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In Vitro Traumatic Brain Injury Models

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Abstract

Traumatic brain injury (TBI) is caused by rapid deformation of the brain, resulting in a cascade of pathological events and ultimately neurodegeneration. In vitro models of TBI can help us to describe the pathobiological mechanisms. In vitro models of brain injury support a platform for performing repeatable, well-controlled, environmentally isolated experiments. Other advantages of in vitro models of injury are monitoring in real time and evaluation of specific region. Acute preparations, organotypic cultures, dissociated primary cultures, and immortalized cell line have been used to study neural injury in vitro. Several in vitro models of TBI have been designed, they include the following: Transection: in vitro transection models leading to axotomy. Compression: this model of TBI can be induced primary and secondary injury by the impactor. Hydrostatic pressure: using transient or static pressure, deformation is induced. Fluid shear stress: culture cells have been deformed using a fluid shear forces. Shear strain: in vitro shear strain model has been simulated for closed-head TBI. Stretch injury models: in vitro models of Stretch injury have been developed to reproduce the mechanics which occur during in vivo TBI. Using appropriate in vitro models, we can understand mechanisms of injury in details and evaluate the effects of potential treatments.

Keywords: In vitro, TBI, Injury, Pathobiology.

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