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The analysis of the dermal collagen matrix in the absence of α11β1-integrins suggests a potential role for integrins α11β1 in the regulation of skin biomechanics

[1] Laura Brigida Cornaghi - [2] Alanna Stanley - [3] Kerry Thompson - [1] Elena Donetti - [4] Donald Gullberg - [5] Beate Eckes - [6] Fabio Quondamatteo

[1] Università degli Studi di Milano, Dipartimento di Scienze Biomediche per la Salute, Milano, Italia - [2] Anatomy Nui Galway, Skin and ECM Research Group, Galway, Irlanda - [3] Anatomy Nui Galway, Anatomy, Galway, Irlanda - [4] University of Bergen, Dept. of Biomedicine, Bergen, Norvegia - [5] University of Cologne, Dept. of Dermatology, Cologne, Germania - [6] University of Glasgow, Anatomy, School of Life Sciences, Glasgow, Regno Unito

Integrins α11β1 are major collagen receptors and are thought to play a central role in fibrillar collagen arrangement [1;2], but this has not been demonstrated in vivo. In order to answer this question, here, we analysed the overall organisation of the dermal collagen network fibril diameter in samples of back skin of α11β1-integrin-deficient mice (KO). Dermal collagen organisation was assessed for its complexity and its heterogeneity on paraffin sections after Sirius red staining (4 KO and 4 controls), by quantifying fractal dimension and lacunarity respectively. The results showed that fractal dimension was increased in KO mice (1,40±0,06 in α11β1 KO mice vs 1,24±0,05 of control mice, p=0,009), whereas Lacunarity was reduced (0,78±0,06 in α11β1 KO mice 0,97±0,02 of control mice p=0,002), indicating a re-organisation of the dermal collagen network in absence of integrins α11β1. Fibril diameter was studied in images taken at the Transmission Electron Microscope (5 KO and 5 controls). The total number of fibrils examined was 22,212 (for the 5 controls) and 28,446 (for the 5 KO). The analysis showed a proportional increase in smaller fibrils with a proportional decrease in larger fibrils in α11β1 KO mice, being these differences were most evident in fibrils with smallest (<40nm) and largest (>120nm) diameter. Chi squared test confirmed statistical significance of these changes (equivalent to p=0,001). Given the fundamental role of dermal collagen in skin stability, these changes in collagen organisation and fibril size also suggest a potential implication of α11β1 integrins in the control of skin biomechanics.

References

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Keywords

Transmission electron microscopy; stereological/morphometric analysis; a11b1 integrins; dermal collagen.