Comparison of Chlamydia antigen and AD-like pathology in the brains of BALB/c mice following intranasal infection with Chlamydia muridarum or Chlamydia pneumoniae

Lindsey V. Weidmann,1 Brian J. Balin,1 Denah M. Appet,1 Justin H. Schripsema,2 Christopher L. Smith,2 Kyle Ramsey2 and C. Scott Little1

1 Philadelphia College of Osteopathic Medicine and 2 Microbiology Department, Chicago College of Osteopathic Medicine, Midwestern University, Downers Grove, Illinois 60515

Abstract

Previous research in collagen IV in mice inoculated with Chlamydia pneumoniae (Cp) demonstrated AD-like pathology in the brain which suggested that this microorganism might be a potential pathogen in Alzheimer’s disease [2]. Recently, we reported an AD-like histological profile following intranasal infection of BALB/c mice with Chlamydia muridarum (Cm) [1]. These findings suggest that Chlamydia-related AD-like histological profiles may be related to the chlamydial species inoculated. In the current study, we have determined if Cm and Cp demonstrate AD-like pathology comparable to that described in previous research and if Cm demonstrates AD-like pathology comparable to that described in Cp infected mice.

Methods

Two different isolates of mouse adapted Chlamydia bacillary White strains were used. The first isolate was Chlamydia bacillary White strain A susceptible to amoxicillin and the second isolate was Chlamydia bacillary White strain C resistant to amoxicillin. Both isolates were used as the inoculum to infect BALB/c mice. Mice were inoculated intranasally with 10,000,000 oNMP of each isolate. Mice were sacrificed 1, 2, 3 and 4 months post-infection. Tissue was examined using 10x, 20x and 40x power objectives. Images were taken with a Sony camera using a co-capture button. Two brains from each group and time point were examined and 20 images were captured per brain section. Images were imported into Adobe Photoshop CS4 and measured with the selection lasso tool. Images were printed at a scale of 1:1 for presentation. Images were cropped to fit the 200x200 pixel parameter and adjusted for contrast and color to show the intensity of the amyloid staining. Images were then transferred to Excel for statistical analysis. Images of tissue sections were used to compare the differences in tissue sections stained for Chlamydia antigen and amyloid deposits.

Results

Chlamydia Labeling

Beta Amyloid Labeling

Table 1: Comparative Analysis of Amyloid and Chlamydia Deposition in Cm and Cp Infected Mice

<table>
<thead>
<tr>
<th></th>
<th>Cm 1 Mon</th>
<th>Cm 2 Mon</th>
<th>Cm 3 Mon</th>
<th>Cm 4 Mon</th>
<th>Cp 1 Mon</th>
<th>Cp 2 Mon</th>
<th>Cp 3 Mon</th>
<th>Cp 4 Mon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amyloid</td>
<td>1.25</td>
<td>1.87</td>
<td>2.25</td>
<td>2.37</td>
<td>1.56</td>
<td>2.09</td>
<td>2.25</td>
<td>2.37</td>
</tr>
<tr>
<td>Chlamydia</td>
<td>0.38</td>
<td>0.72</td>
<td>0.92</td>
<td>1.02</td>
<td>0.38</td>
<td>0.72</td>
<td>0.92</td>
<td>1.02</td>
</tr>
</tbody>
</table>

Conclusions

1. Substantial chlamydia and amyloid labeling at the 2 month time point following intranasal infection with Chlamydia pneumoniae suggests that the chlamydia infection induces amyloid pathology.

2. Amyloid deposition at the 2 month time point in mice intranasally infected with Chlamydia muridarum demonstrates that it has the same AD-like pathology as Cm infected mice. This suggests that Cm may be a potential cause of AD-like pathology.

3. The substantial increase in amyloid deposition and chlamydia labeling observed following infection with the C. muridarum strain implies the chlamydial infection is likely responsible for the AD-like pathology. The degree of pathological induced following infection varies based on the isolate of chlamydia introduced.

Acknowledgments

I would like to thank Guillermo Lopez and Robert Seck for their help labeling and acquiring pathology. I would also like to thank Karen C. for assisting in the histology necessary to complete this project. Thank you to Chris and Iam for use of lab equipment and space during your research. A special thanks goes to Dr. Michael Gage for providing lab space.

Bibliography