The civilization diseases constitute a significant socio-economic problem of the 21st century, and they particularly affect developed countries. Over 70% of deaths annually are attributed to civilization diseases and neurological conditions are associated with a particular burden. Therefore, it is necessary to look for new therapeutic solutions. The development of new therapeutic strategies requires the use of animal models that provide insight into pathological processes that would not be possible solely based on in vitro techniques. Preclinical studies are mainly based on small laboratory animals. They have a number of advantages, but many clinical trials of potentially promising therapeutics failed. The United States Food and Drug Administration recommends the use of large animal models to evaluate the efficacy, durability, dose-response, and safety of advanced medicinal products. Recent progress with biotechnological drugs elevated expectations of therapeutic benefits. In the context of brain diseases, it is important to note that biotechnological drugs are typically characterized by the large size precluding the blood brain barrier penetration after traditional intravenous administration. Intra-arterial injection to the brain is championed as much better delivery route with reports on excellent brain concentration of the drug with reduced systemic toxicity. To achieve higher precision and reproducibility of drug delivery it is prudent to use magnetic resonance imaging as it allows guiding neurointerventions, monitoring the response to the applied therapy in real time and, offers insight into the evolution of lesions over time.

The main aim of the study was to use endovascular techniques in large animals to establish new research tools for translational preclinical studies. These methods were used for induction of an ischemic stroke in domestic pigs with evolution of ischemic brain lesion observed real-time. Second aspect of the project was stem cell-based therapy with MRI-guided transplantation of stem cells into the central nervous system of dogs suffering from degenerative myelopathy.