Characterization of Brain Morphology in Mucopolysaccharidosis Type IIIB Affected Mice Using Magnetic Resonance Imaging

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Introduction

Mucopolysaccharidosis Type IIIB, a lysosomal storage disorder, results in the retention of heparan sulfate. This retention is associated with chronic brain inflammation and abnormal neuropathology, ultimately leading to severe neurodegeneration in affected individuals [1,2]. Characteristic features include increased permeability of the blood brain barrier and activated microglia. The focus of this project is to conduct a longitudinal study to assess changes in brain morphology of MPSIIIB mice with the 4.7 T and 11 T magnets in an attempt to determine what changes are measurable and which magnet produces optimal imaging results and will therefore be used in future studies. This research will not only provide new insight into morphological changes occurring in the brains of these affected mice over time, but it will also fill a long standing void in qualitative and quantitative analysis in this particular animal model.

Experimental

The MPSIIIB mouse model (-/-), provided in collaboration with Mark Sands, and control (+/-) will be employed in this study. Five mice from each genotype will be subject to MRI analysis using the 4.7 T magnet and the 11 T magnet. MRI analysis will be conducted when mice are two, five and eight months of age. Diffusion weighted-MRI is a preferential method of imaging since it is more sensitive to early changes in brain morphology after neuronal damage. In order to improve image detection and resolution, and assess for inflammation and blood brain barrier permeability, a gadolinium chelate based contrast agent will be used. Mice will be injected with 100 µl of 0.5 mol/L gadolinium chelate via tail vein catheter [3]. MRI images will also be take pre and post gadolinium chelate administration. Additional factors associated with MRI such as T_1 and T_2 relaxation time will also be evaluated during the procedure.

Results and Discussion

Thus far we have done MRI parameter optimization for our mice and identified the proper coil and settings. We have not started the experimental comparison MRIs. These are scheduled to begin in early December 2013.

Conclusions

The experiment is feasible and the proper settings have been determined.

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References

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