The Adhesion Modulating Properties of Tenascin-W

Florence Brellier1*, Enrico Martina1,2*, Matthias Chiquet3, Jacqueline Ferralli1, Michael van der Heyden4, Gertraud Orend4, Johannes C. Schittny5, Ruth Chiquet-Ehrismann1,2, Richard P. Tucker6,7

1. Friedrich Miescher Institute for Biomedical Research, Novartis Research Foundation, CH-4058 Basel, Switzerland. 2. University of Basel, Faculty of Science, CH-4056 Basel, Switzerland. 3. Department of Orthodontics and Dentofacial Orthopedics, University of Bern, CH-3010 Bern, Switzerland. 4. Inserm, U682, Strasbourg, F-67200 France, University Strasbourg, UMR-S682, Strasbourg F-67081, France. 5. Institute of Anatomy, University of Bern, CH-3000 Bern, Switzerland. 6. Department of Cell Biology and Human Anatomy, University of California at Davis, Davis, California 95616 USA.

Abstract:

Tenascins are extracellular matrix glycoproteins associated with cell motility, proliferation and differentiation. Tenascin-C inhibits cell spreading by binding to fibronectin; tenascin-R and tenascin-X also have anti-adhesive properties in vitro. Here we have studied the adhesion modulating properties of the most recently characterized tenascin, tenascin-W. C2C12 cells, a murine myoblast cell line, will form broad lamellipodia with stress fibers and focal adhesion complexes after culture on fibronectin. In contrast, C2C12 cells cultured on tenascin-W fail to spread and form stress fibers or focal adhesion complexes, and instead acquire a multipolar shape with short, actin-tipped pseudopodia. The same stellate morphology is observed when C2C12 cells are cultured on a mixture of fibronectin and tenascin-W, or on fibronectin in the presence of soluble tenascin-W. Tenascin-W combined with fibronectin also inhibits the spreading of mouse embryo fibroblasts when compared with cells cultured on fibronectin alone. The similarity between the adhesion modulating effects of tenascin-W and tenascin-C in vitro led us to study the possibility of tenascin-W compensating for tenascin-C knockout mice, especially during epidermal wound healing. Dermal fibroblasts harvested from a tenascin-C knockout mouse express tenascin-W, but dermal fibroblasts taken from a wild type mouse do not. However, there is no upregulation of tenascin-W in the dermis of tenascin-C knockout mice, or in the granulation tissue of skin wounds in tenascin-C knockout animals. Similarly, tenascin-X is not upregulated in early wound granulation tissue in the tenascin-C knockout mice. Thus, tenascin-W is able to inhibit cell spreading in vitro and it is upregulated in dermal fibroblasts taken from the tenascin-C knockout mouse, but neither it nor tenascin-X are likely to compensate for missing tenascin-C during wound healing.

Key Word:
tenascin, extracellular matrix, fibronectin, wound healing, C2C12.