Comparison of acute effects of neurotoxic compounds in neural networks from rodent and human neurons using microelectrode arrays

INTRODUCTION

While neurotoxicity screening using neural networks derived from rodent tissue on microelectrode arrays (MEAs) is now routine, data from neural networks derived from human tissue is lacking. In the present study, we compared the activity of neural networks comprised of human neurons made by direct induction and primary human glia to networks from rat primary cortical cells.

METHODS

Characterization of human neurons

A. MAP2, GFAP, Dapi, Merge

B. MAP2, Synapsin1, Dapi, Merge

C. β3-Tub, GABA, Dapi, Merge

D. MAP2, VGat, Dapi, Merge

Ontogeny of network parameters in human neuronal culture

Comparison of acute effects of neurotoxic compounds in neural networks from rodent and human networks are similar

Responses to neurotoxicants in rat and human networks are similar

Ontogeny of human networks is slower compared to rat networks

SUMMARY and CONCLUSIONS


2. These networks show robust spiking, bursting, and coordinated activity.

3. Human neurons and human glia on MEA and rat glia on MEA provided a normal range of network activities.

4. Only deltamethrin produced a different pattern of effects.

Overall, these data demonstrate that human networks exhibit robust spiking, bursting, and coordinated activity, and are suitable for neurotoxicity studies.