

# Publications

## Epigenetic Immune Cell Quantification Technology Description

### Comparison with flow cytometry; dried blood spot analysis; detection of SCID/XLA in newborns

1. Baron U, Werner J, Schildknecht K, Schulze JJ, Mulu A, Liebert UG, Sack U, Speckmann C, Gossen M, Wong RJ, Stevenson DK, Babel N, Schürmann D, Baldinger T, Bacchetta R, Grützkau A, Borte S, Olek S. Epigenetic immune cell counting in human blood samples for immunodiagnosics. *Sci Transl Med*. 2018 Aug 1;10(452). pii: ean3508. doi: 10.1126/scitranslmed.aan3508. [PubMed PMID: 30068569](#)

### Comparison with flow cytometry; cord vs. adult blood

2. Nettenstrom L, Alderson K, Raschke EE, Evans MD, Sondel PM, Olek S, Seroogy CM. An optimized multi-parameter flow cytometry protocol for human T regulatory cell analysis on fresh and viably frozen cells, correlation with epigenetic analysis, and comparison of cord and adult blood. *J Immunol Methods*. 2013 Jan 31;387(1-2):81-8. doi: 10.1016/j.jim.2012.09.014. Epub 2012 Oct 9. PubMed PMID: 23058673; [PubMed Central PMCID: PMC3529842](#)
3. Liu J, Lluís A, Illi S, Layland L, Olek S, von Mutius E, Schaub B. T regulatory cells in cord blood--FOXP3 demethylation as reliable quantitative marker. *PLoS One*. 2010 Oct 12;5(10):e13267. doi: 10.1371/journal.pone.0013267. PubMed PMID: 20967272; [PubMed Central PMCID: PMC2953505](#)

### DNA (de)methylation markers for detection of specific immune cell subtypes

4. Pink M, Ratsch BA, Mardahl M, Durek P, Polansky JK, Karl M, Baumgrass R, Wallner S, Cadenas C, Gianmoena K, Floess S, Chen W, Nordstroem K, Tierling S, Olek S, Walter J, Hamann A, Syrbe U. Imprinting of Skin/Inflammation Homing in CD4+ T Cells Is Controlled by DNA Methylation within the Fucosyltransferase 7 Gene. *J Immunol*. 2016 Oct 15;197(8):3406-3414. Epub 2016 Sep 2. PubMed PMID: 27591321
5. Steinfelder S, Floess S, Engelbert D, Haeringer B, Baron U, Rivino L, Steckel B, Gruetzkau A, Olek S, Geginat J, Huehn J, Hamann A. Epigenetic modification of the human CCR6 gene is associated with stable CCR6 expression in T cells. *Blood*. 2011 Mar 10;117(10):2839-46. doi: 10.1182/blood-2010-06-293027. Epub 2011 Jan 12. [PubMed PMID: 21228329](#)
6. Wieczorek G, Asemissen A, Model F, Turbachova I, Floess S, Liebenberg V, Baron U, Stauch D, Kotsch K, Pratschke J, Hamann A, Loddenkemper C, Stein H, Volk HD, Hoffmüller U, Grützkau A, Mustea A, Huehn J, Scheibenbogen C, Olek S. Quantitative DNA methylation analysis of FOXP3 as a new method for counting regulatory T cells in peripheral blood and solid tissue. *Cancer Res*. 2009 Jan 15;69(2):599-608. doi: 10.1158/0008-5472.CAN-08-2361. [PubMed PMID: 19147574](#)
7. Polansky JK, Kretschmer K, Freyer J, Floess S, Garbe A, Baron U, Olek S, Hamann A, von Boehmer H, Huehn J. DNA methylation controls Foxp3 gene expression. *Eur J Immunol*. 2008 Jun;38(6):1654-63. doi: 10.1002/eji.200838105. [PubMed PMID: 18493985](#)
8. Baron U, Floess S, Wieczorek G, Baumann K, Grützkau A, Dong J, Thiel A, Boeld TJ, Hoffmann P, Edinger M, Türbachova I, Hamann A, Olek S, Huehn J. DNA demethylation in the human FOXP3

locus discriminates regulatory T cells from activated FOXP3(+) conventional T cells. Eur J Immunol. 2007 Sep;37(9):2378-89. [PubMed PMID: 17694575](#)

- Floess S, Freyer J, Siewert C, Baron U, Olek S, Polansky J, Schlawe K, Chang HD, Bopp T, Schmitt E, Klein-Hessling S, Serfling E, Hamann A, Huehn J. Epigenetic control of the foxp3 locus in regulatory T cells. PLoS Biol. 2007 Feb;5(2):e38. PubMed PMID: 17298177; [PubMed Central PMCID: PMC1783672](#)

## Epigenetic Quantification of Regulatory T-cells (Treg) for disease detection, prognosis and monitoring

### Immune regulatory disorders

- Cepika AM, Sato Y, Liu JM, Uyeda MJ, Bacchetta R, Roncarolo MG. Tregopathies: Monogenic diseases resulting in regulatory T-cell deficiency. J Allergy Clin Immunol. 2018 Dec;142(6):1679-1695. doi: 10.1016/j.jaci.2018.10.026. Review. PubMed PMID: 30527062
- Goudy K, Aydin D, Barzaghi F, Gambineri E, Vignoli M, Ciullini Mannurita S, Doglioni C, Ponzoni M, Cicalese MP, Assanelli A, Tommasini A, Brigida I, Dellepiane RM, Martino S, Olek S, Aiuti A, Ciceri F, Roncarolo MG, Bacchetta R. Human IL2RA null mutation mediates immunodeficiency with lymphoproliferation and autoimmunity. Clin Immunol. 2013 Mar;146(3):248-61. doi: 10.1016/j.clim.2013.01.004. Epub 2013 Jan 24. PubMed PMID: 23416241; [PubMed Central PMCID: PMC3594590](#)
- Barzaghi F, Passerini L, Gambineri E, Ciullini Mannurita S, Cornu T, Kang ES, Choe YH, Cancrini C, Corrente S, Ciccocioppo R, Cecconi M, Zuin G, Discepolo V, Sartirana C, Schmidtke J, Ikinogullari A, Ambrosi A, Roncarolo MG, Olek S, Bacchetta R. Demethylation analysis of the FOXP3 locus shows quantitative defects of regulatory T cells in IPEX-like syndrome. J Autoimmun. 2012 Feb;38(1):49-58. doi: 10.1016/j.jaut.2011.12.009. Epub 2012 Jan 20. PubMed PMID: 22264504; [PubMed Central PMCID: PMC3314976](#)
- Passerini L, Olek S, Di Nunzio S, Barzaghi F, Hambleton S, Abinun M, Tommasini A, Vignola S, Cipolli M, Amendola M, Naldini L, Guidi L, Cecconi M, Roncarolo MG, Bacchetta R. Forkhead box protein 3 (FOXP3) mutations lead to increased TH17 cell numbers and regulatory T-cell instability. J Allergy Clin Immunol. 2011 Dec;128(6):1376-1379.e1. doi: 10.1016/j.jaci.2011.09.010. Epub 2011 Oct 13. [PubMed PMID: 22000569](#)
- Di Nunzio S, Cecconi M, Passerini L, McMurchy AN, Baron U, Turbachova I, Vignola S, Valencic E, Tommasini A, Junker A, Cazzola G, Olek S, Levings MK, Perroni L, Roncarolo MG, Bacchetta R. Wild-type FOXP3 is selectively active in CD4+CD25(hi) regulatory T cells of healthy female carriers of different FOXP3 mutations. Blood. 2009 Nov 5;114(19):4138-41. doi: 10.1182/blood-2009-04-214593. Epub 2009 Sep 8. [PubMed PMID: 19738030](#)

### Solid Tumors

- Le Cornet C, Schildknecht K, Rossello Chornet A, Fortner RT, González Maldonado S, Katzke VA, Kühn T, Johnson T, Olek S, Kaaks R. Circulating Immune Cell Composition and Cancer Risk: A Prospective Study Using Epigenetic Cell Count Measures. Cancer Res. 2020 May 1;80(9):1885-1892. doi: 10.1158/0008-5472.CAN-19-3178. Epub 2020 Feb 19. [PMID: 32075798](#).

16. Barth SD, Schulze JJ, Kühn T, Raschke E, Hüsing A, Johnson T, Kaaks R, Olek S. Treg-Mediated Immune Tolerance and the Risk of Solid Cancers: Findings From EPIC-Heidelberg. *J Natl Cancer Inst.* 2015 Aug 22;107(11). pii: djv224. doi: 10.1093/jnci/djv224. Print 2015 Nov. PubMed PMID: 26298011
17. Thomas AA, Fisher JL, Rahme GJ, Hampton TH, Baron U, Olek S, Schwachula T, Rhodes CH, Gui J, Tafe LJ, Tsongalis GJ, Lefferts JA, Wishart H, Kleen J, Miller M, Whipple CA, de Abreu FB, Ernstoff MS, Fadul CE. Regulatory T cells are not a strong predictor of survival for patients with glioblastoma. *Neuro Oncol.* 2015 Jun;17(6):801-9. doi: 10.1093/neuonc/nou363. Epub 2015 Jan 24. PubMed PMID: 25618892; [PubMed Central PMCID: PMC4483125](#)
18. Türbachova I, Schwachula T, Vasconcelos I, Mustea A, Baldinger T, Jones KA, Bujard H, Olek A, Olek K, Gellhaus K, Braicu I, Könsgen D, Fryer C, Ravot E, Hellwag A, Westerfeld N, Gruss OJ, Meissner M, Hasan MT, Weber M, Hoffmüller U, Zimmermann S, Loddenkemper C, Mahner S, Babel N, Berns E, Adams R, Zeilinger R, Baron U, Vergote I, Maughan T, Marme F, Dickhaus T, Sehouli J, Olek S. The cellular ratio of immune tolerance (immunoCRIT) is a definite marker for aggressiveness of solid tumors and may explain tumor dissemination patterns. *Epigenetics.* 2013 Nov;8(11):1226-35. doi: 10.4161/epi.26334. Epub 2013 Sep 26. [PubMed PMID: 24071829](#)
19. Sehouli J, Loddenkemper C, Cornu T, Schwachula T, Hoffmüller U, Grützkau A, Lohneis P, Dickhaus T, Gröne J, Kruschewski M, Mustea A, Turbachova I, Baron U, Olek S. Epigenetic quantification of tumor-infiltrating T-lymphocytes. *Epigenetics.* 2011 Feb;6(2):236-46. Epub 2011 Feb 1. PubMed PMID: 20962591; [PubMed Central PMCID: PMC3278789](#)
20. Loddenkemper C, Hoffmann C, Stanke J, Nagorsen D, Baron U, Olek S, Huehn J, Ritz JP, Stein H, Kaufmann AM, Schneider A, Cichon G. Regulatory (FOXP3+) T cells as target for immune therapy of cervical intraepithelial neoplasia and cervical cancer. *Cancer Sci.* 2009 Jun;100(6):1112-7. [PubMed PMID: 19514119](#)

## Cardiovascular Disease

21. Barth SD, Kaaks R, Johnson T, Katzke V, Gellhaus K, Schulze JJ, Olek S, Kühn T. The Ratio of Regulatory (FOXP3+) to Total (CD3+) T Cells Determined by Epigenetic Cell Counting and Cardiovascular Disease Risk: A Prospective Case-cohort Study in Non-diabetics. *EBioMedicine.* 2016 Sep;11:151-156. doi: 10.1016/j.ebiom.2016.07.035. Epub 2016 Jul 30. PubMed PMID: 27499494; PubMed Central PMCID: PMC5049920

## Allergy, inflammation, autoimmunity

22. Blokland SLM, van Vliet-Moret FM, Hillen MR, Pandit A, Goldschmeding R, Kruize AA, Bouma G, van Maurik A, Olek S, Hoffmueller U, van Roon JAG, Radstake TRDJ. Epigenetically quantified immune cells in salivary glands of Sjögren's syndrome patients: a novel tool that detects robust correlations of T follicular helper cells with immunopathology. *Rheumatology (Oxford).* 2020 Feb 1;59(2):335-343. doi: 10.1093/rheumatology/kez268. [PMID: 31325310](#); [PMCID: PMC7032543](#).
23. Burska AN, Thu A, Parmar R, Bzoma I, Samans B, Raschke E, Olek S, Conaghan PG, Emery P, Ponchel F. Quantifying circulating Th17 cells by qPCR: potential as diagnostic biomarker for rheumatoid arthritis. *Rheumatology (Oxford).* 2019 Nov 1;58(11):2015-2024. doi: 10.1093/rheumatology/kez162. [PubMed PMID: 31081041](#).
24. Winter M, Thürmann L, Gu Z, Schüürmann G, Herberth G, Hinz D, von Bergen M, Harms H, Olek S, Röder S, Borte M, Eils R, Lehmann I, Trump S. The benzene metabolite 1,4-benzoquinone reduces regulatory T-cell function: A potential mechanism for tobacco smoke-associated atopic

- dermatitis. *J Allergy Clin Immunol*. 2017 Aug;140(2):603-605. doi: 10.1016/j.jaci.2017.01.034. Epub 2017 Mar 6. [PubMed PMID: 28274748](#)
25. Herberth G, Pierzchalski A, Feltens R, Bauer M, Röder S, Olek S, Hinz D, Borte M, von Bergen M, Lehmann I; LINA Study Group. Prenatal phthalate exposure associates with low regulatory T-cell numbers and atopic dermatitis in early childhood: Results from the LINA mother-child study. *J Allergy Clin Immunol*. 2017 Apr;139(4):1376-1379.e8. doi: 10.1016/j.jaci.2016.09.034. Epub 2016 Nov 5. [PubMed PMID: 27826096](#)
  26. Roesner LM, Floess S, Witte T, Olek S, Huehn J, Werfel T. Foxp3(+) regulatory T cells are expanded in severe atopic dermatitis patients. *Allergy*. 2015 Dec;70(12):1656-60. doi: 10.1111/all.12712. Epub 2015 Aug 26. [PubMed PMID: 26228301](#)
  27. Rodríguez-Perea AL, Montoya CJ, Olek S, Chougnnet CA, Velilla PA. Statins increase the frequency of circulating CD4+ FOXP3+ regulatory T cells in healthy individuals. *J Immunol Res*. 2015;2015:762506. doi: 10.1155/2015/762506. Epub 2015 Feb 22. PubMed PMID: 25759848; [PubMed Central PMCID: PMC4352479](#)
  28. Singh A, Yamamoto M, Ruan J, Choi JY, Gauvreau GM, Olek S, Hoffmueller U, Carlsten C, FitzGerald JM, Boulet LP, O'Byrne PM, Tebbutt SJ. Th17/Treg ratio derived using DNA methylation analysis is associated with the late phase asthmatic response. *Allergy Asthma Clin Immunol*. 2014 Jun 24;10(1):32. doi: 10.1186/1710-1492-10-32. eCollection 2014. PubMed PMID: 24991220; [PubMed Central PMCID: PMC4078Türb401](#)
  29. Sebode M, Peiseler M, Franke B, Schwinge D, Schoknecht T, Wortmann F, Quaas A, Petersen BS, Ellinghaus E, Baron U, Olek S, Wiegard C, Weiler-Normann C, Lohse AW, Herkel J, Schramm C. Reduced FOXP3(+) regulatory T cells in patients with primary sclerosing cholangitis are associated with IL2RA gene polymorphisms. *J Hepatol*. 2014 May;60(5):1010-6. doi:10.1016/j.jhep.2013.12.027. Epub 2014 Jan 8. [PubMed PMID: 24412607](#)
  30. Herberth G, Bauer M, Gasch M, Hinz D, Röder S, Olek S, Kohajda T, Rolle-Kampczyk U, von Bergen M, Sack U, Borte M, Lehmann I; Lifestyle and Environmental Factors and Their Influence on Newborns Allergy Risk study group. Maternal and cord blood miR-223 expression associates with prenatal tobacco smoke exposure and low regulatory T-cell numbers. *J Allergy Clin Immunol*. 2014 Feb;133(2):543-50. doi: 10.1016/j.jaci.2013.06.036. Epub 2013 Aug 24. [PubMed PMID: 23978443](#)
  31. Weisse K, Winkler S, Hirche F, Herberth G, Hinz D, Bauer M, Röder S, Rolle-Kampczyk U, von Bergen M, Olek S, Sack U, Richter T, Diez U, Borte M, Stangl GI, Lehmann I. Maternal and newborn vitamin D status and its impact on food allergy development in the German LINA cohort study. *Allergy*. 2013 Feb;68(2):220-8. doi: 10.1111/all.12081. Epub 2012 Dec 18. [PubMed PMID: 23253182](#)
  32. Peiseler M, Sebode M, Franke B, Wortmann F, Schwinge D, Quaas A, Baron U, Olek S, Wiegard C, Lohse AW, Weiler-Normann C, Schramm C, Herkel J. FOXP3+ regulatory T cells in autoimmune hepatitis are fully functional and not reduced in frequency. *J Hepatol*. 2012 Jul;57(1):125-32. doi: 10.1016/j.jhep.2012.02.029. Epub 2012 Mar 14. [PubMed PMID: 22425700](#)
  33. Hinz D, Bauer M, Röder S, Olek S, Huehn J, Sack U, Borte M, Simon JC, Lehmann I, Herberth G; LINA study group. Cord blood Tregs with stable FOXP3 expression are influenced by prenatal environment and associated with atopic dermatitis at the age of one year. *Allergy*. 2012 Mar;67(3):380-9. doi: 10.1111/j.1398-9995.2011.02767.x. Epub 2011 Dec 22. [PubMed PMID: 22187950](#)

34. Ferraro A, Socci C, Stabilini A, Valle A, Monti P, Piemonti L, Nano R, Olek S, Maffi P, Scavini M, Secchi A, Staudacher C, Bonifacio E, Battaglia M. Expansion of Th17 cells and functional defects in T regulatory cells are key features of the pancreatic lymph nodes in patients with type 1 diabetes. *Diabetes*. 2011 Nov;60(11):2903-13. doi: 10.2337/db11-0090. Epub 2011 Sep 6. PubMed PMID: 21896932; [PubMed Central PMCID: PMC3198077](#)
35. McClymont SA, Putnam AL, Lee MR, Esensten JH, Liu W, Hulme MA, Hoffmüller U, Baron U, Olek S, Bluestone JA, Brusko TM. Plasticity of human regulatory T cells in healthy subjects and patients with type 1 diabetes. *J Immunol*. 2011 Apr 1;186(7):3918-26. doi: 10.4049/jimmunol.1003099. Epub 2011 Mar 2. PubMed PMID: 21368230; [PubMed Central PMCID: PMC3091943](#)
36. Schaub B, Liu J, Höppler S, Schleich I, Huehn J, Olek S, Wieczorek G, Illi S, von Mutius E. Maternal farm exposure modulates neonatal immune mechanisms through regulatory T cells. *J Allergy Clin Immunol*. 2009 Apr;123(4):774-82.e5. doi: 10.1016/j.jaci.2009.01.056. [PubMed PMID: 19348917](#)

## Epigenetic Quantification of immune cells in therapy monitoring

### Tumor vaccination

37. Pohla H, Buchner A, Stadlbauer B, Frankenberger B, Stevanovic S, Walter S, Frank R, Schwachula T, Olek S, Kopp J, Willimsky G, Stief CG, Hofstetter A, Pezzutto A, Blankenstein T, Oberneder R, Schendel DJ. High immune response rates and decreased frequencies of regulatory T cells in metastatic renal cell carcinoma patients after tumor cell vaccination. *Mol Med*. 2013 Feb 8;18:1499-508. doi: 10.2119/molmed.2012.00221. PubMed PMID: 23269976; PubMed Central PMCID: PMC3576476
38. Schwarzer A, Wolf B, Fisher JL, Schwaab T, Olek S, Baron U, Tomlinson CR, Seigne JD, Crosby NA, Gui J, Hampton TH, Fadul CE, Heaney JA, Ernstoff MS. Regulatory T-cells and associated pathways in metastatic renal cell carcinoma (mRCC) patients undergoing DC-vaccination and cytokine-therapy. *PLoS One*. 2012;7(10):e46600. doi: 10.1371/journal.pone.0046600. Epub 2012 Oct 31. PubMed PMID: 23118856; [PubMed Central PMCID: PMC3485261](#)

### Hematopoietic stem cell transplantation

39. Sprangers B, DeWolf S, Savage TM, Morokata T, Obradovic A, LoCascio SA, Shonts B, Zuber J, Lau SP, Shah R, Morris H, Steshenko V, Zorn E, Preffer FI, Olek S, Dombkowski DM, Turka LA, Colvin R, Winchester R, Kawai T, Sykes M. Origin of Enriched Regulatory T Cells in Patients Receiving Combined Kidney-Bone Marrow Transplantation to Induce Transplantation Tolerance. *Am J Transplant*. 2017 Aug;17(8):2020-2032. doi: 10.1111/ajt.14251. Epub 2017 Apr 10. PubMed PMID: 28251801; PubMed Central PMCID: PMC5519438
40. Delemarre EM, van den Broek T, Mijnheer G, Meerding J, Wehrens EJ, Olek S, Boes M, van Herwijnen MJ, Broere F, van Royen A, Wulffraat NM, Prakken BJ, Spierings E, van Wijk F. Autologous stem cell transplantation aids autoimmune patients by functional renewal and TCR diversification of regulatory T cells. *Blood*. 2016 Jan 7;127(1):91-101. doi: 10.1182/blood-2015-06-649145. Epub 2015 Oct 19. [PubMed PMID: 26480932](#)
41. Peccatori J, Forcina A, Clerici D, Crocchiolo R, Vago L, Stanghellini MT, Noviello M, Messina C, Crotta A, Assanelli A, Marktel S, Olek S, Mastaglio S, Giglio F, Crucitti L, Lorusso A, Guggiari E, Lunghi F, Carrabba M, Tassara M, Battaglia M, Ferraro A, Carbone MR, Oliveira G, Roncarolo MG, Rossini S, Bernardi M, Corti C, Marcatti M, Patriarca F, Zecca M, Locatelli F, Bordignon C, Fleischhauer K, Bondanza A, Bonini C, Ciceri F. Sirolimus-based graft-versus-host disease prophylaxis promotes the in vivo expansion of regulatory T cells and permits peripheral blood

stem cell transplantation from haploidentical donors. *Leukemia*. 2015 Feb;29(2):396-405. doi: 10.1038/leu.2014.180. Epub 2014 Jun 4. [PubMed PMID: 24897508](#)

## Solid organ transplantation

42. Taubert R, Pischke S, Schlue J, Wedemeyer H, Noyan F, Heim A, Lehner F, Barg-Hock H, Klempnauer J, Olek S, Manns MP, Hardtke-Wolenski M, Jaeckel E. Enrichment of regulatory T cells in acutely rejected human liver allografts. *Am J Transplant*. 2012 Dec;12(12):3425-36. doi: 10.1111/j.1600-6143.2012.04264.x. Epub 2012 Sep 20. PubMed PMID: 22994589
43. Stauch D, Yahyazadeh A, Bova R, Melloh GC, Földner A, Baron U, Olek S, Göldner K, Weiss S, Pratschke J, Kotsch K. Induction of bona fide regulatory T cells after liver transplantation - the potential influence of polyclonal antithymocyte globulin. *Transpl Int*. 2012 Mar;25(3):302-13. doi: 10.1111/j.1432-2277.2011.01405.x. Epub 2011 Dec 21. PubMed PMID: 22188119
44. Bestard O, Cuñetti L, Cruzado JM, Lucia M, Valdez R, Olek S, Melilli E, Torras J, Mast R, Gomà M, Franquesa M, Grinyó JM. Intragraft regulatory T cells in protocol biopsies retain foxp3 demethylation and are protective biomarkers for kidney graft outcome. *Am J Transplant*. 2011 Oct;11(10):2162-72. doi: 10.1111/j.1600-6143.2011.03633.x. Epub 2011 Jul 12. PubMed PMID: 21749644

## Autoimmune hepatitis

45. Taubert R, Hardtke-Wolenski M, Noyan F, Wilms A, Baumann AK, Schlue J, Olek S, Falk CS, Manns MP, Jaeckel E. Intrahepatic regulatory T cells in autoimmune hepatitis are associated with treatment response and depleted with current therapies. *J Hepatol*. 2014 Nov;61(5):1106-14. doi: 10.1016/j.jhep.2014.05.034. Epub 2014 Jun 2. PubMed PMID: 24882050

## Regulatory T-cells as immunosuppressive therapy (adoptive transfer of Treg)

46. Wang H, Song H, Pham AV, Cooper LJ, Schulze JJ, Olek S, Tran DQ. Human LAP(+) GARP(+) FOXP3(+) regulatory T cells attenuate xenogeneic graft versus host disease. *Theranostics*. 2019 Apr 12;9(8):2315-2324. doi: 10.7150/thno.30254. eCollection 2019. PubMed PMID: 31149046; [PubMed Central PMCID: PMC6531299](#).
47. Velaga S, Alter C, Dringenberg U, Thiesler CT, Kuhs S, Olek S, Ukena SN, Franzke A. Clinical-grade regulatory T cells: Comparative analysis of large-scale expansion conditions. *Exp Hematol*. 2017 Jan;45:27-35.e1. doi: 10.1016/j.exphem.2016.09.008. Epub 2016 Sep 28. PubMed PMID: 27693388
48. Bégin P, Schulze J, Baron U, Olek S, Bauer RN, Passerini L, Baccheta R, Nadeau KC. Human in vitro induced T regulatory cells and memory T cells share common demethylation of specific FOXP3 promoter region. *Clin Transl Allergy*. 2015 Oct 20;5:35. doi: 10.1186/s13601-015-0079-2. eCollection 2015. PubMed PMID: 26500760; [PubMed Central PMCID: PMC4617722](#)
49. Noyan F, Lee YS, Zimmermann K, Hardtke-Wolenski M, Taubert R, Warnecke G, Knoefel AK, Schulde E, Olek S, Manns MP, Jaeckel E. Isolation of human antigen-specific regulatory T cells with high suppressive function. *Eur J Immunol*. 2014 Sep;44(9):2592-602. doi: 10.1002/eji.201344381. Epub 2014 Aug 8. [PubMed PMID: 24990119](#)

50. Ukena SN, Velaga S, Goudeva L, Ivanyi P, Olek S, Falk CS, Ganser A, Franzke A. Human regulatory T cells of G-CSF mobilized allogeneic stem cell donors qualify for clinical application. PLoS One. 2012;7(12):e51644. doi: 10.1371/journal.pone.0051644. Epub 2012 Dec 12. PubMed PMID: 23251603; [PubMed Central PMCID: PMC3520921](#)
51. Hoffmann P, Boeld TJ, Eder R, Huehn J, Floess S, Wieczorek G, Olek S, Dietmaier W, Andreesen R, Edinger M. Loss of FOXP3 expression in natural human CD4+CD25+ regulatory T cells upon repetitive in vitro stimulation. Eur J Immunol. 2009 Apr;39(4):1088-97. doi: 10.1002/eji.200838904. [PubMed PMID: 19283780](#)

## DNA methylation analysis as quality control in regenerative medicine

52. Baron U, Türbachova I, Hellwag A, Eckhardt F, Berlin K, Hoffmuller U, Gardina P, Olek S. DNA methylation analysis as a tool for cell typing. Epigenetics. 2006 Jan-Mar;1(1):55-60. Epub 2006 Feb 25. PubMed PMID: 17998806
53. Rapko S, Baron U, Hoffmüller U, Model F, Wolfe L, Olek S. DNA methylation analysis as novel tool for quality control in regenerative medicine. Tissue Eng. 2007 Sep;13(9):2271-80. PubMed PMID: 17590152

## Epigenetic Data Analysis

54. Schildknecht K, Olek S, Dickhaus T. Simultaneous statistical inference for epigenetic data. PLoS One. 2015 May 12;10(5):e0125587. doi: 10.1371/journal.pone.0125587. eCollection 2015. PubMed PMID: 25965389; PubMed Central PMCID: PMC4428829