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CLINICAL ARTICLES

PATTERNS OF SOLUBLE PROTEINS IN CUTANEOUS SCALES.

By

RATAN SINGH* (Assistant Professor); KANDHARI, K. C. (Professor) and PASRICHA J. S.

Some recent studies (Roe, 1958; Matoltsy & Herbst, 1956-a; Matoltsy & Herbst, 1956-b; Wheatley and Farber, 1961; Baden and Freedberg, 1962; Matoltsy and Matoltsy, 1963; Fisher, 1965; Scott, 1965) undertaken on the soluble proteins of epidermis, as also of stratum corneum, scales of psoriasis, exfoliative dermatitis and callus have reported only on the qualitative aspects of the proteins. No attempt has been made to study the quantity of each protein in different types of scales. Roe (1958) observed an increase in total soluble proteins in psoriatic scales, while Fisher (1965) reported a particular increase in a protein having the electrophoretic mobility of serum beta-2 globulin. The exact figures are however, not available. Moreover, the significance of both these observations is not known. The present report deals with a study undertaken to estimate the levels of total soluble proteins as well as the individual fractions in different types of scales, by paper electrophoresis. The diseases, were selected to provide examples of various types of defects in keratinization.

MATERIAL & METHODS

The study was done on scales of psoriasis (15 cases) exfoliative dermatitis (9 cases), keratoderma (4 cases) and callus (2 cases). Only typical cases were included in the study. Scales were collected by scraping the lesions with a blunt knife, while keratotic material from cases of callus and keratoderma was pared off with a sharp knife, taking care not to cause any bleeding.

The material was accurately weighed and extracted with 'Analar' ether (2 changes of 10 minutes each) to remove lipids. The same was then homogenised in a glass pestle and mortar in 5 ml. of 0.05 M borate buffer, pH 9.4. It was kept in a refrigerator at approximately 6° C for 48 hours and then centrifuged at 2500 r. p. m. for 20 minutes. The supernatant portion was separated. All the procedures were carried out in the cold.

Department of Dermatology & Venereology, All India Institute of Medical Sciences,
New Delhi-16, India,

* At present, Assistant Professor of Dermatology and Venereology, Maulana Azad Medical College, New Delhi,

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Total proteins content of the extract was estimated by the Biuret method (Kingsley, 1939) and expressed in terms of grams of total soluble proteins per 100 grams of scales. The remaining portion of the extract was concentrated in a lyophilizer at 40° C and used for paper electrophoresis. Electrophoresis was carried out on 40×4 cm Whatman No. 1 paper strips in 0.05 M. borate buffer, pH 9.4 in an Arthur H. Thomas apparatus, applying 150 volts current for 16 hours. The strips were dried in air and stained with 1.0% bromophenol blue. Elution was done in 0.01 N. sodium hydroxide and the reading taken in a Klett Summerson photo-electric colorimeter.

RESULTS

Values of total soluble proteins were highest in scales of psoriasis and also those of exfoliative dermatitis of psoriatic origin, while they were low in cases of callus, keratoderma and exfoliative dermatitis of non-psoriatic aetiology.

On paper electrophoresis, 3 bands were obtained from all cases of psoriasis (Fig. 1), which were labelled as bands 'A', 'B', and 'C' respectively according to their increasing mobility. Bands 'A' and 'C' were narrow and compact, whereas band 'B' was a broad one and in one patient, it seemed to separate into 2 subfractions (Fig. 2). In exfoliative dermatitis, callus and keratoderma also 3 bands were obtained (Figs. 3, 4, & 5) but in 2 cases of exfoliative dermatitis and 1 case of keratoderma only 2 bands were obtained. One case each of keratoderma and callus showed 4 bands. In contrast to the clear cut bands of psoriatic scales, the bands of exfoliative dermatitis were generally diffuse and less defined.

Quantitative analysis of different fractions in each disease is shown in table I.

DISCUSSION

The technique employed in this investigation provides no means to estimate, how much of the protein in each fraction is contributed by the serum proteins. Nevertheless, this study points out the characteristic nature of the patterns seen in each disease. The psoriatic pattern was characterised by a high total soluble protein content (always higher than 6 g% in this study) with a particular rise in fraction 'B' group compared to the corresponding fraction in other diseases. Specificity of the pattern is further evidenced by the fact that cases of exfoliative dermatitis of psoriatic origin also showed the psoriatic pattern. In one case, in which the investigations were done both during the exfoliative and the psoriatic stages, the total protein value tended to increase further (11.09 g%) during the psoriatic phase, compared to a relatively low level (6.36 g%) during the exfoliative dermatitis phase.

In exfoliative dermatitis of non-psoriatic origin, the differential protein pattern resembled that of psoriasis in that fraction 'B' constituted almost half of the total proteins but it differed in the total protein content which was much lower. The difference was statistically significant.

The patterns of callus and keratoderma resembled each other, but differed from that of psoriasis by a low total soluble protein content and from exfoliative dermatitis

by the differences in the relative proportions of individual fractions. Fractions 'A' and 'B' were present in almost equal proportions, while fraction 'C' was slightly lower.

It will not be possible at this stage to interpret the significance of variations in the patterns, till more is known about these proteins and their role in epidermal metabolism. But the specificity of the patterns does suggest definite variations in the aetiopathogenetic mechanisms involved in each disease. It must however, be pointed out that only typical cases of these diseases are likely to conform to these specific patterns. Cases with doubtful morphology may presumably fail to show any characteristic pattern.

SUMMARY

✓ A quantitative study on soluble proteins of scales of psoriasis, exfoliative dermatitis, callus and keratoderma was undertaken. The proteins were extracted in 0.05 M. borate buffer pH 9.4 by homogenisation. On paper electrophoresis, most of the extracts gave 3 bands (labelled 'A', 'B' & 'C'). Some samples produced only 2 bands and a few others produced 4 bands.

Each disease produced some what characteristic patterns. Psoriasis was characterised by a high level of total soluble proteins, with fraction 'B' constituting almost half of the total. Two cases of exfoliative dermatitis due to psoriatic aetiology also showed the psoriatic pattern, while those of non-psoriatic origin showed a significantly low total protein content. The differential protein pattern however, resembled that of psoriasis. The pattern of callus and keratoderma consisted of a low total soluble protein with fractions 'A' & 'B' being present in equal proportions. Fraction 'C' constituted only one fifth of the total protein. ✓

TABLE I.

Diseases	Total soluble proteins G/100 scales.	Fractions percentage		
		'A'	'B'	'C'
1. Psoriasis (15 cases)	10.83±0.71 (6.14-16.63)	26.96±1.26 (18.80-33.70)	55.57±1.58 (48.50-69.44)	17.47±1.44 (8.33-27.75)
2. Exfoliative Dermatitis				
a) Psoriatic (2 cases)	8.35 (6.36-10.35)	31.03 (21.60-40.46)	54.76 (44.63-64.90)	14.19 (13.50-14.88)
b) Non Psoriatic * (6 cases)	3.98±0.54 (2.27-5.74)	25.49±3.43 (13.30-35.47)	49.10±1.46 (45.85-52.90)	20.96±2.96 (16.13-27.32)
3. Callus and Keratoderma (6 cases)	3.34±0.37 (2.25-4.35)	36.03±2.54 (28.70-39.50)	36.70±3.21 (30.30-40.30)	27.46±3.19 (21.10-31.02)

* 1 case of exfoliative dermatitis was not included, because the lesions were exuding and the scales were mixed with serum.

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