Project Summary: The proteins MMP-2 and MMP-9 are essential for penetration of the blood-brain barrier (BBB). In their absence experimental autoimmune encephalomyelitis (EAE) – the animal model of Multiple Sclerosis (MS) - does not occur. They are produced by different cells and have different effects at the BBB. Data suggests that imaging of MMP-2/-9 activity is possible and that they are sensitive markers specifically for BBB penetrating immune cells. Considering this, our goal is to understand the function of MMP-2/-9 at the parenchymal border and to exploit MMP activity as an imaging biomarker for leukocytes penetrating the BBB in correlation to imaging of T cell dynamics in vivo. We intend to define the function of MMP-2/-9 at the BBB to better understand lesion formation and resolution. This will require correlation of MMP-2/-9 activity and function at the parenchymal border with dynamics of T cell populations. This information will be employed to correlate molecular imaging of T cell populations and MMP-2/-9 activity with conventional MRI imaging technologies in a hybrid PET-MRI approach in both EAE and MS patients.

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