Effects of Ethanol on Brain Injury: Role of Microglial Migration

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Traumatic Brain Injury (TBI)

- **Damage** to the brain due to a strong blow or jolt to the head.
- **CDC:** 2.5 million people were afflicted with TBI & related brain injuries in 2010.
- **Repercussions:** decreased cognitive functioning, increased risk of neuro-degenerative disorders.

**TBI: Role of Ethanol**

- 35-81% of patients with TBI: *intoxicated*; 42% of these patients: heavy drinkers prior to the injury (Opereanu et al., 2010).
- Ethanol is likely a causative agent, but its effects on clinical outcomes of TBI are unclear.
TBI: Role of Microglia

- Microglia cells: Primary immune cells of the central nervous system.

- In response to damage: Microglia get activated and migrate to site of damage.

- Response at the site: Neuro-inflammatory AND the Repair response.
Objective: To study the effects of ethanol on microglia.

Approach: To perform wound healing assay; allow mouse BV2 microglia cells to fill in scratch area over a period of 6 hrs. in the presence and absence of ethanol.

Hypothesis: Ethanol would inhibit the migration of microglial cells.
Wound Healing Assay

Poly-lysine treated plate.

0.5 million mouse BV2 microglia cells/well were plated.

Complete DMEM media containing 10% fetal bovine serum and an antibiotic-antimycotic solution (100 units penicillin, 0.10mg streptomycin, and 250ng amphotericin B per mL).

Multiple images/well were captured at t= 0 and t = 6 hrs. using Olympus IX70 microscope.

CONTROL: Cells incubated at 37°C for 6 hours in DMEM only media.

Confluent microglial cell layer was scraped using 200μL pipette tip.

EtOH: Cells incubated at 37°C for 6 hours in DMEM media containing 100mM ethanol.

Image Analysis: ImageJ using MRI macro or unbiased manual analysis.
Manual vs. MRI Analysis

$r = 0.838$
One-Way ANOVA test
P = 0.646
Results: control

Control t = 0 hrs.

1.354 mm$^2$

Control t = 6hrs.

0.982 mm$^2$
Results: ethanol

EtOH t= 0 hrs. 1.158 mm²

EtOH t= 6 hrs. 1.106 mm²
Paired t test
p** = 0.01
Summary

- The decrease in area of the scratch after 6 hours is reduced in the presence of ethanol.

- Ethanol inhibits the migration of microglia cells.
Thank you!

Questions??

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