

# MUCOPOLYSACCHARIDE CHANGES IN LICHEN PLANUS

By

ABDEL-HAMID MOHAMED ABDEL-AZIZ

Mucopolysaccharides which have long been known to exist in human skin, are of great biological importance. They are the most widely studied component of ground substance. Their biosynthesis (1,2,3,4,5) has been a matter of controversy for many years concerning whether the fibroblast is their main source of origin or the mast cell. Most authors are in agreement with the first view. There is little doubt that fibroblasts are concerned in the formation of collagen but their relation to production of elastin is not that certain.

We have recently had the opportunity to study in detail the histopathologic changes in fibrillary elements of corium connective tissue in different types of lichen planus (6,7). The collagen and elastic fibers (6) were found to be destroyed and in some sections new fibers were present in areas of inflammatory infiltrate while outside the area they were normal. On the other hand prominent proliferation of reticular fibers (7) occurred in the areas of inflammatory infiltrate with relative increase in subepithelial network. The decrease of reticular fibers in areas of involuting lichen planus has been claimed, because of their being used in the process of collagen regeneration (7). As both collagen and mucopolysaccharides play important roles in connective tissue regenerative process and as few studies in literature on mucopolysaccharide changes in lichen planus were found, so we decided to investigate the changes of mucopolysaccharides in different types of lichen planus.

*Method and Material.* 57 cases of different types of lichen planus with 123 biopsies have been studied. Two control biopsy specimens for each case were examined, one from the same patient and the same region and the other from healthy person and from a corresponding region. In collecting the two control biopsies, we took in consideration the same age, sex and race of the patient. The clinical and pathological features of these cases had been published before (6,7,8, 9,10). The paraffin tissue sections were stained by periodic acid Schiff stain for mucopolysaccharides.

*Results.* Microscopic examination of control biopsy tissue of paraffin stained with periodic acid Schiff revealed at the dermal epidermal junction, a regularly shaped vivid red band representing somewhat an amorphous substance. Similar change was found lining the sebaceous glands, sweat glands and hair follicles, as also around the capillaries, arterioles, arteries and veins. Throughout the collagen bundles otherwise a less intense uniform colour was seen.

In lichen ruber planus the paraffin sections stained with periodic acid Schiff showed higher affinity to the stain in the inflammatory zone than elsewhere (Fig. 1).

In many tissue sections the stain positive areas were coloured red while in a few sections, they assumed the magenta colour. Sometimes, intensity of the stain immediately underneath the basal cell layer was noted giving false impression of thickening of the basement membrane—proportionate relationship between the staining affinity and degree of inflammation was found. No relation however was present between it and the duration of the lesion. As compared with silver stain (7), there was prominence of the reticular fibers in the PAS positive areas—outside the area of inflammation, no apparent variations from normally were seen.

In lichen *corneus hypertrophicus*, some PAS stained sections showed pronounced thickening of the immediate subepithelial zone. In the perivascular areas there were higher affinity to PAS than elsewhere (Fig. 2).

In lichen *planus actinicus* sections stained with PAS showed, increased affinity to the stain in areas of intense inflammatory zone and in the immediate subepithelial zone. (Fig. 3),

In lichen *planopilaris* there was positive affinity for periodic acid Schiff stain in the inflammatory zone and in the subepithelial zone (Fig. 4). Sometimes, immediately underneath the basal cell layer the intensity of the stain was noted which gave the impression of false thickening on the basement membrane. Outside the inflammatory zone the affinity for PAS was the same with normal sections.

In involuting lesions of lichen *planus*: during the process of involution the affinity to periodic acid Schiff stain gradually returned to normal (Fig. 5).

*Comment.* Several studies had been done on the changes of mucopolysaccharide with variation of age (11,12,13,14,15) and site of affection (14,15,16,17,18, 19,20). So taking in consideration, in our study, the variation of age, sex and site of affection in collecting the control specimens is of utmost importance. Something which were neglected by previous workers in their applied investigation in this field.

Stoughton and Wells 1950 (17), in their study of three cases of the disease failed to demonstrate any changes with McManus PAS stain in the corium denoting no significant difference from normal skin in the appearance of the dermal epidermal junction or the vessel walls. In disagreement with this opinion Braun-Falco 1954 (21) observed "increased PAS staining of basal membranes and vessels in different types of eczema, psoriasis and in lichen *planus*". Steiner 1957 (22) in his study of four cases of lichen *planus* found that "mucopolysaccharides of inflammatory cutaneous lesions including lichen *planus* were slightly increased above the normal. They are characteristic of mucoprotein by their PAS fuchino-philic, by beta metachromasia with toluidine blue and by hyaluronidase fastness". Steiner (22) came to the conclusion that three structures showed decrease or abnormal PAS fuchino-philic in lichen *planus*, such structures were the epidermal basal membrane, the papillae and subepidermal zone and inflammatory reticulin. Also the work of Hollander, Sommers and Grimwade 1954 (23) noted excess of mucopolysaccharides.

Those observations which denote increase in mucopolysaccharide content conform with those of the author who succeeded in demonstrating PAS stain red coloured areas in some sections as well as magenta colour in others. Fusara and Goltz 1960 (24) suggested that mucopolysaccharide staining magenta with PAS are certain complex of acid mucopolysaccharides or acid mucoproteins while those stained red by PAS are neutral mucopolysaccharides or neutral mucoproteins. If the above conclusions are correct, it is possible to categorize the carbohydrates of tissue section for more accurately than has heretofore been possible.

Regression in the staining affinity to PAS in involuting lesion indicating a decrease in mucopolysaccharide content might again raise the speculation about the fate of the quantity. The author believes that part of the mucopolysaccharide has been consumed in collagen regeneration. This speculation finds its support in the view of Dumphy and Udupal 1955 (25), and others (3,26,27,28,29,30), that the presence of mucopolysaccharides in connective tissue as indicated by metachromasia and hexosamine determinate was practically noticeable in the early stages of collagen fibers formation.

*Summary.* 57 cases of lichen planus had been studied for mucopolysaccharide changes. For each case, two control biopsy specimens were examined, one from the same patient and the other from healthy volunteer taking in consideration the same age, sex, race and site of excision. The mucopolysaccharides showed increase fuchinophilia in the inflammatory zone while normal outside. The possibility of the role of mucopolysaccharides in regeneration of collagen is discussed.

#### REFERENCES

- (1) Asboe Hansen, G.: In Connective Tissue. Ed. Tunbridge R. E. Oxford Blackwell. 1957.
- (2) Kent, P W. In the Biochemistry of Mucopolysaccharides of Connective Tissue. Ed Clark. F. and Grant J. K. Cambridge University Press. 1961.
- (3) Asboe Hansen, G. : In International Review of Connective Tissue Research Vol. I. Ed. Hall D. A. N. Y. Academic press. 1963.
- (4) Muir, H.: In Progress in the Biological Sciences in relation to Dermatology. Vol. 2 Ed. Rook A. and Champion R. H. Cambridge University press. 1964
- (5) Davidson, E. A. In Advances in Biology of Skin. Vol. VI Ageing Ed. Montagna W Oxford Pergamon. 1965.
- (6) Abdel-Aziz A. M.: Histopathological Changes of Collagen and elastic fibers in different types of lichen planus. Underpress.
- (7) Abdol-Aziz A. M.: Histopathological Changes of reticular fibers in different types. of lichen planus. Underpress.
- (8) El-Okbay, M. A., Rhoiah, F. and Abdel-Aziz, A. M.: Treatment of lichen planus. actinicus by resochin. The gazette of Egyptian derm. and Venereology. 2: 1.1968.
- (9) Abdel-Aziz, A. M.: Lichen planus. Histopathological studies on 57 cases. Ind. J. of Derm & Ven. 36: 85, 1970.
- (10) Abdel-All, H. and Abdel-Aziz, A. M.: Unusual clinical types of lichen planus, Under press.

- (11) Meyer, K; Hoffman P. and Linker; A. : In connective tissue C. I. O. M. S. 1957 p 86. cited in inflammation and diseases of connective tissue, A Halmemann symposium edited by Mills, L. C. and Mayer, J. H.; W. B. Saunders company 1961.
- (12) Loewi, G. : The acid mucopolysaccharides of human skin. *Biochem. Biophys. Acta*, 52,435,1961.
- (13) Smith, O. T. : Effect of Cortisone administration on cutaneous collagen and hexosamine in rats of various ages. *J. invest. derm.* 39 :219-224, 1962.
- (14) Smith, J. G ; Davidson, E. A.; Sams, W.M. and Clark, R. D. : Alteration in human dermal connective tissue with age and chronic sundamage. *J. invest. derm.* 39 : 347-350, 1962.
- (15) Smith, J. G; Davidson, E. A. and Taylor, R. W. : Human cutaneous acid mucopolysaccharides. The effect of age and chronic sun damage. In *Advances in biology of skin. I Ageing*. New York. Pergamon 1965.
- (16) Summerly, R. And Jefferson, B. M. : Sulfated acid mucopolysaccharides in actinic elastosis *Brit. J. derm* 81 : 51, 1969.
- (17) Stoughton, R. and Wells, G. : A histochemical study on polysaccharides in normal and diseased skin. *J. invest. derm.* 14 : 37-51, 1950.
- (18) Findlay, G H. : Elastic dystrophy. *Brit. J. derm.* 66 : 16-24, 1954.
- (19) Montgomery, P. O'B. Characterization of basophilic degeneration of collagen by histochemical and microspectroscopic procedures. *J. invest. derm.* 24 : 107, 1955.
- (20) Gillman, T.; Penn, J., Bronks, D. and Roux, M. : Abnormal elastic fibers *Arch. path.* 59 : 733, 1955
- (21) Braun-Falco, O : Histochemische Und morphologische studien an normaler und pathologisch ver aenderter. *Haut. Arch. f. derm. U. Syph.* 198:11-98, 1954. cited by Steiner (22).
- (22) Steiner, K. : Mucoid substances and cutaneous connective tissue in dermatoses. III cutaneous mucopolysaccharides in inflammation of the skin. *J. invest. derm.* 28:419,1957.
- (23) Hollander, A.; Sommers, S. C. and Grimwide, A. L. : Histochemical and ultraviolet microscopic studies of chronic dermatoses and the corium membrane *J. invest derm.* 22 : 335, 1954.
- (24) Fusara, R. M. and Goltz, R. W. : A comparative study of the periodic acid Schiff and Alcien blue stain. *J. invest. derm.* 35 : 305-307, 1960.
- (25) Dumph, J. E. and Udupa, K. N. : Chemical and histochemical sequences in the normal healing wounds. *New England J. med.* 253-847, 1955.
- (26) Bansley, S. H. : On the presence, properties and distribution of intercellular ground substance of loose connective tissue. *Anat. rec.* 60 :93-110, 1934.
- (27) Bunting, H. ; The distribution of acid mucopolysaccharides in mammalian tissues as revealed by histochemical methods. *Ann New York Acad. Sc.* : 52,977, 1950.
- (28) Compagni, M. and Reggianiu, O : Observations in the experimental animal on the nature of metachromatic ground substance in granulation tissue. *J. Path. and bact.* : 62 :563, 1950.
- (29) Jackson, D. S. : Connective tissue growth stimulated by carrageenin: 1-The formation and removal of collagen; *Biochem. J.* 65 : 277, 1957.
- (30) Wood, G. C. : The formation of fibrils from collagen solution. The effect of chondroitin sulphate and some other naturally occuring polyamins on the rate of the formation. *Biochem. J.* 75 : 605, 1960.