Title: An automated approach to measure neurite outgrowth using high content imaging.

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Abstract:

Neurite outgrowth is a process that is essential for repair of the nervous system. The identification of molecules that are involved in neurite outgrowth and potential therapeutics requires the development of high-content imaging screens (HCSs). In this study, we have used the mouse neuroblastoma cell line N1E115 as our model system to investigate neurite outgrowth. In order to quantify the neurites both in terms of number and length, it is important to resolve where the cell body ends and the neurite begins. In our current approach, we have sought to quantify all processes that are extended by the cell. Cells were manipulated in different ways to produce neurites and then stained with phalloidin/DAPI followed by image acquisition. For data analysis we have developed a novel seed controlled level set segmentation method to process neurites. We use the segments of the nuclei as seeds for the level set functions. The topological changes due to merging and splitting of the level set are prevented using dynamic watershed lines. Validation of the proposed method on a data set of 6000 images shows that it performs better than existing commercial software and freeware.

References