Abstract

High-density cultures of mammalian neurons offer a model system for studies of brain development, but the morphological features of individual neurons is difficult to ascertain. We show that a herpes virus vector expressing a bioluminescent protein allows detailed morphometric analyses of living neurons in complex culture environments. Expression of enhanced green fluorescent protein (eGFP) was constitutively driven in neurons using the herpes simplex virus amplicon system. This system allowed us to make novel observations regarding development in high-density cultures from rat hippocampus and cerebellum. After the phase of initial neurite outgrowth, maturing neurons continue to show rapid remodeling of the neurite branches (0.79 ± 0.11 mum/h per neurite; mean ± SEM, n=8), and displacement of the soma within the neurite arbor (1.35 ± 0.74 mum/h). These results demonstrate that a substantial capacity for morphological plasticity persists in maturing mammalian CNS neurons after cessation of net neurite outgrowth in early development.

Keywords

Cerebellum, green fluorescent protein, hippocampus, plasticity, Purkinje neuron.