Astroglial cells support the neuronal differentiation of immortalized neuroectodermal progenitors

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NE-4C neuroectodermal progenitor cells give rise to neurons and astroglia upon induction with all trans retinoic acid

Introduction

All-trans retinoic acid (RA) was found to have important regulatory functions during embryonic development of the nervous system. In vitro, RA was shown to induce neuronal differentiation of several cell types, such as neural crest cells, PC12 cells, embryonal carcinoma (EC) cells and embryonic stem (ES) cells (12). In a new in vitro model system of neuronal differentiation, we show that astroglial cells can replace RA in induction of the neuronal phenotype.

Multipotent progenitor cells or stem cells within the developing nervous system in vitro, neither in GFP-4C nor in PLAP-4C cell lines.

Astrocytes induce neuronal differentiation of the NE-4C neuroectodermal progenitor cells in “contact” co-cultures

The major characteristic feature of gli/progenitor co-cultures was the development of foci of abundant neuron production. Most of the neurons, identified by immunocytochemical detection of neuron specific III-type β-tubulin, appeared as large aggregates. The 7th day of co-culture significant increase in the number of N-tubulin expressing cells was observed as it was shown to be more pronounced either in situ ELISA or direct cell counting. The rate of neuron formation supported by astroglial cells was always higher, if cells were cultured in serum-free defined medium. Treatment with all-trans retinoic acid further increased the rate of neuron formation. Bundles of long neurites and compact aggregates of N-tubulin expressing cells were formed in the presence of RA.

Conclusion

Our results show that, astroglial cells derived from neonatal rat or mouse forebrains support the neuronal differentiation of the neuroectodermal progenitor cells. The data indicate, that the success of neuronal induction of neuroectodermal progenitors by astrocytes is due to a close cell to cell contact and/or due to some easily degradable, short range acting factors released into the medium by astroglial cells. All-trans retinoic acid is a potent candidate for such a role (11).

References

[4] 1. The data indicate, that the success of neuronal induction of neuroectodermal progenitors by astrocytes is close to astrocytes far from astrocytes

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