Effects of Probiotic Bacteria on Inflammation Following Juvenile Traumatic Brain Injury

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Introduction/Objective

Inflammation was evaluated in animal subjects using a model of traumatic brain injury following a probiotic treatment. Animals received a controlled cortical impact injury on the right side of the cranium above the hippocampus. The objective is to identify a link between a probiotic bacterial treatment and the inflammation of a juvenile brain following traumatic brain injury (TBI). Numerical counts of astrocytes will indicate the amount of inflammation present in the brain tissue. Our first hypothesis is that there will be greater number of astrocytes in the tissues on the ipsilateral side of the brain. Alternately, we expected to see a reduction of astrocytes in brain tissue were treated with the probiotic bacteria. The results gathered from this study were not conclusive. However, further research should be conducted in this area before any definitive conclusions can be stated.

Experimental Methods

1.At 28 days post birth, animal subjects received a controlled cortical impact injury (CCI) in the right hemisphere of the brain, above the hippocampus in the brain.

2.Subjects ingested Lactobacillus rheuteri by oral gavaging for one month. The brain tissues from the subjects were harvested and sliced.

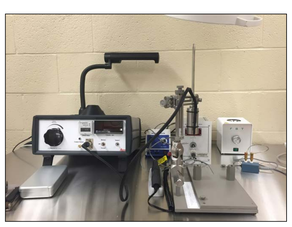
3. Tissues were treated with Glial Fibrillary Acidic Protein antibody (GFAP) at a 1:2000 ratio, and DAB for staining.

4.Tissue sections were mounted onto glass slides and dehydrated.

5.Slides were examined using microscopy at a magnification of 100x. Photos of eight regions of the brain were taken, with four on the ipsilateral cortex, and four on the contralateral cortex.

6.Cell counts for the regions were recorded and used for analysis.

brain tissue slice

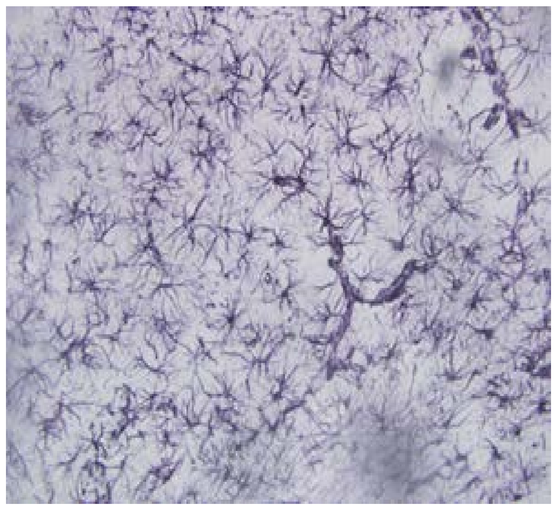


Machine used to administer CCI

Results

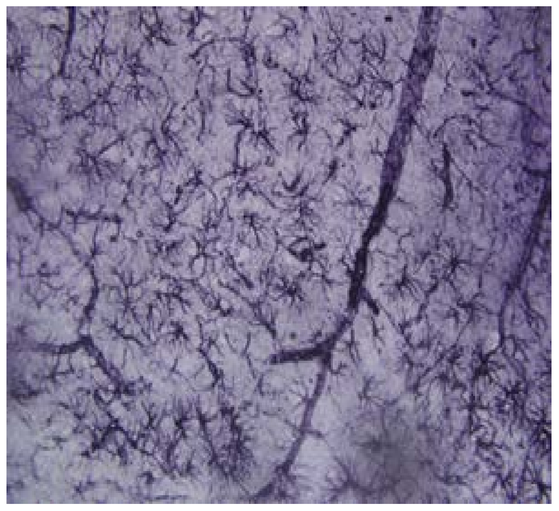
Contralateral

Lacto Sham, 123 astrocytes

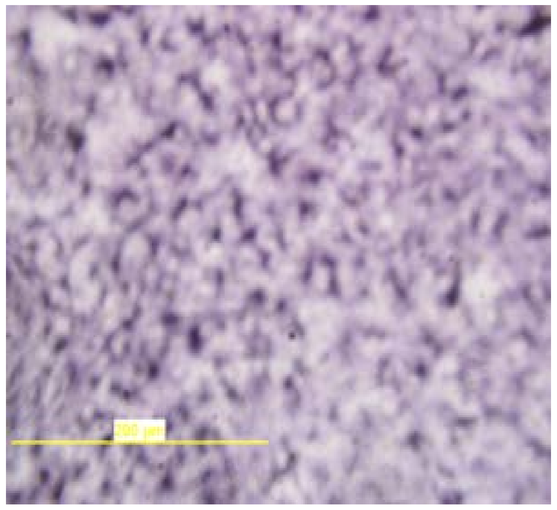


Ipsilateral

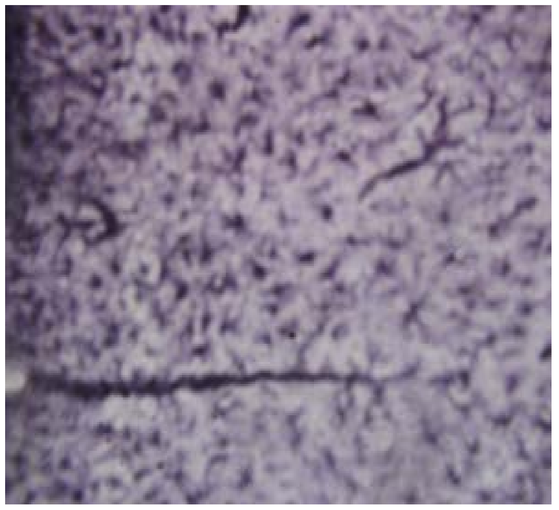
Lacto Sham, 109 astrocytes



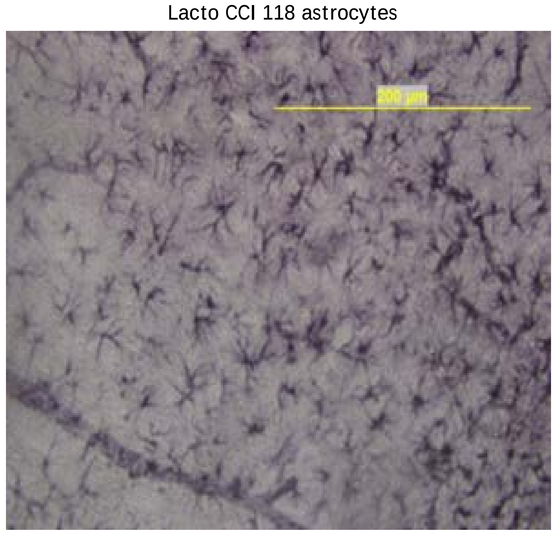
Broth Sham, 126 astrocytes



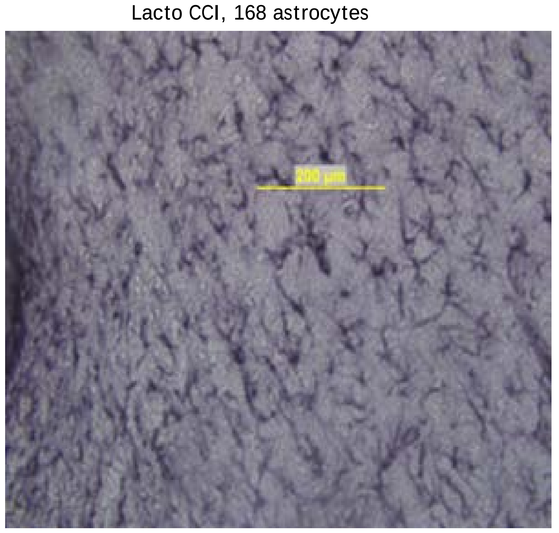
Broth Sham, 142 astrocytes



Lacto CCI 118 astrocytes



Lacto CCI, 168 astrocytes



Discussion

The GFAP antibody and DAB used to treat and stain the brain tissue allowed the astrocytes to be visualized using microscopy. When determining the amount of GFAP antibody to use, it was important to choose an amount that allowed the astrocytes to be visible despite the small concentration. The 1:2000 ratio that was used yielded clear images of the astrocytes.

The numerical counts of astrocytes in the lactobacillus brain tissue were similar in numerical value to the counts of astrocytes in the broth tissues. We were expecting to see a significantly lesser amount of glial cells in the lactobacillus treated tissues. It is unclear whether the probiotic treatment had any effect on the inflammation in the brain tissue following the TBI.

Conclusion

The results indicate that GFAP antibody was an excellent decision for this experiment because it allowed the astrocytes to be visualized in great detail under the microscope. The amount of glial cells in the broth brain tissues was similar to the amount found in the lactobacillus tissues. This study can be expanded upon and conducted again by changing different variables, and it is a study that is still being worked on today.

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