

CD57 natürliche Killerzellen CD57 natural killer cells

**Die CD57+-T-Zellen agieren sowohl gegen virusinfizierte Zellen als auch gegen entartete Zellen.
The CD57+ T cells act against both virus-infected cells as well as against malignant cells.**

Oldham RK (1983) Natural killer cells: artifact to reality: an odyssey in biology. *Cancer Metastasis Rev.* 2(4), 323-36.

Ljunggren HG, Karre K (1990) In search of the 'missing self': MHC molecules and NK cell recognition.. In: *Immunol Today*. Nr. 11(7), 237-244, [PMID 2201309](https://pubmed.ncbi.nlm.nih.gov/2201309/)

<http://www.ncbi.nlm.nih.gov/pubmed/2201309?dopt=Abstract>

„Abstract Natural killer (NK) cells can defend an organism against a variety of threats, probably using several different strategies to discriminate between normal and aberrant cells. According to the 'missing self' hypothesis, one function of NK cells is to recognize and eliminate cells that fail to express self major histocompatibility complex (MHC) class I molecules. In this article Hans-Gustaf Ljunggren and Klas Kärre review in vivo studies with H-2-deficient targets that support this hypothesis. In vitro studies, some of which have given conflicting results, are interpreted within a multiple choice model for NK cell recognition. The authors derive testable predictions for how MHC class I molecules act in cases where they control a rate-limiting step in the NK cell-target interaction“.

Kreuzfelder E, Shen G, Bittorf M, Scheiermann N, Thraenhart O, Seidel D, Grosse-Wilde H (1992) Enumeration of T, B and Natural Killer Peripheral Blood Cells of Patients with Multiple Sclerosis and Controls. *European Neurology*, 32, 190-194. <http://dx.doi.org/10.1159/000116820>

[Huth TK](#), [Brenu EW](#), [Ramos S](#) et al. (2015) Pilot Study of Natural Killer Cells in Chronic Fatigue Syndrome/Myalgic Encephalomyelitis and Multiple Sclerosis. *Scand J Immunol*. doi:

10.1111/sji.12388. [Epub ahead of print] <http://www.ncbi.nlm.nih.gov/pubmed/26381393>

« The results from this pilot study suggest that NK cells from CFS/ME and MS patients may have undergone increased differentiation in response to external stimuli which may affect different mechanisms in the NK cell cytotoxic activity pathway « .

[Bi J](#), [Tian Z](#) (2017) NK Cell Exhaustion. *Front Immunol* 8, 760. doi: 10.3389/fimmu.2017.00760. eCollection 2017. <https://www.ncbi.nlm.nih.gov/pubmed/28702032>

«Here, we provide an overview of our current knowledge on NK cell exhaustion in tumors, and in chronic infections. «

Wang EC, Borysiewicz LK (1995) The Role of CD8, CD57 Cells in Human Cytomegalovirus and Other Viral Infections. *Scandinavian Journal of Infectious Diseases*, 99, 69-77.

Kern F, Ode-Hakim S, Vogt K, Hoflich C, Reinke P, Volk HD. (1996) The enigma of CD57+CD28- T cell expansion--anergy or activation? *Clin Exp Immunol.* (104), 180-184.

Imberti L, Sottini A, Signorini S, Gorla R, Primi D (1997) Oligoclonal CD4 CD57 T-Cell Expansions Con-tribute to the Imbalanced T-Cell Receptor Repertoire of Rheumatoid Arthritis Patients. *Blood*, 89, 2822-2832.

McNerlan SE, Rea IM, Alexander HD, et al. (1998) Changes in natural killer cells, the CD57 CD8 subset, and related cytokines in healthy aging. *J Clin Immunol* 18(1), 31-8.

Merino J, Martínez-González MA, Rubio M, et al. (1998) Progressive decrease of CD8high+ CD28+ CD57- cells with ageing. *Clin Exp Immunol* 112(1), 48-51.

Khan A, Baker SP, Patwardhan NA, et al. (1998) CD57 (Leu-7) expression is helpful in diagnosis of the follicular variant of papillary thyroid carcinoma. *Virchows Arch* 432(5), 427-32.

Hebib C, Leroy E, Rouleau M, et al. (1998) Pattern of cytokine expression in circulation CD57+ T cells from long-term renal allograft recipients. *Transpl Immunol* 6(1), 39-47.

- Nakazawa Y, Koike K, Kitazawa Y, et al. (1998) An analysis of sclerodermatous graft-versus-host-disease after allogeneic bone marrow transplantation: CD8+CD57+T-cell proliferation and increased production of TGF-beta. *Rinsho Ketsueki* 39(3), 185-92.
- Mollet L, Sadat-Sowti B, Duntze J, et al. (1998) CD8hi+CD57+ T lymphocytes are enriched in antigen-specific T cells capable of down-modulating cytotoxic activity. *Int Immunol* 10(3), 311-23.
- Hotta O, Yusa N, Furuta T, et al. (1998) Membranoproliferative glomerulonephritis in the aged and its possible causal relationship with CD8+CD57+ lymphocytes. *Clin Nephrol* 49(3), 138-44.
- Frassanito MA, Silvestris F, Cafforio P, et al. (1998) CD8+/CD57 cells and apoptosis suppress T-cell functions in multiple myeloma. *Br J Haematol* 100(3), 469-77.
- Arai K, Yamamura S, Seki S, et al. (1998) Increase of CD57+ T cells in knee joints and adjacent bone marrow of rheumatoid arthritis (RA) patients: implication for an anti-inflammatory role. *Clin Exp Immunol* 111(2), 345-52. <http://dx.doi.org/10.1046/j.1365-2249.1998.00511.x>
- Karasuno T, Nakamura H, Fukuda H, et al. (1998) Remarkable increase of CD8+ CD11a+ and CD8+ CD57- T cells in patients with post-transfusion graft-versus-host disease. *Rinsho Ketsueki* 39(9),716-8.
- Mori T, Guo MW, Li X, et al. (1998) Isolation and identification of apoptosis inducing nucleosides from CD57(+) HLA-DR bright natural suppressor cell line. *Biochem Biophys Res Commun* 251(2), 416-22.
- Van den Hove LE, Van Gool SW, Vandenberghe P, et al. (1998) CD57+/CD28- T cells in untreated hemato-oncological patients are expanded and display a Th1-type cytokine secretion profile, ex vivo cytolytic activity and enhanced tendency to apoptosis. *Leukemia* 12(10), 1573-82.
- Smith P, Helbert M, Raftery M, et al. (1999) Paraproteins and monoclonal expansion of CD3+CD8+ CD56-CD57+ T lymphocytes in a patient with HIV infection. *Br J Haematol* 105(1), 85-7.
- Mollet L, Fautrel B, Leblond V, et al. (1999) Leukemic CD3+ LGL share functional properties with their CD8+ CD57+ cell counterpart expanded after BMT. *Leukemia* 13(2), 230-40.
- Rowbottom AW, Garland RJ, Lepper MW et al. (2000) Functional analysis of the CD8+CD57+ cell population in normal healthy individuals and matched unrelated T-cell-depleted bone marrow transplant recipients. *Br J Haematol* 110(2), 315-21.
- Bandrés E, Merino J, Vázquez B, et al. (2000) The increase of IFN-gamma production through aging correlates with the expanded CD8(+high)CD28(-)CD57(+) subpopulation. *Clin Immunol* 96(3), 230-5.
- Kraus MD, Haley J (2000) Lymphocyte predominance Hodgkin's disease: the use of bcl-6 and CD57 in diagnosis and differential diagnosis. *Am J Surg Pathol* 24(8), 1068-78.
- Eiras P, Leon F, Camarero C, et al. (2000) Intestinal intraepithelial lymphocytes contain a CD3- CD7+ subset expressing natural killer markers and a singular pattern of adhesion molecules. *Scand J Immunol* 52(1), 1-6.
- Coakley G, Iqbal M, Brooks D, et al. (2000) CD8+, CD57+ T cells from healthy elderly subjects suppress neutrophil development in vitro: implications for the neutropenia of Felty's and large granular lymphocyte syndromes. *Arthritis Rheum* 43(4), 834-43.
- Hebib C, Rouleau M, Hirsch F, et al. (2000) Cytokine expression in peripheral CD57(+) T cells from tolerant renal allograft recipients. *Transplant Proc* 32(2), 386-7.
- Park SH, Araki S, Nakata A, et al. (2000) Effects of occupational metallic mercury vapour exposure on suppressor-inducer (CD4+CD45RA+) T lymphocytes and CD57+CD16+ natural killer cells. *Int Arch Occup Environ Health* 73(8), 537-42.
- Sze DM, Giesajtis G, Brown RD, et al. (2001) Clonal cytotoxic T cells are expanded in myeloma and reside in the CD8(+)/CD57(+)/CD28(-) compartment. *Blood*. (98), 2817-2827.

Lima M, Gonçalves C, Marques L, et al. (2001) Association of CD4+/CD56+/CD57+/CD8+(dim) large granular lymphocytic leukemia, splenic B-cell lymphoma with circulating villous lymphocytes, and idiopathic erythrocytosis. *Ann Hematol* 80(11), 685-90.

De Paula AM, Gomez RS (2001) Immunolocalization of p53, glutathione S-transferase pi and CD57 antigens in oral leukoplakia. *Anticancer Res* 21(1A), 379-85.

Li X, Guo M, Mori E, et al. (2001) Active roles of caspase-3 in human gastric carcinoma cell death by apoptosis inducing nucleosides from CD57+HLA-DR bright natural suppressor cell line. *Int J Oncol* 18(4), 837-42.

Mori T, Guo M, Jin A, et al. (2001) Human esophageal cancer cell death mediated by apoptosis-inducing nucleosides from CD57+HLA-DRbright natural suppressor cell line. *Int J Oncol* 19(6), 1235-41.

Song K, Coleman RA, Alber C, et al. (2001) TH1 cytokine response of CD57+ T-cell subsets in healthy controls and patients with alcoholic liver disease. *Alcohol* 24(3), 155-67.

Zheng M, Luan X (2001) Prognostic significance of CD57+ cell level and pTNM staging system in patients with laryngeal cancer. *Lin Chuang Er Bi Yan Hou Ke Za Zhi* 15(2), 73-6

Stricker RB, Winger EE (2001) Decreased CD57 lymphocyte subset in patients with **chronic Lyme disease**. *Immunol Lett* 76(1), 43-8. [Abstract](#)

Stricker RB, Burrascano J, Winger E (2002) Longterm decrease in the CD57 lymphocyte subset in a patient with **chronic Lyme disease**. *Ann Agric Environ Med* 9(1), 111-3. [Abstract](#)

Stricker RB, Winger EE. (2002) Normalization of the CD57 natural killer cell subset associated with prolonged antibiotic therapy in patients with **chronic Lyme disease**. *Clin Immunol* 103, 117-8.

Villegas FR, Coca S, Villarrubia VG, et al. (2002) Prognostic significance of tumor infiltrating natural killer cells subset CD57 in patients with squamous cell lung cancer. *Lung Cancer* 35(1), 23-8.

Maeda T, Yamada H, Nagamine R, et al. (2002) Involvement of CD4+,CD57+ T cells in the disease activity of rheumatoid arthritis. *Arthritis Rheum* 46(2), 379-84.

Koros AM, Goodwin DG, Siderits RH, et al. (2002) "Natural killer" (NK) cell antigens CD56, CD57 and others are expressed on breast and lung tumor cells as well as sea urchin coelomocytes. *J Biol Regul Homeost Agents* 16(3),173-5.

Guo M, Sato E, Jin A, et al. (2002) Human prostate cancer cell death by novel anticancer compounds, apoptosis-inducing nucleosides from CD57+ HLA-DR(bright) natural suppressor cell line. *Prostate* 51(3), 166-74.

Koike Y, Seki S, Ohkawa T, et al. (2002) CD57+ T cells augment IFN-gamma production in a one-way mixed lymphocyte reaction and their expansion after stem cell transplantation in paediatric patients. *Clin Exp Immunol* 130(1), 162-8.

Vaquero J, Zurita M, Aguayo C, et al. (2003) Apoptosis is not correlated with the presence of CD57+ NK-cells in brain metastases. *Acta Neurochir (Wien)* 145(9), 773-6.

Brenchley JM, Karandikar NJ, Betts MR, et al. (2003) Expression of CD57 defines replicative senescence and antigen-induced apoptotic death of CD8+ T cells. *Blood* 101(7), 2711-20.

Harada K, Isse K, Tsuneyama K, et al. (2003) Accumulating CD57 + CD3 + natural killer T cells are related to intrahepatic bile duct lesions in primary biliary cirrhosis. *Liver Int* 23(2), 94-100.

Chochi K, Ichikura T, Majima T, et al. (2003) The increase of CD57+ T cells in the peripheral blood and their impaired immune functions in patients with advanced gastric cancer. *Oncol Rep* 10(5), 1443-8.

- Aronsson B, Troye-Blomberg M, Smedman L (2004) Increase of circulating CD8+CD57+ lymphocytes after measles infection but not after measles vaccination. *J Clin Lab Immunol* 1-12.
- Matsubara K, Yura K, Hirata T, et al. (2004) Acute lymphoblastic leukemia with coexpression of CD56 and CD57: case report. *Pediatr Hematol Oncol* 21(7), 677-82.
- Nasir A, Catalano E, Calafati S, et al. (2004) Role of p53, CD44V6 and CD57 in differentiating between benign and malignant follicular neoplasms of the thyroid. *In Vivo* 18(2), 189-95.
- Sincovics JG, Horvarth JC., (2005) **Human natural killer cells**: A comprehensive review. *International Journal of Oncology* 27, 5-47
- Shinomiya N, Koike Y, Koyama H, et al. (2005) Analysis of the susceptibility of CD57 T cells to CD3-mediated apoptosis. *Clin Exp Immunol* 139(2), 268-78.
- Wood KL, Knox KS, Wang Y, et al. (2005) Apoptosis of CD57+ and CD57- lymphocytes in the lung and blood of HIV-infected subjects. *Clin Immunol* 117(3), 294-301.
- Palmer BE, Blyveis N, Fontenot AP, et al. (2005) Functional and phenotypic characterization of CD57+CD4+ T cells and their association with HIV-1-induced T cell dysfunction. *J Immunol* 175(12), 8415-23.
- Sada-Ovalle I, Torre-Bouscoulet L, Valdez-Vázquez R, et al. (2006) Characterization of a cytotoxic CD57+ T cell subset from patients with pulmonary tuberculosis. *Clin Immunol* 121(3), 314-23.
- Le Priol Y, Puthier D, Lecureuil C, et al. (2006) High cytotoxic and specific migratory potencies of senescent CD8+ CD57+ cells in HIV-infected and uninfected individuals. *J Immunol.* (177), 5145-54.
- Orange JS (2006) Human natural killer cell deficiencies. *Curr Opin Allergy Clin Immunol.* 6(6), 399-409.
- Focosi D, Petrini M. (2007) **CD57** Expression on Lymphoma Microenvironment As a New Prognostic Marker Related to Immune Dysfunction. *Journal of Clinical Oncology*, 25, 10, 1289-1291 American Society of Clinical Oncology. DOI: 10.1200/JCO.2006.10.2251 <http://www.ncbi.nlm.nih.gov/pubmed/17401023>
- Winger EE (2007) CD57+ cells and recurrent spontaneous abortion. *Am J Reprod Immunol* 58(4), 311-4.
- Hoji A, Connolly NC, Buchanan WG, et al. (2007) CD27 and CD57 expression reveals atypical differentiation of human immunodeficiency virus type 1-specific memory CD8+ T cells. *Clin Vaccine Immunol* 14(1), 74-80.
- Pedroza-Seres M, Linares M, Voorduyn S, et al. (2007) Pars planitis is associated with an increased frequency of effector-memory CD57+ T cells. *Br J Ophthalmol* 91(10), 1393-8.
- Yamada H, Kaibara N, Okano S, et al. (2007) Interleukin-15 selectively expands CD57+ CD28- CD4+ T cells, which are increased in active rheumatoid arthritis. *Clin Immunol* 124(3), 328-35.
- Mileshkin L, Honemann D, Gambell P, et al. (2007) Patients with multiple myeloma treated with thalidomide: evaluation of clinical parameters, cytokines angiogenic markers, mast cells and marrow CD57+ cytotoxic T cells as predictors of outcome. *Haematologica* 92(8), 1075-82.
- Characiejus D, Pasukoniene V, Jonusauskaite R, et al. (2008) Peripheral blood CD8 high CD57+ lymphocyte levels may predict outcome in melanoma patients treated with adjuvant interferon-alpha. *Anticancer Res* 28(2B), 1139-42.
- Akagi J, Baba H (2008) Prognostic value of CD57(+) T lymphocytes in the peripheral blood of patients with advanced gastric cancer. *Int J Clin Oncol* 13(6), 528-35.

- Mendes AV, Kallas EG, Benard G, et al. (2008) Impact of cytomegalovirus and grafts versus host disease on the dynamics of CD57+CD28-CD8+ T cells after bone marrow transplant. *Clinics (Sao Paulo)* 63(5), 667-76.
- Tupin E, et al. (2008) NKT cells prevent chronic joint inflammation after infection with *Borrelia burgdorferi*. *Proc Natl Acad Sci USA* 105(50), 19863–19868
- Chong LK, Aicheler RJ, Llewellyn-Lacey S, Tomasec P, Brennan P, Wang EC. (2008) Proliferation and interleukin 5 production by CD8hi CD57+ T cells. *Eur J Immunol.* (38), 995-1000.
- Waldhauer I, Steinle A (2008) NK cells and cancer immunosurveillance. *Oncogene.* 27(45), 5932-43.
- Ozcimen EE, Kiyici H, Uckuyu A, et al. (2009) Are CD57+ natural killer cells really important in early pregnancy failure? *Arch Gynecol Obstet* 279(4), 493-7.
- Chattopadhyay PK, Betts MR, Price DA, et al. (2009) The cytolytic enzymes granzyme A, granzyme B, and perforin: expression patterns, cell distribution, and their relationship to cell maturity and bright CD57 expression. *J Leukoc Biol.* (85), 88-97.
- Iking-Konert C, Vogl T, Prior B, et al. (2009) Expression of CD57 on CD8+ T lymphocytes of patients with Wegener's granulomatosis and microscopic polyangiitis: evidence for continuous activation of CD8+ cells. *Clin Exp Rheumatol* 27(1 Suppl 52), S19-24.
- Stricker RB, Winger EE (2009) Natural killer cells in **chronic Lyme disease**. *Clin Vaccine Immunol* 16, 1704
- Marques A, Brown MR, Fleisher TA (2009) Natural killer cell counts are not different between patients with **post-Lyme disease** syndrome and controls. *Clin Vaccine Immunol* 16(8), 1249-50. [Abstract](#)
- Focosi D, Bestagno M, Burrone O, et al. (2010) **CD57+** T lymphocytes and functional immune deficiency. *J Leukoc Biol* 87(1), 107-16. <http://www.ncbi.nlm.nih.gov/pubmed/19880576>
- Churchill HR, Roncador G, Warnke RA, et al. (2010) Programmed death 1 expression in variant immunoarchitectural patterns of nodular lymphocyte predominant Hodgkin lymphoma: comparison with CD57 and lymphomas in the differential diagnosis. *Hum Pathol* 41(12):1726-34
- Lopez-Vergès S, Milush JM, Pandey S, et al. (2010) **CD57** defines a functionally distinct population of mature NK cells in the human CD56 dim CD16+ NK-cell subset. *Blood* 116(19), 3865-74. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2981540/> <http://www.ncbi.nlm.nih.gov/pubmed/20733159>
- Björkström NK, Riese P, Heuts F et al. (2010) Expression patterns of NKG2A, KIR, and CD57 define a process of CD56dim NK-cell differentiation uncoupled from NK-cell education. *Blood* 116(19),3853-64.
- Ruiz-Mateos E, Ferrando-Martinez S, Machmach K, et al. (2010) High levels of CD57+CD28- T-cells, low T-cell proliferation and preferential expansion of terminally differentiated CD4+ T-cells in HIV-elite controllers. *Curr HIV Res* 8(6), 471-81.
- Tajima S, Maeda I, Kanemaki Y, et al. (2010) Evaluation of CD56 and CD57 immunostainings for discrimination between endocrine ductal carcinoma in situ and intraductal papilloma. *Pathol Int* 60(6), 459-65.
- Zheng Z, Qianqiao Z, Qi H, et al. (2010) In vitro deprivation of CD8(+)CD57(+)T cells promotes the malignant growth of bone marrow colony cells in patients with lower-risk myelodysplastic syndrome. *Exp Hematol* 38(8), 677-84.
- Schleinitz N, Vely F, Harle J-R, Vivier E (2010) Natural killer cells in human autoimmune diseases. *Immunology* <http://dx.doi.org/10.1111/j.1365-2567.2010.03360.x>
- Wood KL, Voss OH, Huang Q, et al. (2010) The small heat shock protein 27 is a key regulator of CD8+ CD57+ lymphocyte survival. *J Immunol* 184(10), 5582-8

Enoki Y, Katoh G, Okabe H, et al. (2010) Clinicopathological features and CD57 expression in renal cell carcinoma in acquired cystic disease of the kidneys: with special emphasis on a relation to the duration of haemodialysis, the degree of calcium oxalate deposition, histological type, and possible tumorigenesis. *Histopathology* 56(3), 384-94.

Akagi J, Baba H (2010) PSK may suppress CD57(+) T cells to improve survival of advanced gastric cancer patients. *Int J Clin Oncol* (2), 145-52.

Wahl J, Bogatyreva L, Boukamp P, et al. (2010) Ewing's sarcoma cells with CD57-associated increase of tumorigenicity and with neural crest-like differentiation capacity. *Int J Cancer* 127(6), 1295-307.

Liebenberg LJ, Adedeji AL, Martin DP, et al. (2010) CD57 expression by T cells in the female genital tract of HIV-zx1 infected women. *Clin Immunol* 135(1), 137-45.

Janols H, Bredberg A, Thuvesson I, et al. (2010) Lymphocyte and monocyte flow cytometry immunophenotyping **as a diagnostic tool in uncharacteristic inflammatory disorders**. *BMC Infect Dis* 205. [Abstract](#)

Oloquequi J, Montes JF, Prats A, et al. (2011) Significant increase of CD57+ cells in pulmonary lymphoid follicles of COPD patients. *Eur Respir J* 37(2), 289-98.

Lopez-Vergès S, Milush JM, Schwartz BS, et al. (2011) Expansion of a unique CD57⁺NKG2Chi natural killer cell subset during acute human cytomegalovirus infection. *Proc Natl Acad Sci U S A* 108(36), 14725-32.

Nakata T, Takayama E, Magari H, et al. (2011) Simultaneous detection of T lymphocyte-related antigens (CD4/CD8, CD57, TCR β) with nuclei by fluorescence-based immunohistochemistry in paraffin-embedded human lymph node, liver cancer and stomach cancer. *Acta Cytol* 55(4), 357-63

Strioga M, Pasukoniene V, Characiejus D (2011) CD8⁺ CD28⁻ and CD8⁺ CD57⁺ T cells and their role in health and disease. *Immunology* 134(1), 17-32. [Abstract](#)

Shiraki T, Takayama E, Magari H, et al. (2011) Altered cytokine levels and increased CD4⁺CD57⁺ T cells in the peripheral blood of hepatitis C virus-related hepatocellular carcinoma patients. *Oncol Rep* 26(1), 201-8.

Cabibi D, Aragona F, Guarnotta C, et al. (2011) Glut-1 expression and in situ CD1a/CD57 immunologic deficit in keratoacanthoma and squamous cell carcinoma of immunocompetent patients. *Immunohistochem Mol Morphol* 19(3), 239-45.

Characiejus D, Pasukoniene V, Jacobs JJ, et al. (2011) Prognostic significance of peripheral blood CD8^{high}CD57⁺ lymphocytes in bladder carcinoma patients after intravesical IL-2. *Anticancer Res* 31(2), 699-703.

Gayoso I, Sanchez-Correa B, Campos C, et al. (2011) Immunosenescence of human natural killer cells. *J Innate Immun* 3(4), 337-43. [Abstract](#)

Shimizu H, Yokohama A, Jimbo T, et al. (2012) Mature natural killer cell lymphoma with an unusual immunophenotype: CD16⁻, CD56⁻, and CD57 negative. *Eur J Haematol* 8(2), 181-2.

Katchar K, Drouin EE, Steere AC (2013) Natural killer cells and natural killer T cells in Lyme arthritis. *Arthritis Res Ther* 15(6), R183.

Campbell KS, Hasegawa J (2013) Natural killer cell biology: an update and future directions. *J Allergy Clin Immunol*. 132(3), 536-44. Epub 2013 Jul 30.1.

[Nielsen](#) CM, [White](#) MJ, [Goodier](#) MR, [Riley](#) EM (2013) **Functional Significance of CD57 Expression on Human NK Cells and Relevance to Disease**. *Front Immunol*. 4, 422. Published online 2013 Dec 9. doi: [10.3389/fimmu.2013.00422](https://doi.org/10.3389/fimmu.2013.00422) PMID: PMC3856678 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3856678/>

Lee W-Y, Sanz M-J, Wong CHY et al. (2014) Invariant natural killer T cells act as an extravascular cytotoxic barrier for joint-invading Lyme Borrelia. Cross Mark. doi: 10.1073/pnas.1404769111
<http://www.pnas.org/content/early/2014/09/08/1404769111.abstract>

[Bernt - Dieter Huismans](#). Letzte Revision August 2017 www.Huismans.click 
Back to top: <http://www.erlebnishaft.de/cd57.pdf>