



## SHORT COMMUNICATION

### Transmission Electron Microscopic Study of Aging Elastic Fibres of Goat (*Capra hircus*)

Tripathi M and Zaidi B

Mata Gujri Mahila Mahavidyalaya (Auto.) Jabalpur, (M.P.) India

#### ARTICLE INFO

Received: June 28, 2014  
Revised: July 11, 2014  
Accepted: July 23, 2014

#### Key words:

Ageing  
Elastic fibres  
Elastin  
Fibrillin microfibrils  
TEM

#### ABSTRACT

The elastic fibres are essential tissue elastic macromolecules created by fibrillin-rich microfibrils. They appear in dermis much later than the collagen fibres. The study has shown that these fibres were completely absent in group I fetuses (Crown Rump length up to 20cm), appears originating in group II fetuses (20 cm and above C R length). Micrographs show very clear genesis of fibres in group II fetuses. Grown-up fetuses of this group (CR length 30 to 35 cm) show the intensity invariably elevated very high, a common feature of growing dynamic tissues continues up to group III, neonate group. There is clear view of histogenesis of elastic fibres in fetal stage and remarkable changes with the growing age.

#### \*Corresponding Author

Tripathi M  
drmahimatipathi@yahoo.co.in

**Cite This Article as:** Tripathi M and B Zaidi, 2014. Transmission electron microscopic study of aging elastic fibres of goat (*Capra hircus*). Inter J Vet Sci, 3(4): 216-218. www.ijvets.com

## INTRODUCTION

The dermis of skin is usually described as having two structurally distinctive layers: the papillary layer and the reticular layer (Montagna, 1962). Connective tissue in the dermis is composed of the fibrous proteins collagen, elastin, and reticulin in which elastin accounts for 4% of the total fibres. The papillary layer underlies the epidermis and is composed of open networks of fine fibres. Below this the reticular layer, composed of densely intertwining coarse fibres, forms the main dermal anchoring. The physiological elasticity of many organs depends mainly on the presence of elastic fibres. This is especially true of skin samples, where the amount and arrangement of these connective tissue components varies considerably in relation to different age groups and body regions as investigated in the study (Tripathi *et al.*, 2013b). The elastic fibers present in various connective tissues of the body are responsible for physiologic elasticity of the organs. These fibers consist of 2 distinct components, elastin and the elastic fiber microfibrils.

The elastic fiber system is composed of three types of fibers. The oxytalan fibers are made up only of microfibrils usually arranged in parallel bundles, with a mechanical resistance function. The elaunin fibers are composed of microfibrillar components with small granules of elastin. Mature elastic fibers are formed by progressive deposition of elastin in a microfibrillar

structure. These two last fibers are responsible for tissue elasticity (Fullmer *et al.*, 1958, Ross *et al.*, 1977).

Kielty *et al.* (2002) estimated elastic fibres as highly insoluble structures, which are composed of elastin and fibrillin microfibrils. In mammals, collagens are sources of tensile strength to the tissues, while elastin and proteoglycans are essential to matrix resiliency. Nature, structural appearance and contents of the collagenous and elastic systems are now a subject of intensive investigation in mammalian group.

## MATERIALS AND METHODS

The study was conducted in 10 Fetuses (Group I- CR length up to 20 cm & Group II-CR length 20cm and above), group III - 5 neonate goats & group IV - 5 adult indigenous goats. The skin samples were collected from different regions of the body of fetal goat- dorsal, ventral, thigh, neck and flank region with the help of razor blade, scissors and forceps. Tissue pieces measured approx 1mm size for fixing. Placed in glass processing vials and closed with plastic caps. For electron microscopy, small segments of tissues are fixed in a solution containing PBS (Phosphate buffer saline) 0.1M in 2.5% glutaraldehyde at pH=7.2 -7.4, the tissues were fixed for 2 hours, followed by postfixation in 1% osmium tetroxide (dissolved in PBS (Phosphate buffer saline) for 2 hours. Tissues were dehydrated in an ascending acetone series, 70, 80, 90 with

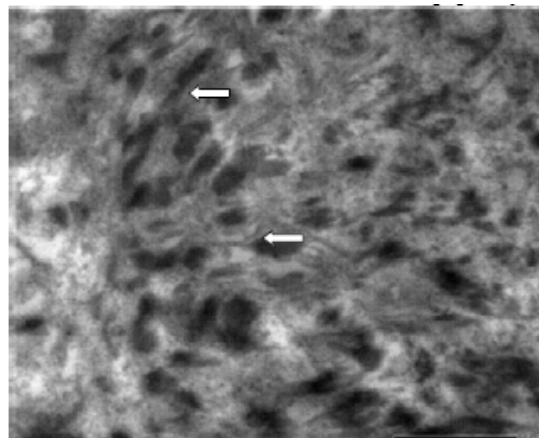
three changes of 100% solution (for 15 minutes each change).

Samples set for Transmission Electron Microscopic study by block making and ultra-thin sectioning prepared in ultramicrotome (Ultracut-UCT, Leica) at High Security Animal Disease Laboratory (Jeol JEM-1400) Bhopal. The sections were examined in electron microscope.

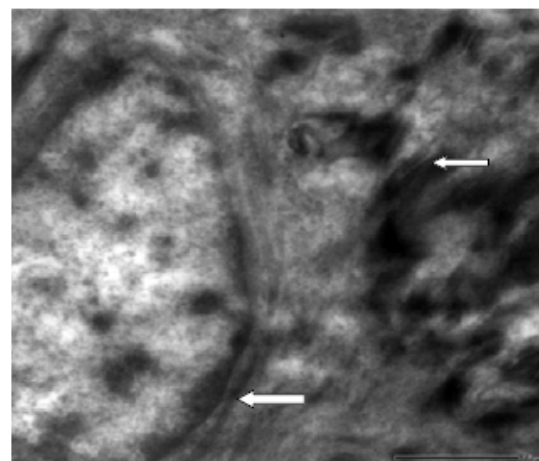
## RESULTS AND DISCUSSION

In electron microscopic images we observed the fibres arrangement confirm the basic pattern of fibres array or microfibrils interspersed with elongated patches of amorphous material (as shown in images). A common trait seems to apply to all samples that differential distribution of elastic system fibres coincided with structurally distinct collagen and their presence in dermal layer are in prominent intermingling to support the skin movement and elasticity where as in free extremity blends into a basement membrane (Tripathi *et al.*, 2013a). Genesis, growth and structural variations observed in conformity with growth and growing age in samples reported as Group I-There is no evidence of elastic fiber formation noticed in the sections of Group I fetuses. Group II - The elastic fibres appeared to arise at the angles of the fibroblast cell mainly in superficial and middle zone of dermis (Figure 1). In fetuses upto 35 cm crown rump length the emerging fibres become prominently visible mainly in deep zone of matrix (Figure 2). The fibres in sub epithelial matrix/dermis confirmed general pattern in all the regions of the body. The matrix here mainly consisted of connective tissue cell and newly formed delicate elastic fibres which were less prominent in deep part of the dermis particularly in initial stages. The intensity of fibers as reported were general in all samples that elastic assimilation was intense found in neck & dorsal region of the skin (Tripathi *et al.*, 2013b). The fibers were found moderate to weak in flank region & weak in ventral region.

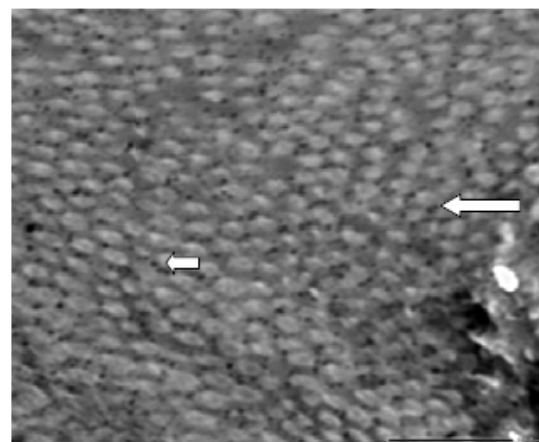
Group III - In this group the arrangement was precise in all samples as the elastic assimilation was highest (intense) found in neck and dorsal region of the skin. Remarkably intense bundles grouped as compact fascicules are reported apparently intermingled with collagenous bundles. The electron microscopic picture of fibres which are equivalent of the elaunin fibres of light microscopy shows that these fibres are formed of microfibrils interspersed with elongated patches of amorphous material (Figure 3). Elastic fibres found here are coincide with structurally distinct collagen in dermal layer appearing in a peculiar manner. These fibers bring into being in abundance between and around hair follicles in the reticular layer. The sweat glands as reported were sparsely layered with elastic fibers, deeply located in the dermis below the sebaceous glands, similar observations were also reported in 3 months of age in sheep where the Elastic fibres were abundant in reticular layer and arranged around the sweat glands and wool follicles (Mandage *et al.*, 2006). In the human skin, oxytalan fibres are very thin and are disposed perpendicularly to the dermal-epidermal junction, attaching to the basement membrane. They start from a plexus of elaunin fibres which is located in the interface between the papillary



**Fig. 1:** Electron micrograph – cross section of skin of fetal goat (35 CR length, group III), dorsal region, Arrows indicating randomly scattered elastic fibres.

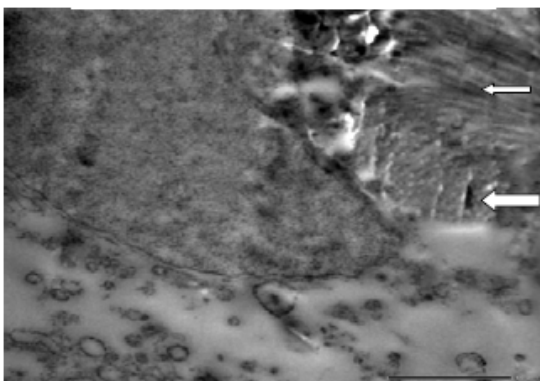


**Fig. 2:** Electron micrograph – cross section of skin of fetal goat (35 CR length, group III), dorsal region, Transmission electron micrograph showing elastic fibre (arrow point MF, microfibrils).



**Fig. 3:** Electron micrograph – cross section of skin of Neonate, dorsal region, Transmission electron micrograph showing elastic fascicules

dermis and the reticular dermis; this plexus is roughly parallel to the basement membrane and is connected with the thick elastic fibres in the reticular dermis. The continuity



**Fig. 4:** Electron micrograph – cross section of skin of Adult, dorsal region, showing elastic fibre bundles

between the deep elastic fibres through elaunin fibres to oxytalan fibres at the dermal-epidermal junction has been very well characterized (Gregorio S. Montes, 1996) the parallel rings that surround the secretory coil of the eccrine sweat glands.

Group IV showing distribution of dense elastin fibre bundles found in rigorously scattered and slack slender groups (Figure 4) run intermingled with collagen bundles. These fiber bundles are notable for their roles in aging. The fiber proteins become more cross-linked and rigid with the age as the body grows up, chiefly abundant in reticular layer. In this group revealed regular pattern in all samples that elastic assimilation in the papillary layer were thin, sparse and showed parallel arrangement (mainly in the superficial dermis). Reticular layer of dermis showed thick, loosely arranged fibres in the form of fascicles. The fascicles condensed in bands around the hair follicles, sebaceous glands and blood vessels but sparse around sweat glands, found intermingled in the arrector pili muscles. Kapadnis *et al.* (2005) noticed the elastic fibers in the reticular layer of neck region of goat were thick and located at both ends of arrector pill muscles attaching to hair follicles. Faury (2001) observed that in vascular tissues the elastic fibres are deposited developmentally to reinforce the high pressure circulation.

An early step in elastic fibre formation is the pericellular deposition of fibrillin-1 rich microfibrils as a template for soluble tropoelastin (Kielty *et al.*, 2002).

#### Acknowledgement

Authors are highly oblige and thankful to Madhya Pradesh Council of Science and Technology for their great cooperation and providing financial assistance.

#### REFERENCES

- Faury G, 2001. Function–structure relationship of elastic arteries in evolution: from microfibrils to elastin and elastic fibres. *Pathol Biol (Paris)* 49: 310-325.
- Fullmer HM and RD Lillie, 1958. The oxytalan fiber: a previously undescribed connective tissue fiber. *J Histochem Cytochem*, 6: 425-30.
- Gregorio S Montes, 1996. Structural biology of the fibres of the collagenous and elastic systems, *Cell Biol Inter*, 20: 15-27.
- Kapadnis PJ, NS Bhosale and CS Mamade, 2005. Study on connective tissue fibre in neck skin of goat. *Indian Journal of Animal Research*, 39: 60-62
- Kielty CM and ME Grant, 2002. The collagen family: structure, assembly and organization in the extracellular matrix. In *Connective tissue and its heritable diseases: molecular, genetic and medical aspects*. New York, NY:Wiley-Liss. Royce PM and B Steinmann eds, pp: 159-221.
- Montagna W, 1962. *The Structure and Function of Skin*. New York: Academic Press.
- Tripathi M, B Zaidi and S Sarkhel, 2013a. Age related changes in elastic fiber configuration in skin of fetal, neonatal & adult goat (*Capra hircus*) *Inter J Multidiscipl Res Acad (IJMRA)* 3: 562-569.
- Tripathi M and B Zaidi, 2013b. Regional Variation in Elastic Fibers on Different Regions of the Skin in Neonatal Goat (*Capra hircus*). *Inter J Scient Res Public*, 3: April 2013 1 ISSN 2250-315.
- Ross R, PJ Fialkow and LK Altman, 1977. The morphogenesis of elastic fibers. *Adv Exp Med Biol*; 79: 7-17.