

# ELASTINS AND ELASTIC FIBERS

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## Elastin structure and Biochemical properties

Bashir M.M., Indik Z., Yeh H., Ornstein-Goldstein N., Rosenbloom J.C., Abrams W., Fazio M., Uitto J., Rosenbloom J. (1989). Characterization of the complete human elastin gene. *J. Biol. Chem.* 264, 8887-8891.

*Cloning of the entire human elastin gene, including the 5'-flanking sequences is described. Functionally distinct domains of tropoelastin are encoded by separate exons. The 5'flanking region of the elastin gene lacks a canonical TATA sequence ; promoter is G + C rich and contains several SP 1 binding sites, and one AP 2 binding site.*

Debelle L., Alix A.J.P., Wei S.M., Jacob M.P., Huvenne J.P., Berjot M., Legrand P. (1998). The secondary structure and architecture of human elastin. *Eur. J. Biochem.* 258, 533-539.

*The structural characterization of insoluble human elastin is described. Data from several biophysical methods indicate that elastin is constituted of 10 %  $\alpha$  helices and 35 %  $\beta$  strands structures; 55 % of undefined conformation (or labile ones) are also identified in the secondary structure of the polymer in its solid state.*

Vrhovski B. and Weiss A.S. (1998) Biochemistry of tropoelastin. *Eur. J. Biochem.* 258, 1-18.

*A comprehensive review on the biochemical properties of the precursor form of insoluble elastin and its role in elastic fiber structure and assembly.*

## Interaction between elastin and other extracellular matrix components: the elastic fiber system

Pasquali-Ronchetti I., Baccarassi-Contri M., Fornieri C., Mori G., Quagliano D. (1993). Structure and Composition of the elastin fiber in normal and pathological conditions. *Micron* 24,75-89.

*Emphasis is made on the presence of several other extracellular matrix components in the constitution of human skin elastic fibers: proteoglycans, lysyl oxidase, microfibrillar components. The irreversible alterations associated with aging and pathological conditions are depicted.*

Rosenbloom J., Abrams W.R., Mecham R. (1993). Extracellular matrix: the elastic fiber. *Faseb J.* 7 : 1208-1218.

*In this review, the authors give an overall description of the regulations of elastin gene expression and focus on the importance of individual microfibrillar proteins in elastic fiber assembly.*

Brown-Augsburger P., Broekelmann T., Rosenbloom J., Mecham R.P. (1996). Functional domains on elastin and microfibril associated glycoprotein involved in elastic fibre assembly. *Biochem J.* 318, 149-155.

*Building of elastic fibers involves interaction between C terminus of tropoelastin and microfibrils through the N terminal domain of microfibril-associated glycoprotein (MAGP).*

### **Interaction between elastin and cell**

Hornebeck W., Tixier J.M., Robert L. (1987). Inducible adhesion of mesenchymal cells to elastic fibers : Elastonectin. Proc. Natl Acad. Sci. USA 83, 5517-5520.

*The first description of the binding of elastin to human skin fibroblasts. A 120 kDa protein, designated "elastonectin", is implicated in the induced adhesion of mesenchymal cells to elastic fibers.*

Jacob M.P., Fulop T., Foris, G., Robert L. (1987). Effect of elastin peptides on ion fluxes in mononuclear cells, fibroblasts and smooth muscle cells. Proc. Natl. Acad. Sci. USA 84, 995-999.

*At low concentrations, elastin peptides are found to increase calcium influx and to inhibit calcium efflux by a calmodulin-dependent mechanism in human skin fibroblasts. Generation of such peptides may well be involved in the phenotypic modulation of fibroblasts during aging.*

Hinek A., Wrenn D.S., Mecham R.P., Baronides S.H. (1988). The elastin receptor: a galactoside-binding protein. Science, 239, 1539-1540.

*The elastin receptor complex contains a 67 kDa protein that binds to galactosugars. Lactose is able to release this protein from cell surface, further empedding elastin-cell interaction.*

### **Elastin degradation by proteinases**

Senior R.H., Griffin G.L., Fliszar C.J., Shapiro S.D., Goldberg DE, Welgus H.G. (1991). Human 92 and 72-kilodalton type IV collagenases are elastases. J. Biol. Chem. 226, 7870-7875.

*Those matrix metalloproteinases play important functions in skin aging and pathology. Authors demonstrate that they exhibit insoluble elastin degrading activity, in vitro.*

### **Skin elastic fibers in aging and pathology**

Christiano A.M. and Uitto J. (1994). Molecular pathology of the elastic fibers. J. invest. Dermatol. 103, 535-575.

*An excellent review that describes the contribution of components of elastic fiber in genetic diseases. By genetic linkage analysis, their contribution to Pseudoxanthoma elasticum is excluded; mutations in fibrillin- 1 gene leads to Marfan syndrome and mutation in Fibrillin-2 in congenital contractural arachnodactyly. Those in elastin gene itself contribute to cardiovascular and neurobehavioral disorders : supravascular aortic stenosis and Williams syndrome, respectively.*

Bersnstein E.F., Qiu Chen Y., Tamai K., Shepley K.J., Resnik K.S., Tuan R., Mauviel A., Uitto J. (1994). Enhanced elastin and fibrillin gene expression in chronically photodamaged skin. J. Invest. Dermatol. 103, 182-186.

*Photoaged skin, characterized by accumulation of elastotic material, contained increased elastin and fibrillin mRNAs. Increased elastin mRNA levels was due to transcriptional upregulation of the gene.*

Bernstein E.F., Brown D.B., Urbach F., Forbes D., Del Monaco M., Wu May, Katchman S.D., Uitto J. (1995). Ultraviolet radiation activates the human skin promoter in transgenic mice: a novel in vivo and in vitro model of cutaneous photoaging. *J. invest. Dermatol.* 105, 269-273.

*Using such a model (transgenic mice expressing the human elastin promoter in a tissue specific manner), the influence of ultraviolet irradiations on the transcriptional activation of elastin gene can be evaluated. This model can be advantageous to screen the beneficial value of sunscreens.*

Zhang M.C., Lan He, Giro M.G., Siu Li Yong, Tiller G.E., Davidson J.M. (1999). Cutis laxa arising from frameshift mutation in exon 30 of the elastin gene (ELN)\*. *J. Biol. Chem.* 274, 981-986.

*Two frameshift mutations in exon 30 from elastin gene were identified in two generations of a cutis laxa family. Mutations resulted in missence C termini. Those de novo mutations are probably responsible for defects in elastin and acquisition of the cutis laxa phenotype.*