

## DMSG Forschungsförderung Einzelprojekte: Publikationen

### Ausschreibungsjahr 2024: „Einfluss des Alters auf den Verlauf der Multiplen Sklerose“

**Prof. Dr. med. Manuel Alexander Friese:** “Inflammaging contributes to neurodegeneration in multiple sclerosis”

**Prof. Dr. Ahmed Abdelhak, Prof. Dr. Hayrettin Tumani:** “Multifaceted Age assessment and Progression in Multiple Sclerosis – MAP-MS study”

### Ausschreibungsjahr 2023: „Fatigue und Multiple Sklerose“

**Carolin Balloff:** “Bicentric evaluation of sleep disorders as a cause and therapeutic approach for fatigue and cognitive impairment in Multiple Sclerosis”

**Dr. Dr. Marlene Tahedi:** “Bridging the gap: Longitudinal characterization of microstructural cerebellar features in multiple sclerosis fatigue”

### Ausschreibungsjahr 2022: „Beeinflussbare Umweltfaktoren der Multiplen Sklerose“

**Univ.-Prof. Dr. Tanja Kuhlmann, Univ.-Prof. Dr. Jan Lünemann:** “CNS intrinsic effects of obesity-associated factors in Multiple Sclerosis”

**Prof. Dr. Linker, Dr. Haase:** “Probiotic Lactobacillus supplementation augments Vitamin D associated immunomodulation in persons with multiple sclerosis”

Träger C, Kaiser M, Freudenstein D, Heckscher S, Dettmer K, Oefner PJ, Liebisch G, Hiergeist A, Gessner A, Lee DH, Angstwurm K, **Linker RA, Haase S.** A probiotic approach identifies a Treg-centred immunoregulation via modulation of gut microbiota metabolites in people with multiple sclerosis and healthy individuals. EBioMedicine. 2025 Jun;116:105743. doi: 10.1016/j.ebiom.2025.105743.

### Ausschreibungsjahr 2021: „Genderspezifische Aspekte der Multiplen Sklerose“

**Prof. Dr. Simon Faissner, Prof. Dr. Kerstin Hellwig:** “LOTUS-MS - influence Of anovulation and menopause on the course of MS”

### Ausschreibungsjahr 2020: „Genetische Faktoren der Multiplen Sklerose“

**Prof. Dr. Manuel Alexander Friese:** “Genetic determinants of neuronal resilience to inflammatory stress in multiple sclerosis”

Woo, M. S., Mayer, C., Binkle-Ladisch, L., Sonner, J. K., Rosenkranz, S. C., Shaposhnykov, A., Rothammer, N., Tsvilovsky, V., Lorenz, S. M., Raich, L., Bal, L. C., Vieira, V., Wagner, I., Bauer, S., Glatzel, M., Conrad, M., Merkle, D., Freichel, M., **Friese**, M. A., 2024. STING orchestrates the neuronal inflammatory stress response in multiple sclerosis. *Cell*, 187(15), 4043–4060.e30. <https://doi.org/10.1016/j.cell.2024.05.031>

Woo, M. S., Bal, L. C., Winschel, I., Manca, E., Walkenhorst, M., Sevgili, B., Sonner, J. K., Di Liberto, G., Mayer, C., Binkle-Ladisch, L., Rothammer, N., Unger, L., Raich, L., Hadjilaou, A., Noli, B., Manai, A. L., Vieira, V., Meurs, N., Wagner, I., Pless, O., ... **Friese**, M. A., 2024. The NR4A2/VGF pathway fuels inflammation-induced neurodegeneration via promoting neuronal glycolysis. *The Journal of clinical investigation*, 134(16), e177692. <https://doi.org/10.1172/JCI177692>

### Ausschreibungsjahr 2019: „Beeinflussbare Risikofaktoren der Multiplen Sklerose“

**PD Dr. Lisa Ann Gerdes:** “Risk factors of MS: A study of the intestinal microbiome in monozygotic twins”

Yoon H, **Gerdes** LA, Beigel F, Sun Y, Kövilein J, Wang J, Kuhlmann T, Flierl-Hecht A, Haller D, Hohlfeld R, Baranzini SE, Wekerle H, Peters A. Multiple sclerosis and gut microbiota: Lachnospiraceae from the ileum of MS twins trigger MS-like disease in germfree transgenic mice-An unbiased functional study. *Proc Natl Acad Sci U S A*. 2025 May 6;122(18):e2419689122. doi: 10.1073/pnas.2419689122. Epub 2025 Apr 21. PMID: 40258140; PMCID: PMC12067282.

Kavaka V, Mutschler L., de la Rosa del Val C, Eglseer K, Gómez-Martínez AM, Flierl-Hecht A, Ertl-Wagner B, Keeser D, Mortazavi M, Seelos K, Zimmermann H, Haas J, Wildemann B, Kümpfel T, Dornmair K, Korn T, Hohlfeld R, Kerschensteiner M, **Gerdes** LA\*, Beltran E\*. Twin study identifies early immunological and metabolic dysregulation of CD8+ T cells in multiple sclerosis. *Science Immunology*, 2024. doi: 10.1126/sciimmunol.adj8094

Engels D, Flierl-Hecht A, Shalaginova G, Rek S, Keeser D, Reinhard MA, Padberg F, Kümpfel T, **Gerdes** LA. Multiple sclerosis twin study reveals distinct genetic, disease-specific, and psychometric impact on coping with critical life events. *J Neurol Sci.* 2025 Feb 15;469:123381. doi: 10.1016/j.jns.2024.123381 Epub 2025 Jan 2. PMID: 39798189

Yoon H\*, **Gerdes** LA \*, Beigel F \*, Sun Y., Kövilein JB, Wang J, Kuhlmann T, Flierl-Hecht A, Haller D, Hohlfeld R, Baranzini SE, Wekerle H, Peters A. Ileal Lachnospiraceae from MS Twins trigger MS-like Disease in Germfree Transgenic Mice: An unbiased exploration. PNAS, accepted

Peters, A., **Gerdes**, L. A., Wekerle, H., 2024. Multiple sclerosis and the intestine: Chasing the microbial offender. *Immunological reviews*, 10.1111/imr.13357. Advance online publication. <https://doi.org/10.1111/imr.13357>

Ingelfinger, F., Kuiper, K. L., Ulutekin, C., Rindlisbacher, L., Mundt, S., **Gerdes**, L. A., Smolders, J., van Luijn, M. M., Becher, B., 2024. Twin study dissects CXCR3<sup>+</sup> memory B cells as non-heritable feature in multiple sclerosis. *Med (New York, N.Y.)*, 5(4), 368–373.e3. <https://doi.org/10.1016/j.medj.2024.02.013>

Mortazavi, M., **Gerdes**, L. A., Hizarci, Ö., Kümpfel, T., Anslinger, K., Padberg, F., Stöcklein, S., Keeser, D., Ertl-Wagner, B., 2024. Impact of adult-onset multiple sclerosis on MRI-based intracranial volume: A study in clinically discordant monozygotic twins. *NeuroImage. Clinical*, 42, 103597. <https://doi.org/10.1016/j.nicl.2024.103597>

Schneider-Hohendorf, T., **Gerdes**, L. A., et.al., 2022. Broader Epstein-Barr virus-specific T cell receptor repertoire in patients with multiple sclerosis. *The Journal of experimental medicine*, 219(11), e20220650. <https://doi.org/10.1084/jem.20220650>

Ingelfinger, F., **Gerdes**, L. A., Kavaka, V., Krishnarajah, S., Friebel, E., Galli, E., Zwicky, P., Furrer, R., Peukert, C., Dutertre, C. A., Eglseer, K. M., Ginhoux, F., Flierl-Hecht, A., Kümpfel, T., De Feo, D., Schreiner, B., Mundt, S., Kerschensteiner, M., Hohlfeld, R., Beltrán, E., ... Becher, B., 2022. Twin study reveals non-heritable immune perturbations in multiple sclerosis. *Nature*, 603(7899), 152–158. <https://doi.org/10.1038/s41586-022-04419-4>

iMSMS Consortium. Electronic address: sergio.baranzini@ucsf.edu, iMSMS Consortium, 2022. Gut microbiome of multiple sclerosis patients and paired household healthy controls reveal associations with disease risk and course. *Cell*, 185(19), 3467–3486.e16. <https://doi.org/10.1016/j.cell.2022.08.021>

Hohlfeld, R., Beltran, E., **Gerdes**, L. A., Dornmair, K., 2021. Tissue-resident CD8<sup>+</sup> memory T cells in multiple sclerosis. *Brain: a journal of neurology*, 144(1), e7. <https://doi.org/10.1093/brain/awaa352>

Penkert, H., Lauber, C., Gerl, M. J., Klose, C., Damm, M., Fitzner, D., Flierl-Hecht, A., Kümpfel, T., Kerschensteiner, M., Hohlfeld, R., **Gerdes**, L. A., Simons, M., 2020. Plasma lipidomics of monozygotic twins discordant for multiple sclerosis. *Annals of clinical and translational neurology*, 7(12), 2461–2466. <https://doi.org/10.1002/acn3.51216>

**Dr. Stefan Jordan:** “Food energy in multiple sclerosis: The role of cellular energy-sensors for pathogenic spinal cord infiltration and monocyte pro-inflammatory function”

## Ausschreibungsjahr 2018: „Verlauf einschätzen und Therapieerfolg messen: Neue Wege zu patientenrelevanten Studienendpunkten“

**Prof. Dr. Kerstin Ritter, Prof. Dr. Friedemann Paul, PD Dr. Michael Scheel:** “DeepMS: Deep Learning for monitoring disease progression in multiple sclerosis (MS)”

Noteboom, S., Seiler, M., Chien, C., Rane, R. P., Barkhof, F., Strijbis, E. M. M., Paul, F., Schoonheim, M. M., **Ritter, K.**, 2024. Evaluation of machine learning-based classification of clinical impairment and prediction of clinical worsening in multiple sclerosis. *Journal of neurology*, 10.1007/s00415-024-12507-w. Advance online publication. <https://doi.org/10.1007/s00415-024-12507-w>

Schulz, M. A., Hetzer, S., Eitel, F., Asseyer, S., Meyer-Arndt, L., Schmitz-Hübsch, T., Bellmann-Strobl, J., Cole, J. H., Gold, S. M., Paul, F., **Ritter, K.**, Weygandt, M., 2023. Similar neural pathways link psychological stress and brain-age in health and multiple sclerosis. *iScience*, 26(9), 107679. <https://doi.org/10.1016/j.isci.2023.107679>

Chien, C., Seiler, M., Eitel, F., Schmitz-Hübsch, T., Paul, F., **Ritter, K.**, 2022. Prediction of high and low disease activity in early MS patients using multiple kernel learning identifies importance of lateral ventricle intensity. *Multiple sclerosis journal - experimental, translational and clinical*, 8(3), 20552173221109770. <https://doi.org/10.1177/20552173221109770>

**Dr. Dr. Marlene Tahedi, Prof. Dr. Jens V. Schwarzbach:** “Functional connectivity dynamics as a novel outcome measure in multiple sclerosis diagnosis/prognosis”

**Tahedi, M.**, Levine, S. M., Weissert, R., Kohl, Z., Lee, D. H., Linker, R. A., **Schwarzbach, J. V.**, 2022. Early remission in multiple sclerosis is linked to altered coherence of the Cerebellar Network. *Journal of translational medicine*, 20(1), 488. <https://doi.org/10.1186/s12967-022-03576-4>

## Ausschreibungsjahr 2017: „Marker und Mechanismen progredienter Multiplen Sklerose im klinischen Kontext“

**Dr. Ahmed Abdelhak, Prof. Dr. Hayrettin Tumani:** “Explorative study of emerging blood biomarkers in progressive multiple sclerosis (EmBioProMS)”

**Abdelhak A, Bachhuber F, Ning K, et al** Blood biomarkers for predicting disability worsening in progressive multiple sclerosis: a multinational, individual participant-level analysis *Journal*

of Neurology, Neurosurgery & Psychiatry Published Online First: 12 June 2025. doi: 10.1136/jnnp-2025-335831

**Abdelhak**, A., Antweiler, K., Kowarik, M. C., Senel, M., Havla, J., Zettl, U. K., Kleiter, I., Skripuletz, T., Haarmann, A., Stahmann, A., Huss, A., Gingele, S., Krumbholz, M., Benkert, P., Kuhle, J., Friede, T., Ludolph, A. C., Ziemann, U., Kümpfel, T., **Tumani**, H., 2024. Serum glial fibrillary acidic protein and disability progression in progressive multiple sclerosis. *Annals of clinical and translational neurology*, 11(2), 477–485. <https://doi.org/10.1002/acn3.51969>

**Abdelhak**, A., Antweiler, K., Kowarik, M. C., Senel, M., Havla, J., Zettl, U. K., Kleiter, I., Hoshi, M. M., Skripuletz, T., Haarmann, A., Stahmann, A., Huss, A., Gingele, S., Krumbholz, M., Selge, C., Friede, T., Ludolph, A. C., Overell, J., Koendgen, H., Clinch, S., ... **Tumani**, H., 2024. Patient-reported outcome parameters and disability worsening in progressive multiple sclerosis. *Multiple sclerosis and related disorders*, 81, 105139. <https://doi.org/10.1016/j.msard.2023.105139>

**Abdelhak**, A., Krumbholz, M., Senel, M., Havla, J., Zettl, U. K., Kleiter, I., Skripuletz, T., Stahmann, A., Huss, A., Antweiler, K., Gingele, S., Kowarik, M. C., Hoshi, M. M., Hengstebeck, S., Friede, T., Ludolph, A.C., Kümpfel, T., Ziemann, U., **Tumani**, H., 2021. Patient-Centered Approach Might Effectively Tackle The Definition Of Progression In Chronic Neurological Diseases: Results From The EmBioProMS Trial In Progressive Multiple Sclerosis. *medRxiv. The reprint server for health sciences*. <https://doi.org/10.1101/2021.09.07.21262777>

**Abdelhak**, A., Huss, A., Stahmann, A., Senel, M., Krumbholz, M., Kowarik, M. C., Havla, J., Kümpfel, T., Kleiter, I., Wüstinger, I., Zettl, U. K., Schwartz, M., Roesler, R., Friede, T., Ludolph, A. C., Ziemann, U., **Tumani**, H., 2020. Explorative study of emerging blood biomarkers in progressive multiple sclerosis (EmBioProMS): Design of a prospective observational multicentre pilot study. *Contemporary clinical trials communications*, 18, 100574. <https://doi.org/10.1016/j.conctc.2020.100574>

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**Prof. Dr. Armin Nagel, Prof. Dr. Tobias Engelhorn, Prof. Dr. Ralf Linker:** “Tissue potassium (K<sup>+</sup>) versus sodium (Na<sup>+</sup>) as new marker in progressive multiple sclerosis.”

Wilferth, T., Müller, M., Gast, L. V., Ruck, L., Meyerspeer, M., Lopez Kolkovsky, A. L., Uder, M., Dörfler, A., **Nagel**, A. M. (2022). Motion-corrected <sup>23</sup>Na MRI of the human brain using interleaved <sup>1</sup>H 3D navigator images. *Magnetic resonance in medicine*, 88(1), 309–321. <https://doi.org/10.1002/mrm.29221>

Wilferth, T., Mennecke, A., Gast, L. V., Lachner, S., Müller, M., Rothhammer, V., Huhn, K., Uder, M., Doerfler, A., **Nagel**, A. M., Schmidt, M., 2022. Quantitative 7T sodium magnetic resonance imaging of the human brain using a 32-channel phased-array head coil: Application to patients with secondary progressive multiple sclerosis. *NMR in biomedicine*, 35(12), e4806. <https://doi.org/10.1002/nbm.4806>

Müller, M., Egger, N., Sommer, S., Wilferth, T., Meixner, C. R., Laun, F. B., Mennecke, A., Schmidt, M., Huhn, K., Rothhammer, V., Uder, M., Dörfler, A., **Nagel**, A. M., 2022. Direct imaging of white matter ultrashort T<sub>2</sub>\* components at 7 Tesla. *Magnetic resonance imaging*, 86, 107–117. <https://doi.org/10.1016/j.mri.2021.11.016>

Ruck, L., Mennecke, A., Wilferth, T., Lachner, S., Müller, M., Egger, N., Doerfler, A., Uder, M., **Nagel**, A. M., 2023. Influence of image contrasts and reconstruction methods on the classification of multiple sclerosis-like lesions in simulated sodium magnetic resonance imaging. *Magnetic resonance in medicine*, 89(3), 1102–1116. <https://doi.org/10.1002/mrm.29476>

## Ausschreibungsjahr 2016: „Marker & Mechanismen der progredienten Multiplen Sklerose“

**Dr. Mehrnoosh Jafari, Prof. Dr. Martin Kerschensteiner:** “Complement-mediated pathology in progressive MS models“

Jafari, M., Schumacher, A. M., Snaidero, N., Ullrich Gavilanes, E. M., Neziraj, T., Kocsis-Jutka, V., Engels, D., Jürgens, T., Wagner, I., Weidinger, J. D. F., Schmidt, S. S., Beltrán, E., Hagan, N., Woodworth, L., Ofengeim, D., Gans, J., Wolf, F., Kreutzfeldt, M., Portugues, R., Merkler, D., ... Kerschensteiner, M., 2021. Phagocyte-mediated synapse removal in cortical neuroinflammation is promoted by local calcium accumulation. *Nature neuroscience*, 24(3), 355–367. <https://doi.org/10.1038/s41593-020-00780-7>

**Prof. Dr. Wolfgang Brück, Prof. Dr. Christine Stadelmann-Nessler:** “Disease-specific abnormalities in the normal-appearing white and cortical grey matter as major drivers of disease progression in multiple sclerosis“

Bergner, C. G., van der Meer, F., Winkler, A., Wrzos, C., Türkmen, M., Valizada, E., Fitzner, D., Hametner, S., Hartmann, C., Pfeifenbring, S., Stoltenburg-Didinger, G., **Brück**, W., Nessler, S., **Stadelmann**, C., 2019. Microglia damage precedes major myelin breakdown in X-linked adrenoleukodystrophy and metachromatic leukodystrophy. *Glia*, 67(6), 1196–1209. <https://doi.org/10.1002/glia.23598>

Fard, M. K., van der Meer, F., Sánchez, P., Cantuti-Castelvetri, L., Mandad, S., Jäkel, S., Fornasiero, E. F., Schmitt, S., Ehrlich, M., Starost, L., Kuhlmann, T., Sergiou, C., Schultz, V., Wrzos, C., **Brück**, W., Urlaub, H., Dimou, L., **Stadelmann**, C., Simons, M., 2017. BCAS1 expression defines a population of early myelinating oligodendrocytes in multiple sclerosis lesions. *Science translational medicine*, 9(419), eaam7816. <https://doi.org/10.1126/scitranslmed.aam7816>

Lagumersindez-Denis, N., Wrzos, C., Mack, M., Winkler, A., van der Meer, F., Reinert, M. C., Hollasch, H., Flach, A., Brühl, H., Cullen, E., Schlumbohm, C., Fuchs, E., Lington, C., Barrantes-Freer, A., Metz, I., Wegner, C., Liebetanz, D., Prinz, M., **Brück**, W., **Stadelmann**, C., ... Nessler, S., 2017. Differential contribution of immune effector mechanisms to cortical

demyelination in multiple sclerosis. *Acta neuropathologica*, 134(1), 15–34.  
<https://doi.org/10.1007/s00401-017-1706-x>

Masuda, T., Sankowski, R., Staszewski, O., Böttcher, C., Amann, L., Sagar, Scheiwe, C., Nessler, S., Kunz, P., van Loo, G., Coenen, V. A., Reinacher, P. C., Michel, A., Sure, U., Gold, R., Grün, D., Priller, J., **Stadelmann**, C., Prinz, M., 2019. Spatial and temporal heterogeneity of mouse and human microglia at single-cell resolution. *Nature*, 566(7744), 388–392. <https://doi.org/10.1038/s41586-019-0924-x>

**Stadelmann**, C., Timmler, S., Barrantes-Freer, A., Simons, M., 2019. Myelin in the Central Nervous System: Structure, Function, and Pathology. *Physiological reviews*, 99(3), 1381–1431. <https://doi.org/10.1152/physrev.00031.2018>