Microfluidics to Study Huntington's Disease by Visual Proteomics

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Cryogenic electron microscopy (cryo-EM) allows the investigation of biological samples at high resolution. Whereas the technology for imaging and data processing made impressive progress during the last seven years, sample preparation remains a bottle-neck. We developed microfluidic strategies for protein purification and preparation for high-resolution imaging of the protein by cryo-EM, allowing the atomic structure of the target be solved from less than 1 µL cell lysate. The new SNI PhD project aims at further developing microfluidic methods to grow eukaryotic cells directly on EM-grids, and to vitrify these cells without any harsh procedure as used until today.

We aim at directly apply this new method to study the stereotypic spatiotemporal spreading of pathological lesions through the nervous system. This prion-like spreading of inclusions is a hallmark of many neurodegenerative diseases. We will use the Huntington Disease model systems to study the spreading of prion-like particles through neuronal connections between diseased and healthy cells by cryo-EM tomography.