The beta1 integrin-actin interaction in the development of spinal cord

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The earliest developing interneurons in the chick spinal cord can be divided into two groups: neurons in the ventral region whose axons pioneer the primitive longitudinal pathway (PL-cells) and neurons whose axons project circumferentially (C-cells) along the lateral marginal zone and join contralateral ventrolateral longitudinal pathways.Neuronal cells use integrins to attach, migrate and extend processes on extracellular matrix (ECM) molecules. The beta1- class integrin is known to mediate neuronal attachment and process outgrowth in response to several ECM molecules. Integrins not only play a structural role since contact with the extracellular matrix can activate several intracellular signaling pathways. The signals that the integrins initiate appear to influence such cell properties as differentiation, proliferation, survival and gene expression. Cell adhesion to the extracellular matrix triggers the formation of integrin-mediated contact and reorganization of the actin cytoskeleton. Specific molecules of the matrix bind to integrin receptor on the cell surface, triggering a cascade of signaling events, which affect critical cell functions. Chick embryos have been collected from stage 15 until stage 40 of Hamburger and Hamilton, fixed in Bouins solution, embedded in paraffin for cross-section (5mm). The slides were prepared for immunohistochemical staining using monoclonal primary antibody anti-integrin beta1 and polyclonal antibody anti-actin (Chemicon) plus ExtrAvidin-biotin-peroxidase labeled secondary antibodies (Sigma). To begin to examine the integrin-cytoskeletal interactions we screened beta1-class integrin and actin. The integrin-actin interaction was observed from stage 15 on the entire thickness of the neural tube during migration of neuroblasts on radial glial cells. On stage 26 a more positive reaction was observed on the region of the C-cells, along axons projections pathways and on the floor plate. Expression of this interaction decreased on later stages as the neuronal cells differentiate (stage 35). A stronger pattern of immunostaining was observed along the pial surface on all stages. The different distributions and modifications observed in the labeling pattern suggest that the decrease on the expression of these molecules during the development is crucial for histogenesis of the spinal cord, since beta1 integrin-actin interaction initiates an intracellular signaling that coincides with the organizational phenomena of the spinal cord. In a previous work we demonstrated the presence of collagen II,IX and osteonectin and the results from this work indicates that neuroblasts and interneurons may use multiple molecules during axonal pathway position, and developmental stage.