

Department of Neurology

Chair of Neurology

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Research focus

- Stroke research – clinical and experimental
- Neurocritical care
- Telemedicine and health services
- Epilepsy
- Neuroimmunology
- Pain and functional imaging
- Autonomic nervous system
- Neuromuscular diseases
- Dystonia and botulinum toxin therapy
- Neuro-oncology

Structure of the Chair

Professorships: 4
Personnel: 309
• Doctors (of Medicine): 64
• Scientists: 12 (thereof funded externally: 9)
• Graduate students: 35

Clinical focus areas

- Emergency care
- Stroke
- Neurocritical care
- Epilepsy – center of epilepsy (EZE)
- Neuroimmunology
- Neuromuscular diseases
- Pain medicine
- Neuro-oncology
- Autonomic nervous system disorders
- Neurophysiology
- Ultrasound
- Dystonia und botulinum toxin therapy
- Neurocognitive disorders
- Telemedicine

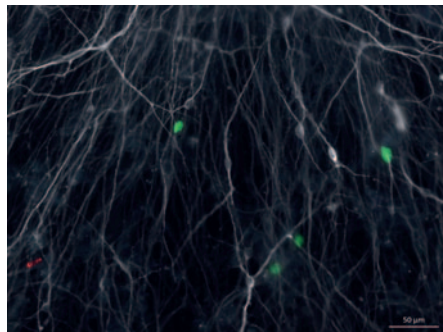
Research

The Department of Neurology is one of the largest neurological centers in Germany treating 4,000 in-patients and more than 19,000 outpatients each year. The research activities of our Department are shown in detail below. During the reporting period more than 200, some of them high-ranking publications, could be published.

Stroke research – clinical and experimental

PI: Prof. Dr. H. Huttner, PD Dr. B. Kallmünzer
Each year about 7,000 patients are admitted to our specialized neurological emergency room. After an immediate clinical examination, adequate diagnostic procedures and prompt specific emergency treatment are initiated, if necessary. For many neurovascular clinical studies, the screening and inclusion is managed directly in the emergency room. Additionally, all stroke patients – also those transferred from the North-Bavarian telestroke network STENO – are entered into prospective registries to allow scientific analyses (e.g. „Drip-and-ship“ in cases of planned thrombectomy).

We treat more than 1,000 inpatients on our 14-bed monitored stroke unit. An extremely high level of medical care (iv-thrombolysis rate > 25%) is combined with state-of-the-art research, including clinical studies on thrombolysis, recanalization therapy, and secondary prevention of cardioembolism.



Neuronal cell culture

Neurocritical care

PI: Prof. Dr. H. Huttner
In clinical routine – also addressed in clinical and translational research studies – we mainly focus on severe strokes, intracranial hemorrhage, meningitis, and status epilepticus. Examples of current research projects refer to stroke treatment approaches that still are considered experimental, e.g. intraventricular fibrinolysis, brain edema management using multimodal neuromonitoring, and hypothermia.

Telemedicine

PI: PD Dr. L. Breuer
Since 2007, the Department of Neurology has been coordinating the Stroke Network using Telemedicine in Northern Bavaria (STENO), which includes three stroke centers and 18 regional hospitals. As the only telestroke-network of its kind, it has been certified in 2011 according to DIN EN ISO 9001:2008 for its network-wide quality management system. STENO is

part of the medical standard care and ensures comprehensive stroke care in North Bavaria and southern Thuringia at the highest level. The impact and effects of STENO are investigated in scientific studies.

Epilepsy

PI: Prof. Dr. H.M. Hamer, MHBA
The Erlangen Epilepsy Center ranks among the top five university epilepsy centers in Germany. Scientific hot spots include:
1) Changes of the innate immune-system in epilepsy;
2) Epilepsy in CNS-malformations;
3) Automatic seizure detection;
4) Magnetoencephalography;
5) Neuropsychology/Cognition and invasive EEG;
6) Quantitative EEG in epilepsy and encephalopathy;
7) Drug monitoring;
8) Historical aspects of epileptology;
9) Socio-economic aspects of epilepsy.
Funding: EU, DFG, Bavarian State Ministry of Health and Care

Neuroimmunology

PI: Prof. Dr. R. Linker
Three research groups successfully focus on
1) immunoregulation and biomarkers in multiple sclerosis (MS) patients,
2) neuroprotection and neurodegeneration in experimental models with a focus on glial cells, and
3) Influence of environmental factors on the pathogenesis of MS. Further research comprises studies on new imaging modalities and studies on new treatment in a bench-to bedside approach.
Funding: IZKF Erlangen, DFG, several industry-funded research projects

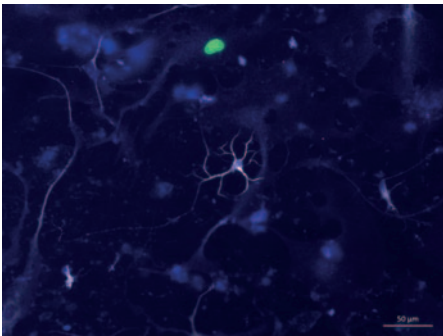
Pain and Headache

PI: Prof. Dr. F. Seifert
This group investigates neural mechanisms of sensory, autonomic, and cognitive processing in pain disorders (neuropathic pain, headache, stroke, and MS). We use psychophysical and autonomic testing combined with functional and structural brain imaging methods (voxel-based lesion symptom mapping (VLSM), functional magnetic resonance imaging (fMRI), repetitive transcranial magnetic stimulation (rTMS).

Autonomic nervous system

PI: Prof. Dr. M. J. Hilz
The autonomic research laboratory evaluates cardiovascular autonomic function in patients with central and peripheral autonomic network disorders. Additional quantitative sensory testing of thermal perception refines the evaluation

of small fiber neuropathies. In patients with lysosomal orphan diseases (M. Fabry, M. Pompe), we evaluate the effects of enzyme replacement therapy. We study the clinical organization of the central autonomic network by assessing cardiovascular autonomic function in patients with central nervous system lesions, such as stroke, MS, traumatic brain injury, and in persons who are exposed to repetitive mild head and brain injuries.



Neuronal cell culture

Neuromuscular diseases

PI: Dr. M. Türk, Dr. C. Möbius, Prof. Dr. R. Linker, Prof. Dr. R. Schröder

The Neuromuscular Disease Center is an interdisciplinary center providing a specialized outpatient clinic and a neuropathological laboratory for diagnostic biopsies and for the investigation of neuromuscular diseases. The neuromuscular research is composed of several task forces with the following key aspects:

- 1) Immunopathogenesis of autoimmune myositis, myasthenia gravis, and immune neuropathies;
- 2) Studies on the pathogenesis of myofibrillar myopathy and other protein aggregation myopathies.

Dystonia and botulinum toxin therapy

PI: Dr. C. Möbius

Our main aim is to improve the diagnostic and therapeutic process for patients with dystonic movement disorders and spasticity. Other than participating in several multicenter clinical trials, our research focus lies in the early detection and treatment of post stroke spasticity and the identification of specific muscle patterns in cervical dystonia using ultrasound and ultrasound-guided electromyography.

Neuro-oncology

PI: PD Dr. M. Uhl

The goal of interdisciplinary neuro-oncology is the treatment of patients with brain tumors. Beside the daily routine patients, we have the ambition to provide attractive clinical trials for all

patients. A focus here are currently translational immune therapy studies of the phases II and III.

Teaching

Between everyday clinical practice and the teachings segment of our Department, the interdisciplinary clinical courses „Querschnittsfächer“ for immunology/infectiology, emergency medicine and pain medicine gained widespread recognition by the students.

We supervise MD and PhD theses.

Selected publications

Winder K, Seifert F, Köhrmann M, Crodel C, Kloska S, Dörfler A, Hösl KM, Schwab S, Hilz MJ. Lesion mapping of stroke-related erectile dysfunction. *Brain*. 2017 Jun 1;140(6):1706-1717

Staykov D, Kuramatsu JB, Bardutzky J, Volbers B, Gerner ST, Kloska SP, Doerfler A, Schwab S, Huttner HB. Efficacy and safety of combined intraventricular fibrinolysis with lumbar drainage for prevention of permanent shunt dependency after intracerebral hemorrhage with severe ventricular involvement: A randomized trial and individual patient data meta-analysis. *Ann Neurol*. 2017 Jan;81(1):93-103

Wilck N et al. Salt-responsive gut commensal modulates T(H)17 axis and disease. *Nature*. 2017 Nov 30;551(7682):585-589

Kuramatsu JB et al. Management of therapeutic anticoagulation in patients with intracerebral haemorrhage and mechanical heart valves. *Eur Heart J*. 2018 May 14;39(19):1709-1723

Lang JD, Kostev K, Onugoren MD, Gollwitzer S, Graf W, Müller T, Olmes DG, Hamer HM. Switching the manufacturer of antiepileptic drugs is associated with higher risk of seizures: A nationwide study of prescription data in Germany. *Ann Neurol*. 2018 Dec;84(6):918-925

Gerner ST et al. Association of prothrombin complex concentrate administration and hematoma enlargement in non-vitamin K antagonist oral anticoagulant-related intracerebral hemorrhage. *Ann Neurol*. 2018 Jan;83(1):186-196

International cooperations

Prof. J. Frisen, Department of Cell and Molecular Biology, Karolinska Institute, Stockholm: Sweden

Prof. D. Henshall, Royal College Dublin: Ireland

S. Hanslmayr, Birmingham: UK

Prof. Dr. M.-J. Hilz, Icahn School of Medicine at Mount Sinai: USA

Prof. R. Guerrini, Florence: Italy