Argument Analysis of Alzheimer's Disease

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Introduction

Experimental science papers can be difficult to understand. In Dr. Jodi Schneider's lab we studied the argumentation and logical reasoning within a paper in Alzheimer's research. Alzheimer's disease is a form of dementia that affects 30 million people worldwide, and has no known cure.

Understanding the reasoning of papers can help assess their quality, and could make it easier to translate or reuse scientific research. We use a new representation called micropublication (Clark et al. 2014) to visualize the structure of the multiple experiments.

We used the paper "Propagation of Tau Pathology in a Model of Early Alzheimer's Disease". This paper describes how mouse models can be used to study Alzheimer's disease. It is one of the top ten most influential Alzheimer's disease research papers selected by members of Journal of Alzheimer's Disease.

Methods

How to Create a Micropublication:

1. Identify a scientific research paper

2. Annotate using http://hypothes.is

3. Diagram the reasoning and arguments of the scientific paper

4. Create a Micropublication

Results

We analyzed the paper "Propagation of Tau Pathology in a Model of Early Alzheimer's Disease" (#1) through annotation (#2) and argument diagramming.

The micropublication diagram (#4) provides an outline and summary for the paper and its claims. The authors' main claim is that their mouse model helps understand the mechanism and progression of Alzheimer's disease. In the micropublication below, C0 shows the main claim. We found 4 lines of argument supporting this claim, shown below as the four sub-claims C1, C2, C3, C4. The material (M), methods (m), and data (D) produce the sub-claims.
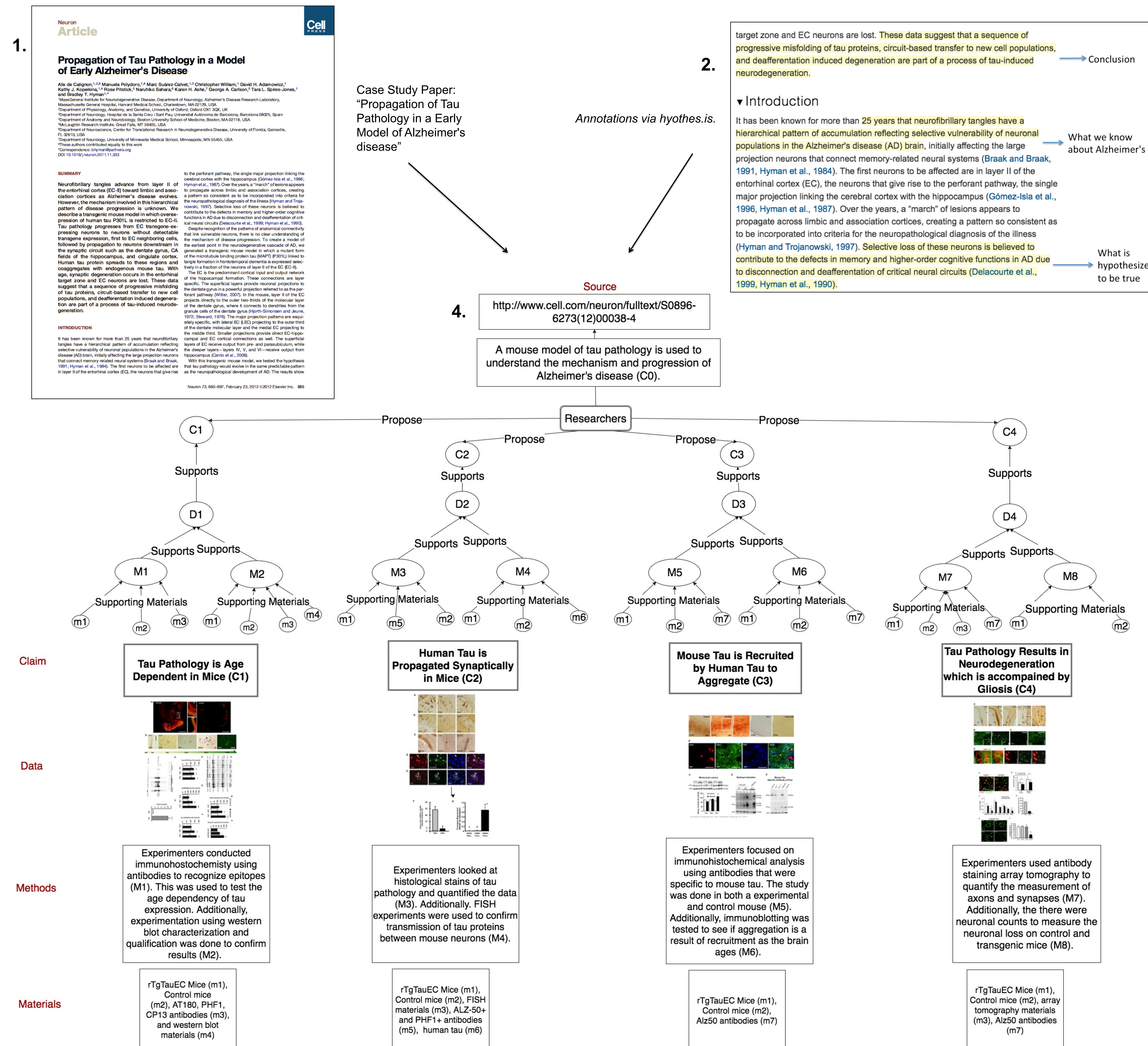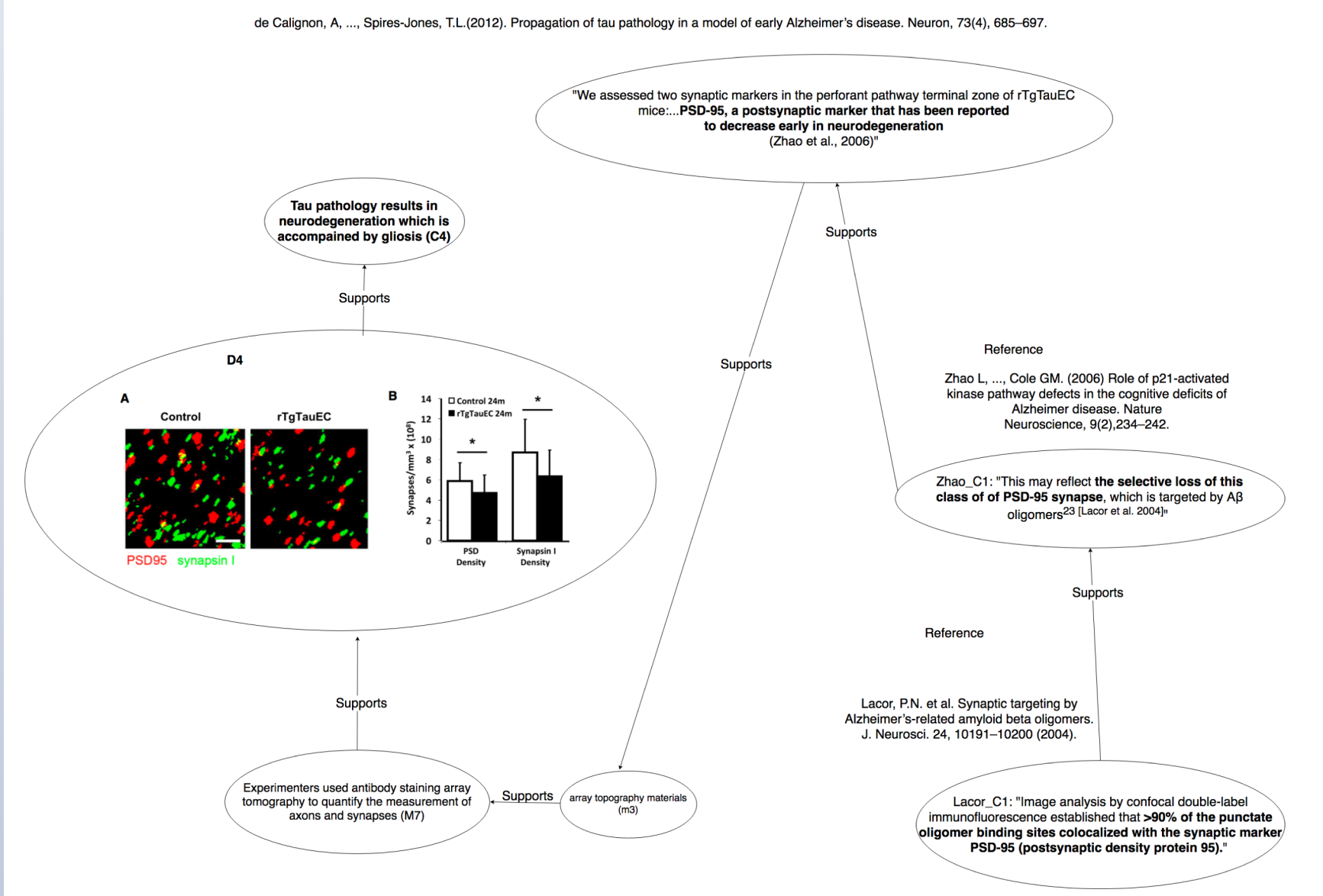

Fig 1: Micropublication model for "Propagation of Tau Pathology in a Model of Early Alzheimer's Disease"

Future Work

Papers can be linked by citation relationships. Claim C4 is supported by citing Zhao et al. 2006 which in turn cites Lacor et al. 2004.

Fig 2: Argument Graph Across Papers

This chain of citations justifies the choice of biomarker materials: "PSD-95, a postsynaptic marker that has been reported to decrease early in neurodegeneration (Zhao et al., 2006)".

Conclusions

We identified four lines of argument about how tau pathology in mice models is related to Alzheimer's disease in humans. We created a diagram of the logical reasoning presented in "Propagation of Tau Pathology in a Model of Early Alzheimer's Disease".

This can make the role of research data and supporting evidence more clear. For instance, showing the dependencies between articles (Figure 2) could help identify possible logical inconsistencies in a network of scientific papers, and prioritize research for reproducibility experiments. Micropublications can also support more granular search and retrieval of aspects of scientific papers, such as the materials or methods used.

In the future, the manual analysis conducted will help informatics researchers in the Schneider Lab develop a system to automatically extract arguments.

References

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