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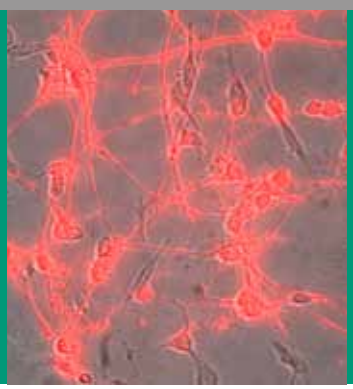
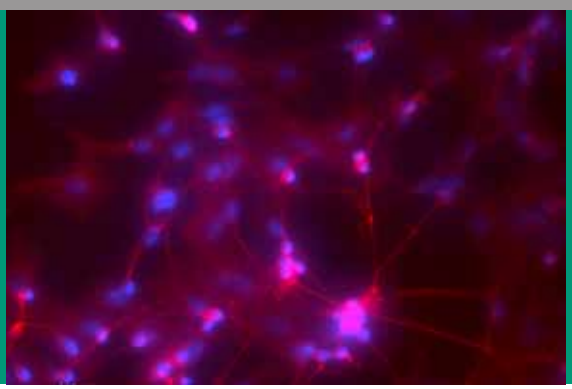
FRAUNHOFER INSTITUTE FOR CELL THERAPY AND IMMUNOLOGY IZI





CELL CULTURE MODELS

Cell culture systems are of outstanding value for evaluating the efficacy of cell or drug based strategies for neuroprotection or neuroregeneration following ischemia. They do not reflect the complexity of a living organism, but allow highly precise control of and influence on environmental factors and experimental design. Moreover, therapeutic mechanisms can be investigated in these systems in a comparatively cost-effective manner. Cell culture models are therefore the forefront of developing novel therapies for ischemic stroke. In combination with small and large animal models they also ensure continuous improvement of such therapies. This might be important to ensure both patient welfare as well as competitive advantages.

Unique Feature

Basic mechanisms of neuroprotection following ischemia can be investigated and verified in well controlled, cost-effective setups prior to evaluation in more complex animal models.

Methods

Neural and neuronal human stem and progenitor cells are differentiated into adult neuronal networks in vitro. Subsequently, cell cultures are subjected to oxygen and glucose deprivation in specialized incubators. After transfer to normoxic culture conditions, effects of cell or drug application on neuronal survival can be examined.

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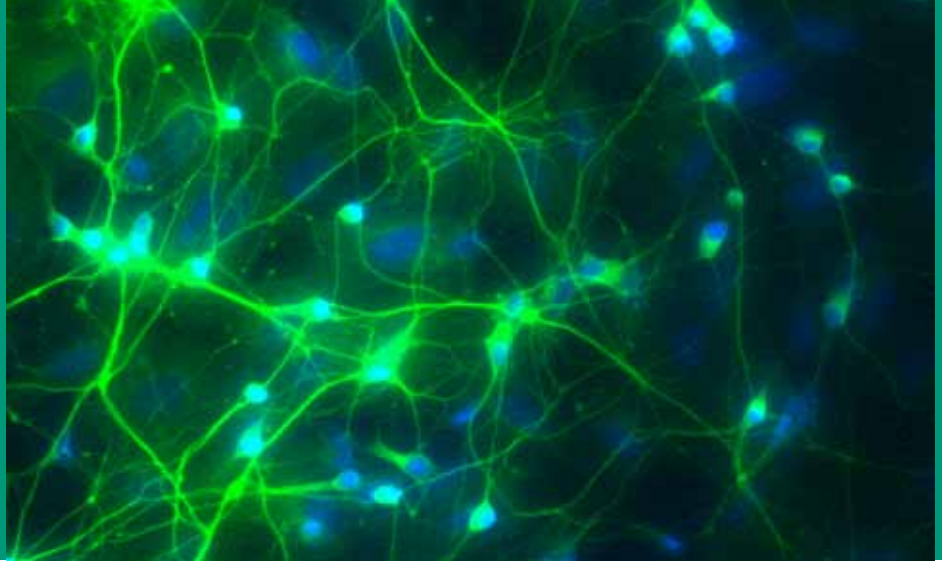

Investigation Methods

- Caspase assays: quantification of apoptosis
- Propidium iodide staining: quantification of necrosis
- FACS: cell analysis
- Fluorescence microscopy: cell analysis and visualization
- Measurement of cytokines: investigation of mediator-based effects

Selected Applications

- Evaluation of neuroprotective properties of therapeutic approaches
- Investigation of drug or cell application on ischemically damaged neurons
- Detailed description of mediators (e. g. pro- / anti-inflammation, cytokines, neuroprotection, induction of proliferation, vasogenesis)
- Identification and improvement of relevant therapeutic mechanisms
- Gross time window and dose-response studies
- Early detection of limiting factors or ineffective approaches
- Description of direct and indirect cellular interaction
- Comparative evaluation of different cell fractions
- Identification of and discrimination between neuroprotective properties of (stem cell) population and neurogenesis in vitro

Reference Project

A recent project evaluates the neuroprotective potential of adult, stem cell containing populations from cord blood and bone marrow in relation to cell age and senescence. In specialized cell cultures, the hematopoietic and neuronal differentiation potential as well as the neuroprotective properties of cells are evaluated after oxygen and glucose deprivation in neuronal cell and organotypic slice culture. We investigate bone marrow specimens from young and old donors as well as cord blood samples after short and long term cryopreservation.