 6843. (selected as 'highlighted article of the month')
  9. **Chung Y**, Chang JH, Kweon MN, Rennert PD, Kang CY. CD8a-11b+ dendritic cells but not CD8a+ dendritic cells mediate cross-tolerance toward intestinal antigens. Blood. 2005 ;106:201
  8. **Chung Y**, Lee SH, Kim DH, Kang CY. Complementary role of CD4+CD25+ regulatory T cells and TGF-beta in oral tolerance. J Leukoc Biol. 2005 ;77:906
  7. **Chung Y**, Ko SY, Ko HJ, Kang CY. Split peripheral tolerance: CD40 ligation blocks tolerance induction for CD8 T cells but not for CD4 T cells in response to intestinal antigens. Eur J Immunol. 2005 ;35:1381
  6. **Chung Y**, Chang WS, Kim S, Kang CY. NKT cell ligand alpha-galactosylceramide blocks the induction of oral tolerance by triggering dendritic cell maturation. Eur J Immunol. 2004 ;34:2471
  5. **Chung Y**, Kim DH, Lee SH, Kang CY. Co-administration of CD40 agonistic antibody and antigen fails to overcome the induction of oral tolerance. Immunology. 2004 ;111:19
  4. Lee JY, Kim DH, **Chung Y**, Shin SU, Kang CY. Comparison of the antitumor efficacies of Her-2/neu DNA vaccines inducing contrasting IgG immunity but comparable CTL activity in mice. Vaccine. 2003;21:521
  3. **Chung Y**, Choi J, Chang YS, Cho SH, Kang CY. Preventive and therapeutic effects of oral tolerance in a murine model of asthma. Immunobiology. 2002 ;206:408
  2. Kim KM, Shin EY, Moon JH, Heo TH, Lee JY, **Chung Y**, Lee YJ, Cho HM, Shin SU, Kang CY. Both the epitope specificity and isotype are important in the antitumor effect of monoclonal antibodies against Her-2/neu antigen. Int J Cancer. 2002 ;102:428
  1. **Chung Y**, Chang SY, Kang CY. Kinetic analysis of oral tolerance: memory lymphocytes are refractory to oral tolerance. J Immunol. 1999 ;163:3692

#### **Invited Review Articles:**

9. Kim BS, Park YJ, **Chung Y**. Targeting IL-17 in autoimmunity and inflammation. Arch Pharm Res. 2016;39:1537.
8. Na H, Cho M, **Chung Y**. Regulation of Th2 Cell Immunity by Dendritic Cells. Immune Netw. 2016;16:1-12.
7. Kim IK, **Chung Y**, Kang CY. GITR drives TH9-mediated antitumor immunity. Oncoimmunology. 2015;5:e1122862
6. Ryu H, **Chung Y**. Regulation of IL-17 in atherosclerosis and related autoimmunity. Cytokine. 2015: 74:219
5. Chang JH, **Chung Y**. Regulatory T cells in B cell follicles. Immune Netw. 2014: 14: 227
4. Kim YU, Liu X, Tanaka S, Tran DQ, **Chung Y**. Regulation of Germinal Center Reactions by B and T Cells. Antibodies 2013: 2: 554
3. Dhamne C, **Chung Y**, Alousi AM, Cooper LNJ, Tran DQ. Peripheral and Thymic Foxp3+ Regulatory T Cells in Search of Origin, Distinction and Function. Frontiers in Immunology 2013: 4:253.

2. Nurieva RI, **Chung Y**. Understanding the development and function of T follicular helper cells. Cell. Mol. Immunol. 2010; 7: 190
1. **Chung Y**, Dong C. Don't leave home without it: the IL-23 visa to Th17 cells. Nat Immunol. 2009: 10:236