Introduction

Lithium (Li) is a neuroprotective agent and a candidate drug for Alzheimer’s disease (AD), amyotrophic lateral sclerosis (ALS), and Parkinson’s disease (PD). More recently, Li has also been regarded as a therapeutic strategy for treatment of psychiatric disorders and neurodegenerative diseases. However, Li administration may cause severe adverse effects. Therefore, the effects of Li administration need to be precisely monitored. Imaging mass spectrometry (IMS) is a powerful tool for monitoring Li distribution in tissue sections and elucidating the pharmacodynamic and pharmacokinetic behavior of Li. In this study, we performed IMS using a MALDI-TOF mass spectrometer to clarify the effects of Li administration on mouse brains.

Methods

Using a MALDI-TOF instrument, we analyzed lithium distribution in mouse brains at a single dose level of Li (10 mM). The mice were sacrificed 14 days after administration, and the brains were prepared for IMS analysis. The IMS images were visualized using a software program to assess Li distribution. We used SIMS (secondary ion mass spectrometry) to monitor Li distribution in tissue sections. The IMS images were compared with HE staining images to assess the effects of Li administration.

Results

Visualization of Li in mouse brains: We successfully visualized Li distribution in mouse brains using IMS. The IMS images showed a uniform distribution of Li in the mouse brains, indicating that Li administration had a uniform effect on the brain tissue. The IMS images were also compared with HE staining images to assess the effects of Li administration on the brain tissue. The IMS images showed that Li administration influenced the morphology of the brain tissue, indicating that Li administration had a significant effect on the brain structure.

Conclusions

Our results indicate that IMS is a powerful tool for monitoring Li distribution in tissue sections and elucidating the pharmacodynamic and pharmacokinetic behavior of Li. IMS is also a useful tool for assessing the effects of Li administration on the brain tissue. Our results suggest that IMS is a promising tool for the study of Li administration.