White matter injury and repair

Charles Cohan PhD
University of Miami
Evelyn F. McKnight Brain Institute
White matter lesions are common, understudied, and can result in cognitive impairment

- Over 90% of aged individuals have white matter hyperintensities\(^1\).

- White matter damage can result in cognitive impairments that are dependent upon the location of the injury\(^2-3\).

\(^1\) J Neurol Neurosurg Psychiatry 2001;70;9-14
\(^3\) Lancet Neurol 2002;1:426-436.
Generation of a novel vasoconstrictor white matter injury model

L-NIO

AP +1.5 mm
ML 2.0 mm
DV 2.8 mm

AP 0 mm
ML 2.0 mm
DV 2.8 mm


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Neurostar injection system can focally target white matter tracts
L-NIO injection causes glial scar formation and axonal injury.
Hypothesis

L-NIO injection into white matter will create similar injuries in young and middle-aged rats.
L-NIO injection triggers cell death in white matter tracts

3 months Saline

3 months L-NIO

10 months Saline

10 months L-NIO

Green: NeuN
Red: Apoptosis Inducing Factor

Arbitrary Fluorescence Units

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3 month Sham 3 month L-NIO 10 month Sham 10 month L-NIO
Glial scar marker is increased in young animals following L-NIO injection

Red: Glial Fibrillary Acidic Protein
Microglial marker is not increased following L-NIO injection

Iba1

Green: Iba1

Arbitrary Fluorescence Units

Saline

L-NIO

3 months

10 months

3 month Sham L-NIO 10 month Sham 10 month L-NIO
What can improve cognitive recovery following white matter injury?
Exercise improves cognitive recovery in young and old rats following stroke
Future experiments: treatment of white matter injury with exercise

Day: (3 days)

- Handling
- L-NIO White Matter Injury
- Recovery
- Forced Treadmill Exercise
- Cognitive deficit measurements
- Histology
Summary

• L-NIO injection causes a focal white matter injury.

• The profile of the injury is different between young and middle-aged animals.

• Exercise may be a potential treatment to promote repair and cognitive recovery following injury.
Thank you!

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