Determining the Embryonic Origin of Primate Encephalization via High Resolution MRI

A.C. Halley, T.W. Deacon, B. Inglis (UC Berkeley)

Introduction

This research project aims to study embryonic alterations to brain growth in a variety of primate species as compared with non-primate mammals. Our goal is to compare brain and body weights/volumes in primate and non-primate mammal embryos at comparable developmental stages to (1) confirm or disconfirm the conservation of shared primate and shared non-primate growth patterns, and (2) estimate the timing of divergence in primate brain/body growth and to identify its developmental mechanisms.

Experimental

Two rat embryos on loan from the Museum of Vertebrate Zoology (MVZ) in Berkeley, CA were shipped in NMR tubes to colleagues at the NHMFL for testing of scanning protocols. Embryos were scanned in phosphate buffered saline (PBS) utilizing the 750 MHz Bruker magnet. UTE, RARE, and FLASH images were obtained. Protocol testing was interrupted by console updates and unforeseen delays in scanning schedules; scanning is expected to resume in January 2014.

Results and Discussion

Initial scanning yielded images promising for the proposed study (see figures 1 and 2), and will allow volumetric analysis of embryonic brain growth. However, additional scans to improve spatial resolution are planned utilizing fluorinert rather than phosphate buffered saline. Additionally, using gauze rather than foam to fix the embryo in place is predicted to remove air completely from the solution. Once improved scanning protocols are determined, additional embryos will be shipped from the MVZ for structural scanning, and analysis of brain growth will commence.

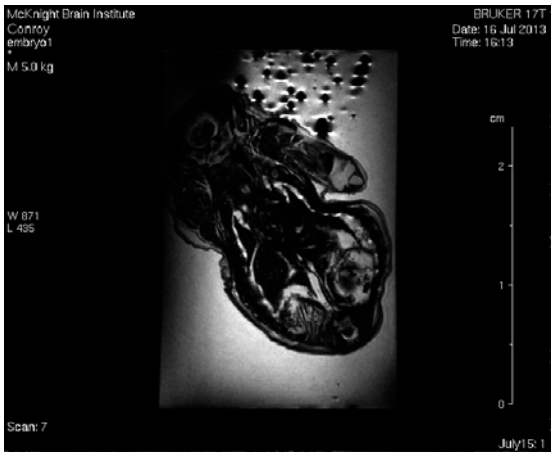

Figure 1. RARE scan of rat embryo in phosphate buffered saline in 25mm NMR tube used to test scanning protocols.

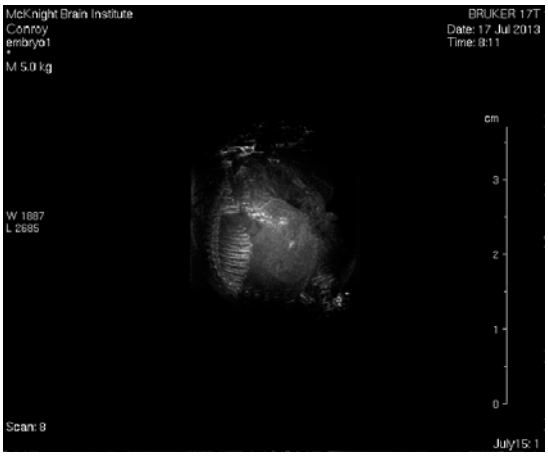

Figure 2. UTE scan of rat embryo in phosphate buffered saline in 25mm NMR tube used to test scanning protocols.

Conclusions

Initial scanning is promising for the proposed study. Further improvement of spatial resolution by the methods described above is planned for January 2014, after which embryonic specimens central to the proposed study will be scanned and analyzed.

Acknowledgements

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