Identification of novel bioactive mediators of tissue scarring, inflammation and extracellular matrix remodeling after spinal cord injury, (SCI-NET)

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Spinal cord injury (SCI) can have a devastating impact on the life of affected individuals. It is usually the result of severe trauma following road traffic accidents, occupational and sporting accidents and acts of violence. SCI often results in partial or complete paralysis, limiting the patients' ability to perform simple daily functions independently (such as eating, washing and dressing) as well as loss of bladder, bowel and sexual function. Despite this, there are still no adequate therapies for SCI. Pathologically, SCI is characterized by chronic inflammation at the site of injury and tissue damage that does not heal or regenerate. The lack of healing causes drastic changes in the tissue structure, which becomes fibrotic scar tissue. We have recently discovered that there is a link between the molecules (or proteins) involved in tissue scarring and chronic inflammation, and that proteins that make up the scar tissue can cause and amplify inflammation. This leads to a long term inflammatory reaction and does not allow positive tissue regeneration and healing. Unfortunately, the molecules that are responsible for this problematic response are not yet known and the mechanism is not understood. Here, our consortium of leading international experts in the field of SCI will collaborate in order to understand this pathological process and will test a therapeutic approach that aims to block this unceasing local inflammation and promote positive wound healing. To do so, we will use rodent animal models that accurately replicate the pathological characteristics of human SCIs and precious clinical human samples from SCI patients. In our pre-clinical animal models we will test the therapeutic approach and identify the molecules and mechanisms that drive inflammation and scarring. The human samples will be used to discover new diagnostic markers of disease and possible therapy targets focusing on the disruption of perpetual inflammation and fibrosis. To maximize our chances for discovery we will use different variations of a high-end technology called proteomics, based on state-of-the-art analytical instruments that can identify and quantify thousands of proteins, the key molecules that make up our tissues and are massively altered after injury. Our approach is very innovative and we expect to make new discoveries that will change our understanding of the pathology of SCI and processes involved in repairing the spinal cord, and ultimately this data may lead to new therapies for improving functional outcome for spinal injured patients.