

Curriculum Vitae

Work Address:

Experimental Haematology
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Personal Data

Name Ulf Klein
 Birthplace Homberg (now Duisburg), Germany
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Work Experience

01/2017– Present	Section of Experimental Haematology, Leeds Institute of Medical Research, School of Medicine, St. James's University Hospital <i>Professor</i>	Leeds
01/2017 – 06/2017	Departments of Pathology & Cell Biology and Microbiology & Immunology and HICCC, CUMC <i>Adjunct Professor</i>	New York
06/2016 – 12/2016	Departments of Pathology & Cell Biology and Microbiology & Immunology and HICCC, CUMC <i>Associate Professor (with tenure)</i>	New York
07/2009 – 05/2016	Departments of Pathology & Cell Biology and Microbiology & Immunology and HICCC, CUMC <i>Assistant Professor</i>	New York
04/2007 – 12/2016	Herbert Irving Comprehensive Cancer Center, CUMC <i>Director of the Flow Cytometry Shared Resource</i>	New York
10/2003 – 06/2009	Institute for Cancer Genetics, Columbia University <i>Associate Research Scientist</i>	New York

Post Doctoral Training

10/1999 – 09/2003	Institute for Cancer Genetics, Columbia University <i>Postdoctoral Fellow</i>	New York
06/1998 – 09/1999	Institute of Genetics, University of Cologne <i>Postdoctoral Fellow</i>	Cologne

Education

06/1993 – 05/1998	Institute of Genetics, University of Cologne	Cologne
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Graduate Student, Ph.D. in Genetics, May 1998
Mentor of Ph.D. thesis: Dr. Klaus Rajewsky

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|-------------------|---|---------|
| 10/1990 – 06/1991 | King's College London
<i>Undergraduate</i> (Study Abroad); Biochemistry, Non-Award | London |
| 10/1986 – 05/1993 | University of Cologne
<i>Diploma Student</i> , Diploma in Biology, May 1993
Mentor of diploma thesis: Dr. Klaus Rajewsky | Cologne |

Honors

Fellowship Programs

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| 2000 | European Molecular Biology Organization (EMBO) Long-Term-Fellowship
(discontinued for HFSP) |
| 2000 – 2003 | Human Frontier Science Program (HFSP) Long-Term-Fellowship |

Publications

Peer Reviewed Publications:

1. Thomas, M.J., U. Klein, J. Lygeros, M. Rodriguez-Martinez. A probabilistic model of the germinal center reaction. **Front. Immunol.** doi: 10.3389/fimmu.2019.00689, *In press*.
2. Li, X., A. Gadzinsky, L. Gong, H. Tong, V. Calderon, Y. Li, D. Kitamura, U. Klein, W.Y. Langdon, F. Hou, Y.R. Zou, H. Gu. Cbl ubiquitin ligases control B cell exit from the germinal-center reaction. **Immunity** 48:530-541, 2018.
3. Grinberg-Bleyer, Y., R. Caron, J.J. Seeley, N.S. De Silva, C.W. Schindler, M.S. Hayden, U. Klein, S. Ghosh. The alternative NF- κ B pathway in regulatory T cell homeostasis and suppressive function. **J. Immunol.** 200:2362-2371, 2018.
4. Grinberg-Bleyer, Y., H. Oh, A. Desrichard, D. Bhatt, R. Caron, T. Chan, R. Schmid, U. Klein, M.S. Hayden, S. Ghosh. NF- κ B c-Rel is crucial for the regulatory T cell immune checkpoint in cancer. **Cell** 170:1096-1108, 2017.
5. Oh, H., Y. Grinberg-Bleyer, W. Liao, D. Maloney, P. Wang, Z. Wu, J. Wang, D. Bhatt, N. Heise, R. Schmid, M.S. Hayden, U. Klein, R. Rabadan, S. Ghosh. An NF- κ B transcription-factor-dependent lineage-specific transcriptional program regulates Treg identity and function. **Immunity** 47:1-16, 2017.
6. Kratchmarov, R., S.A. Nish, W.W. Lin, W.C. Adams, Y.H. Chen, B. Yen, N.J. Rothman, U. Klein, S.L. Reiner. IRF4 couples anabolic metabolism to Th1 cell fate determination. **Immunohorizons** 1:156-161, 2017.
7. Riemann, M., N. Andreas, M. Fedoseeva, E. Meier, D. Weih, H. Freytag, R. Schmidt-Ullrich, U. Klein, Z.Q. Wang, F. Weih. Central immune tolerance depends on crosstalk between the classical and alternative NF- κ B pathways in medullary thymic epithelial cells. **J. Autoimmun.** 81:56-67, 2017.
8. Adams, W.C., Y.H. Chen, R. Kratchmarov, B. Yen, S.A. Nish, W.W. Lin, N.J. Rothman, L.L. Luchsinger, U. Klein, M. Busslinger, J.C. Rathmell, H.W. Snoeck, S.L. Reiner. Anabolism-associated mitochondrial stasis driving lymphocyte differentiation over self-renewal. **Cell Rep.** 17:3142-3152, 2016.
9. Milanovic, M., N. Heise, N.S. De Silva, M.M. Anderson, K. Silva, A. Carette, F. Orelli, G. Bhagat, and U. Klein. Differential requirements for the canonical NF- κ B transcription factors c-REL and RELA during the generation and activation of mature B-cells. **Immunol. Cell Biol.** 95:261-271, 2017.

10. Chinen, T., A.K. Kannan, A.G. Levine, X. Fan, U. Klein, Y. Zheng, G. Gasteiger, Y. Feng, J.D. Fontenot, A.Y. Rudensky. An essential role for IL-2 receptor in regulatory T cell function. **Nat. Immunol.** 17:1322-1333, 2016.
11. De Silva, N.S., M.M. Anderson, A. Carette, K. Silva, N. Heise, G. Bhagat, and U. Klein. Transcription factors of the alternative NF- κ B pathway are required for germinal center B-cell development. **Proc. Natl. Acad. Sci. USA.** 113:9063-9068, 2016.
12. Vlantis, K., A. Wullaert, A. Polykratis, V. Kondylis, M. Dannappel, R. Schwarzer, P. Welz, T. Corona, H. Walczak, F. Weih, U. Klein, M. Kelliher and M. Pasparakis. NEMO prevents RIP Kinase 1-mediated epithelial cell death and chronic intestinal inflammation by NF- κ B-dependent and independent functions. **Immunity** 44:553-567, 2016.
13. De Silva, N.S., K. Silva, M.M. Anderson, G. Bhagat, and U. Klein. Impairment of mature B-cell maintenance upon combined deletion of the alternative NF- κ B transcription factors RELB and NF- κ B2 in B cells. **J. Immunol.** 196:2591-2601, 2016.
14. Lin, W.-H.W., W.C. Adams, S.A. Nish, Y.-H. Chen, B. Yen, N.J. Rothman, R. Kratchmarov, T. Okada, U. Klein, and S. Reiner. Asymmetric PI3K signaling driving developmental and regenerative cell fate bifurcation. **Cell Rep.** 13:2203-2218, 2015.
15. Kondylis, V., A. Polykratis, H. Ehlken, L. Ochoa-Callejero, B.K. Straub, S. Krishna-Subramanian, T.-M. Van, H.-M. Curth, N. Heise, F. Weih, U. Klein, P. Schirmacher, M. Kelliher, and M. Pasparakis. NEMO prevents steatohepatitis and hepatocellular carcinoma by inhibiting RIPK1 kinase activity-mediated hepatocyte apoptosis. **Cancer Cell** 28:582-598, 2015.
16. Grinberg-Bleyer, Y., T. Dainichi, H. Oh, N. Heise, U. Klein, R.M. Schmid, M.S. Hayden, and S. Ghosh. Cutting Edge: NF- κ B p65 and c-REL Control Epidermal Development and Immune Homeostasis in the Skin. **J. Immunol.** 194:2472-2476, 2015.
17. Heise, N., N.S. De Silva, K. Silva, A. Carette, G. Simonetti, M. Pasparakis, and U. Klein. Germinal center B-cell maintenance and differentiation are controlled by distinct NF- κ B transcription factor subunits. **J. Exp. Med.** 211:2103-2118, 2014.
18. Simonetti, G., A. Carette, K. Silva, H. Wang, N.S. De Silva, N. Heise, C.W. Siebel, M.J. Shlomchik, and U. Klein. IRF4 controls the positioning of mature B-cells in the lymphoid microenvironments by regulating NOTCH2 expression and activity. **J. Exp. Med.** 210:2887-2902, 2013.
19. Ochiai, K., M. Maienschein-Cline, G. Simonetti, J. Chen, R. Rosenthal, R. Brink, A.S. Chong, U. Klein, A.R. Dinner, H. Singh, and R. Sciammas. Transcriptional regulation of germinal center B and plasma cell fates by dynamical control of IRF4. **Immunity** 38:918-929, 2013.
20. Nayar, R., M. Enos, A. Prince, H. Shin, S. Hemmers, J.-K. Jiang, U. Klein, C.J. Thomas, and L.J. Berg. TCR signaling via ITK and IRF4 regulates CD8+ T cell differentiation. **Proc. Natl. Acad. Sci. USA.** 109:E2784-E2793, 2012.
21. Rodriguez-Martinez, M., A. Corradin, U. Klein, M. Alvarez, G. Toffolo, B. Di Camillo, A. Califano, and G. Stolovitzky. Quantitative modeling of the terminal differentiation of B cells and mechanisms of lymphomagenesis. **Proc. Natl. Acad. Sci. USA.** 109:2672-2677, 2012.
22. Lia, M., A. Carette, H. Tang, Q. Shen, T. Mo, G. Bhagat, R. Dalla-Favera, and U. Klein. Functional dissection of the chromosome 13q14 tumor suppressor locus using transgenic mouse lines. **Blood** 119:2981-2990, 2012. (Plenary Paper)
23. Eguchi, J., X. Wang, S. Yu, E.E. Kershaw, P.C. Chiu, J. Dushay, J.L. Estall, U. Klein, E. Maratos-Flier, and E.D. Rosen. Transcriptional control of adipose lipid handling by IRF4. **Cell Metabolism** 13:249-259, 2011.
24. Klein, U., M. Lia, M. Crespo, R. Siegel, Q. Shen., T. Mo, A. Ambesi-Impiombato, A. Migliazza, A. Califano, G. Bhagat, and R. Dalla-Favera. The DLEU2/mir-15a/16-1 cluster controls B cell proliferation and its deletion leads to chronic lymphocytic leukemia. **Cancer Cell** 17:28-40, 2010.
25. Wang, K., M. Saito, B.C. Bisikirska, M.J. Alvarez, W.K. Lim, P. Raibhandari, Q. Shen, I. Nemenman, K. Basso, A.A. Margolin, U. Klein, R. Dalla-Favera, and A. Califano. Genome-wide identification of post-translational modulators of transcription factor activity in human B cells. **Nat. Biotechnol.** 27:829-839, 2009.

26. Schenten, D., S. Kracker, G. Esposito, S. Franco, U. Klein, M. Murphy, F.W. Alt, and K. Rajewsky. Pol zeta ablation in B cells impairs the germinal center reaction, class switch recombination, DNA break repair, and genome stability. **J. Exp. Med.** 206:477-490, 2009.
27. Zheng, Y., A. Chaudhry, A. Kas, P. deRoos, J.M. Kim, T.-T. Chu, L. Corcoran, P. Treuting, U. Klein, and A.Y. Rudensky. Regulatory T-cell suppressor program co-opts transcription factor IRF4 to control Th2 responses. **Nature** 458:351-356, 2009.
28. Piccaluga, P.P., A. Califano, U. Klein, C. Agostinelle, B. Bellosillo, E. Gimeno, S. Serrano, F. Sole, Y. Zhang, B. Falini, P.L. Zinzani, and S.A. Pileri. Gene expression analysis provides a potential rationale for revising the histological grading of follicular lymphomas. **Haematologica** 93:1033-1038, 2008.
29. Vakiani, E., K. Basso, U. Klein, M.M. Mansukhani, G. Narayan, P.M. Smith, V.V. Murty, R. Dalla-Favera, L. Pasqualucci, and G. Bhagat. Genetic and phenotypic analysis of B cell post-transplant lymphoproliferative disorders provides insights into disease biology. **Hematol. Oncol.** 26:199-211, 2008.
30. Parekh, S., J.M. Polo, R. Shaknovich, P. Juszczynski, P. Lev, S.M. Ranuncolo, Y. Yin, U. Klein, G. Cattoretti, R. Dalla-Favera, M.A. Shipp, and A. Melnick. BCL6 programs lymphoid cells for survival and differentiation through distinct biochemical mechanisms. **Blood** 110:2067-2074, 2007.
31. Piccaluga, P.P., C. Agostinelli, A. Califano, M. Rossi, K. Basso, S. Zupo, P. Went, U. Klein, P.L. Zinzani, M. Baccharani, R. Dalla-Favera, and S.A. Pileri. Gene expression analysis of peripheral T-cell lymphoma, unspecified, reveals distinct profiles and new potential therapeutic targets. **J. Clin. Invest.** 117:823-834, 2007.
32. Klein, U., S. Casola, G. Cattoretti, Q. Shen, M. Lia, T. Mo, T. Ludwig, K. Rajewsky, and R. Dalla-Favera. Transcription factor IRF4 controls plasma cell differentiation and class-switch recombination. **Nat. Immunol.** 7:773-782, 2006.
33. Basso, K., A.A. Margolin, G.A. Stolovitzky, U. Klein, R. Dalla-Favera, and A. Califano. Reverse engineering of regulatory networks in human B cells. **Nat. Genet.** 37:382-390, 2005.
34. Smith, P.G., F. Wang, K.N. Wilkinson, K.J. Savage, U. Klein, D.S. Neuberg, M.A. Shipp, and R.C.T. Aguiar. The phosphodiesterase PDE4B limits c-AMP associated, PI3K-AKT dependent, apoptosis in diffuse large B cell lymphoma. **Blood** 105:308-316, 2005.
35. Gloghini, A., B. Canal, U. Klein, L. Dal Maso, T. Perin, R. Dalla-Favera, and A. Carbone. RT-PCR analysis of RNA extracted from Bouin-fixed and paraffin-embedded lymphoid tissues. **J. Mol. Diagn.** 6:290-296, 2004.
36. Basso, K., U. Klein, H. Niu, G.A. Stolovitzky, Y. Tu, A. Califano, G. Cattoretti, and R. Dalla-Favera. Tracking CD40 signaling during germinal center development. **Blood** 104:4088-4096, 2004.
37. Basso, K., A. Liso, E. Tiacchi, R. Benedetti, A. Pulsoni, R. Foa, F. Di Raimondo, A. Ambrosetti, A. Califano, U. Klein, R. Dalla-Favera, and B. Falini. Gene expression profiling of hairy cell leukemia reveals a phenotype related to memory B cells with altered expression of chemokine and adhesion receptors. **J. Exp. Med.** 199:59-68, 2004.
38. Klein, U., A. Gloghini, G. Gaidano, A. Chadburn, E. Cesarman, R. Dalla-Favera, and A. Carbone. Gene expression profile analysis of AIDS-related primary effusion lymphoma (PEL) suggests a plasmablastic derivation and identifies PEL-specific transcripts. **Blood** 101:4115-4121, 2003.
39. Klein, U., Y. Tu, G.A. Stolovitzky, J.L. Keller, J. Haddad, V. Miljkovic, G. Cattoretti, A. Califano, and R. Dalla-Favera. Transcriptional analysis of the B cell germinal center reaction. **Proc. Natl. Acad. Sci. USA.** 100:2639-2644, 2003.
40. Küppers[#], R., U. Klein[#], I. Schwering[#], V. Distler, A. Bräuninger, G. Cattoretti, Y. Tu, G.A. Stolovitzky, A. Califano, M.-L. Hansmann, and R. Dalla-Favera. Identification of Hodgkin and Reed-Sternberg cell-specific genes by gene expression profiling. **J. Clin. Invest.** 111:529-537, 2003. [#]equal contribution
41. Schwering, I., A. Bräuninger, U. Klein, B. Jungnickel, M. Tinguely, V. Diehl, M.-L. Hansmann, R. Dalla-Favera, K. Rajewsky, and R. Küppers. Loss of the B lineage-specific gene expression

- program in Hodgkin and Reed/Sternberg cells of Hodgkin's lymphoma. **Blood** 101:1505-1512, 2003.
42. Tu, Y., G.A. Stolovitzky, and U. Klein. Quantitative noise analysis for gene expression microarray experiments. **Proc. Natl. Acad. Sci. USA**. 99:14031-14036, 2002.
 43. Li. C.-M., M. Guo, A. Borczuk, C.A. Powell, M. Wei, H. Thaker, R. Friedman, U. Klein, and B. Tycko. Gene expression in Wilms tumors mimics the earliest committed stage in the metanephric mesenchymal-epithelial transition. **Am. J. Pathol.** 160:2181-2190, 2002.
 44. Klein, U., G. Esposito, F. Baudat, S. Keeney, and M. Jasin. Mice deficient for the type II topoisomerase-like DNA transesterase Spo11 show normal immunoglobulin somatic hypermutation and class switching. **Eur. J. Immunol.** 32:316-321, 2002.
 45. Klein, U., Y. Tu, G.A. Stolovitzky, M. Mattioli, G. Cattoretti, H. Husson, A. Freedman, G. Inghirami, L. Cro, L. Baldini, A. Neri, A. Califano, and R. Dalla-Favera. Gene expression profiling of B cell chronic lymphocytic leukemia reveals a homogeneous phenotype related to memory B cells. **J. Exp. Med.** 194:1625-1638, 2001.
 46. Goossens, T., A. Bräuninger, U. Klein, R. Küppers, and K. Rajewsky. Receptor revision plays no major role in shaping the receptor repertoire of human memory B cells after the onset of somatic hypermutation. **Eur. J. Immunol.** 31:3638-3648, 2001.
 47. Esposito, G., I. Godin, U. Klein, M.-L. Yaspo, A. Cumano, and K. Rajewsky. Disruption of the Rev3l-encoded catalytic subunit of polymerase zeta in mice results in early embryonic lethality. **Curr. Biol.** 10:1221-1224, 2000.
 48. Esposito, G., G. Texido, U.A. Betz, H. Gu, W. Müller, U. Klein, and K. Rajewsky. Mice reconstituted with DNA polymerase beta-deficient fetal liver cells are able to mount a T cell-dependent immune response and mutate their Ig genes normally. **Proc. Natl. Acad. Sci. USA**. 97:1166-1171, 2000.
 49. Geiger, K.D., U. Klein, A. Bräuninger, S. Berger, K. Leder, K. Rajewsky, M.-L. Hansmann, and R. Küppers. CD5-positive B cells in healthy elderly humans are a polyclonal B cell population. **Eur. J. Immunol.** 30:2918-2923, 2000.
 50. Klein, U., K. Rajewsky, and R. Küppers. Human Immunoglobulin (Ig)M+IgD+ peripheral blood B cells expressing the CD27 cell surface antigen carry somatically mutated variable region genes: CD27 as a general marker for somatically mutated (memory) B cells. **J. Exp. Med.** 188:1679-1689, 1998.
 51. Pasqualucci, L., A. Migliazza, N. Fracchiolla, C. William, A. Neri, L. Baldini, R.S.K. Chaganti, U. Klein, R. Küppers, K. Rajewsky, and R. Dalla-Favera. BCL-6 mutations in normal germinal center B cells: Evidence of somatic hypermutation acting outside Ig loci. **Proc. Natl. Acad. Sci. USA**. 95:11816-11821, 1998.
 52. Goossens, T., U. Klein, and R. Küppers. Frequent occurrence of deletions and duplications during somatic hypermutation: Implications for oncogene translocations and heavy chain disease. **Proc. Natl. Acad. Sci. USA**. 95:2463-2468, 1998.
 53. Klein, U., R. Küppers, and K. Rajewsky. Evidence for a large compartment of IgM-expressing memory B cells in humans. **Blood** 89:1288-1298, 1997.
 54. Fischer[#], M., U. Klein[#], and R. Küppers. Molecular single-cell analysis reveals that CD5-positive peripheral blood B cells in healthy humans are characterized by rearranged V_{kappa} genes lacking somatic mutation. **J. Clin. Invest.** 100:1667-1676, 1997. [#]equal contribution
 55. Klein, U., G. Klein, B. Ehlin-Henriksson, K. Rajewsky, and R. Küppers. Burkitt's lymphoma is a malignancy of mature B cells expressing somatically mutated V region genes. **Mol. Med.** 1:495-505, 1995.
 56. Klein, U., R. Küppers, and K. Rajewsky. Variable region gene analysis of B cell subsets derived from a 4-year-old child: somatically mutated memory B cells accumulate in the peripheral blood already at young age. **J. Exp. Med.** 180:1383-1393, 1994.
 57. Klein, U., R. Küppers, and K. Rajewsky. Human IgM⁺IgD⁺ B cells, the major B cell subset in the peripheral blood, express V_{kappa} genes with no or little somatic mutation throughout life. **Eur. J. Immunol.** 23:3272-3277, 1993.

Reviews and Previews:

1. Kennedy, R., and U. Klein. Aberrant activation of NF- κ B signaling in aggressive lymphoid malignancies. **Cells** 7:189, 2018.
1. Klein, U., and N. Heise. Unexpected functions of NF- κ B during germinal center B-cell development: Implications for lymphomagenesis. **Curr. Opin. Hematol.** 22:379-387, 2015.
2. De Silva, N.S., and U. Klein. Dynamics of B cells in germinal centres. **Nat. Rev. Immunol.** 15:137-148, 2015.
3. Simonetti, G., M.T.S. Bertilaccio, P. Ghia, and U. Klein. Mouse models in the study of chronic lymphocytic leukemia pathogenesis and therapy. **Blood** 124:1010-1019, 2014.
4. Klein, U. Programming plasma cell survival. **J. Exp. Med.** 211:744, 2014. (preview)
5. De Silva, N.S., G. Simonetti, N. Heise, and U. Klein. The diverse roles of IRF4 in late germinal center B cell differentiation. **Immunol. Rev.** 247:73-92, 2012.
6. Klein, U., and S. Ghosh. The two faces of NF- κ B signaling in cancer development and therapy. **Cancer Cell** 20:556-558, 2011. (preview)
7. Klein, U., and R. Dalla-Favera. New insights into the pathogenesis of chronic lymphocytic leukemia. **Semin. Cancer Biol.** 20:377-383, 2010.
8. Klein, U., and L. Pasqualucci. B cell receptor signaling derailed in lymphomas. **Immunol. Cell Biol.** 88:346-347, 2010. (preview)
9. Klein, U., and R. Dalla-Favera. Germinal centres: role in B cell physiology and malignancy. **Nat. Rev. Immunol.** 8:22-33, 2008.
10. Klein, U., and R. Dalla-Favera. Unexpected steps in plasma-cell differentiation. **Immunity** 26:543-544, 2007. (preview)
11. Klein, U., and R. Dalla-Favera. New insights into the phenotype and cell derivation of B cell chronic lymphocytic leukemia. **Curr. Top. Microbiol. Immunol.** 294:31-49, 2005.
12. Klein, U., Y. Tu, G.A. Stolovitzky, J.L. Keller, J. Haddad, V. Miljkovic, G. Cattoretti, A. Califano, and R. Dalla-Favera. Gene expression dynamics during germinal center transit in B cells. **Proc. N. Y. Acad. Sci.** 987:166-172, 2003.
13. Pasqualucci, L. O. Bereschenko, H. Niu, U. Klein, K. Basso, R. Guglielmino, G. Cattoretti, and R. Dalla-Favera. Molecular pathogenesis of non-Hodgkin's lymphoma: the role of BCL6. **Leuk. Lymphoma** 44 Suppl 3:S5-12, 2003.
14. Küppers, R., U. Klein, M.-L. Hansmann, and K. Rajewsky. Cellular origin of human B cell lymphomas. **N. Engl. J. Med.** 341:1520-1529, 1999.
15. Küppers, R., T. Goossens, and U. Klein. The role of somatic hypermutation in the generation of deletions and duplications in human Ig V region genes and chromosomal translocations. **Curr. Top. Microbiol. Immunol.** 246:193-198, 1999.
16. Klein, U., K. Rajewsky, and R. Küppers. Phenotypic and molecular characterization of human peripheral blood B cell subsets with special reference to N-region addition and J κ -usage in V κ J κ -joints and κ/λ ratios in naïve versus memory B cell subsets to identify traces of receptor editing processes. **Curr. Top. Microbiol. Immunol.** 246:141-146, 1999.
17. Klein, U., T. Goossens, M. Fischer, H. Kanzler, A. Bräuninger, K. Rajewsky, and R. Küppers. Somatic hypermutation in normal and transformed human B cells. **Immunol. Rev.** 162:261-280, 1998.

Articles in Books:

1. Heise, N., and U. Klein. Somatic hypermutation and affinity maturation analysis using the 4-hydroxy-3-nitrophenyl-acetyl (NP) system. Germinal centers: Methods and Protocols. Editor: D. Calado, **Methods Mol. Biol.** 1623:191-208, 2017.
2. Klein, U., and N.S. De Silva. Mature B-cell development and germinal center reaction. **Biology of Lymphoma**, Chapter 2, pp. 13-35; editors: G. Lenz and L. Pasqualucci; DeGruyter, Germany, 2016.

3. Basso, K., and U. Klein. Gene expression profile analysis of lymphomas. Lymphoma – Methods and Protocols. Chapter 12; editor: R. Küppers, **Methods Mol. Biol.** 971:213-226, 2013.
4. Klein, U. Gene expression profiling in the study of CLL. **Chronic Lymphocytic Leukemia**, Chapter 2, pp. 19-33; editors: S. O'Brien & J.G. Gribben; Informa Healthcare, U.S.A., 2009.
5. Klein, U. Gene expression patterns in lymphoma classifications. **The Lymphoid Neoplasms (3rd edition)**, Chapter 26, pp. 380-392; editor: I. Magrath, Hodder Arnold, UK, 2010.
6. Klein, U. Cellular origin of chronic lymphocytic leukemia. **Hematology Education: the education programme for the annual congress of the European Hematology Association.** 3:55-60, 2009.
7. Klein, U., and R. Dalla-Favera. Gene expression profiling in the study of lymphoid malignancies. **Molecular Hematology, 2nd edition**, pp. 298-306; editors: D. Provan & J. Gribben; Blackwell, UK, 2005. **Molecular Hematology, 3rd edition**, pp. 350-359; editors: D. Provan & J. Gribben; Blackwell, UK, 2010.