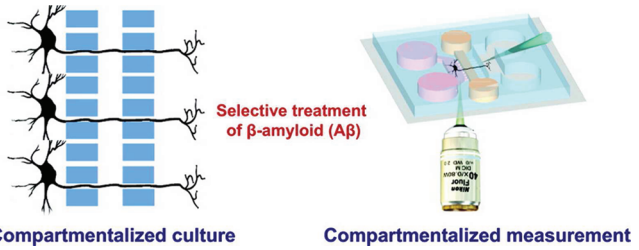
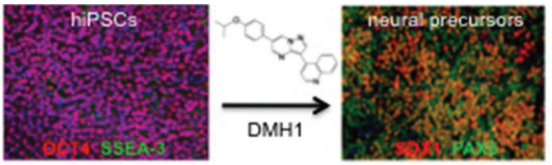
MICROFLUIDIC PLATFORM FOR EXPLORING AXONAL TRANSPORT



Axonal transport plays a critical role in the transmission of signals in neurons. More recently, a link between dysfunctional axonal transport and neurogenerative diseases such as Alzheimer's, Parkinson's, and Huntington's diseases have been suspected. In this issue, Kim et al. (DOI: 10.1021/cn3000026) provide a microfluidic platform for investigating the role of β-amyloid (Aβ) in affecting mitochondrial transport in full-length axons.

Aβ has been shown as a major component in forming neuritic plaques in the brain of patients suffering from Alzheimer's disease. Several studies have pointed to a link between Aβ toxicity and dysfunctional mitochondrial trafficking in the axon. However, the lack of an appropriate approach to assay mitochondrial trafficking has impeded clarifying this link. The authors developed a microfluidic platform to study the effects of Aβ on mitochondrial transport and observed significant decreases in mitochondrial movement in the vicinity of Aβ-exposed axonal compartments.

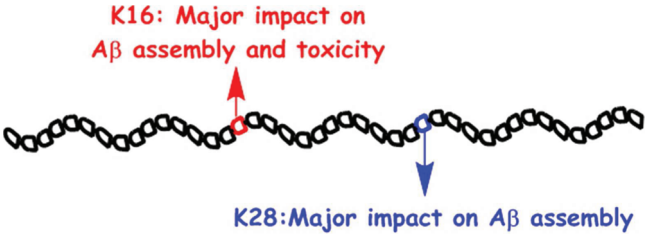
SMALL MOLECULE PROMOTES NEUROGENESIS



Human-induced pluripotent stem cells (hiPSCs) can be differentiated into cell types from all three germ layers, including several types of nerve cells. New methodologies have provided a platform for researchers to identify underlying causes of neurological diseases. Recent studies have shown that inhibition of the bone-morphogenic protein (BMP) and TGF-β1 pathways, belonging to the transforming growth factor-β (TGF-β) superfamily of proteins, results in efficient conversion of hiPSCs to neural precursor cells. In this issue, Neely et al. (DOI: 10.1021/cn300029t) provide a selective small molecule for efficient neurogenesis of hiPSCs.

Previous work has shown that combined inhibition of BMP and TGF-β1 pathways using small molecules, Noggin and SB431542, result in efficient neurogenesis. The authors compare the efficiency of Noggin with another small molecule, DMH-1, to modulate the BMP signaling pathway. The results showed that DMH1 can replace Noggin for efficient neurogenesis when used in combination with SB431542.

LYSINE RESIDUES CRITICAL TO β-AMYLOID TOXICITY



The aggregation of amyloid β-protein (Aβ) into neurotoxic oligomers is an underlying pathological process linked to Alzheimer's disease. Previous work suggests that hydrophobic and electrostatic interactions are involved in Aβ aggregation and oligomerization. In the current issue, Sinha et al. (DOI: 10.1021/cn3000247) identify two key lysine residues involved in Aβ assembly.

By substituting alanine at lysine-16 and lysine-28 in the Aβ40 and Aβ42 sequences, the authors demonstrated the critical role of these residues in assembly and toxicity. These important findings suggest that lysine-16 and lysine-28 are good targets for Aβ assembly inhibitors and modulators.

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