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HISTOCHEMISTRY OF THE SKIN IN BOTH RAT AND LIZARD

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ABSTRACT

Parts of ventral and dorsal skin were taken in both albino rat Rattus rattus and the lizard Chalcides ocellatus. Histochemical studies of alkaline phosphatase, acid phosphaase, glycogen and acid mucopolysaccharides in these parts revealed the presence of some differences between the two examined animals. This may be due to the class variations and differences in physiological behaviour and habitat. Also no detectable difference was found in the distribution of enzymes and the substances examined in both dorsal and ventral skin except some variation was noticed in the distribution of acid mucopolysaccharides in the ventral and dorsal skin of the lizard.

INTRODUCTION

Few histochemical studies were made on the skin of lizards. Braun-Falco [1] found an intense alkaline phosphatase reaction in the basal layer of the epidermis in the mouse. While the dermis and hypodermis showed a weak reaction. On the other hand Hashimoto [2], stated that the

the alkaline phosphatase was present as a faint reaction in some cells of stratum germinativum and sebaceous gland. However all investigators agree that dermal capillaries and hair papillae show a moderate alkaline phosphatase reaction [3]. Furth [4] found that acid phosphatase might have a defensive role in the skin. He stated that acid phosphatase was abundant in the epidermis. While the dermis showed a weak enzymatic reaction. On the other hand Elkan [5] found that acid phosphatase was present in the superficial layer of the epidermis of mouse. Glycogen was present in the stratum basale and in sebaceous glands [6]. Sampaio et al. [7] found that both rat and pig skin contain acid mucopolysaccharides. Recently [5] found that the mucopolysaccharides in the lizard skin are concentrated in the superficial layer of the oestoderm, particulary along the oesteodermal sutures. Occasionally lacunae in the oestoderm were filled with mucopolysaccharides, While those parts of the dermis which are not supplied with oestoderm, were devoid of mucopolysaccharides.

MATERIAL AND METHODS

In the present study 16 adult animals were used 8 albion rats Rattus rattus and 8 lizards Chalcides ocellatus. The animals were sacrificed by stunning and decapitation. The skin specimens were taken from two sites abdomen i.e ventral and back skin. The specimens were fixed in a solution containing loo ml. conc. formaline, 900 ml. distilled

water 5 gm. of 0.5% acetyl pyridinum chloride. Washing of the specimen was done in tape water for 24 hour. Decalcification was then carried out in buffered formic acid [8] for specimens equipped with oestoderm i.e the lizard skin. Dehydration, clearing, infiltration and embedding in paraffin wax done as usual. Specimens were cut at 8 U thickness. Five sections from each site of the skin were chosen for the staining. The procedure was as fallows:-
section (1) was stained with HX & E [9]. for orientation
section (2) & section (3) Gomori methods for alkaline and acid phosphatase. section (4) for PAS, section (5) for alcian blue.

Aim of the work

Generally, it was found that studies done on histochemistry of the skin in both rat and lizard are not enough and mostly incomplete. The present study represent an example of marked class variations. It seems possible to assume that these class variations refect differences in habitat and physiolgical behaviour. Accordingly such comparative histochemical study of both types might be helpful in the elucidation of the physiological processes.

RESULTS

No detectable difference in the distribution of alkaline phosphatase, acid phosphatase and glycogen in

both ventral and dorsal skin of the rat and lizard. Some variations were noticed in the distribution of mucopolysaccharides in the ventral and dorsal skin of lizard.

Alkaline phosphatase:- (1) Rat, A weak reaction was found in the basal layer of the epidermis, while hair papillae and blood vessels showed a moderate reaction. Moreover a moderate reaction was noticed in the peripheral cells of the sebaceus glands (Fig. 1). (2) Lizard:- The basal cell layer of the epidermis, basement membrane and superficial layer showed a faint reaction of the alkaline phosphatase, while the dermis showed a moderate reaction (Fig. 2)

Acid phosphatase:- (1) Rat:All sites of the epidermis showed a strong reaction. However a moderate reaction was noticed in hair the follicles and sebaceus glands. (Fig. 3). (2) Lizard:- both basal and superficial layers of the skin showed a strong reaction, while the dermis showed a moderate reaction (Fig. 4). Glycogen: (1) Rat: Strong reaction was noticed in the basal layer in the epidermis and in sebaceus glands, while it diminished gradually in its upper layer. Hair follicles showed a moderate reaction of glycogen. (Fig. 5).

(2) Lizard:- the basal layer of epidermis showed a strong reaction, while the superficial layer showed a moderate reaction. On the other hand the osteoderm showed a strong reaction, while dermis showed a moderate one (Fig. 6).

Acid mucopolysaccharides:- (1) Rat: A moderate reaction was noticed in the basal cells of the epidermis and superfical layer sebaceus glands and hair follicles showed strong reaction, while the dermis showed a moderate one (Fig. 7). (2) Lizard:- Acid mucopolysaccharides were concentrated in the superficial part of the oestodermis particulary along osteodermal sutures. The lacunae in the oestodermis showed a strong reaction. Back skin of lizard contain a higher concentration of mucopolysaccharides than the ventral skin (Fig. 8).

DISCUSSION

The present study provides an example of class variations observed by the histochemical work of the skin in both rat and lizard. It seems possible to assume that these class variation reflect differences in physiological behaviour and their habitat, so that such histochemical studies might be helpful in the elucidation of physiological processes in both animals. In the present study it was decided not to use female animals owing to the known effect of oestrus cycle on epidermis [10].

Alkaline phosphatase:- Some variations in the distribution of alkaline phosphatase in the skin of both animals were noticed. (1) Rat: A weak reaction in the basal layer of epidermis and a moderate reaction of hair papillae, blood vessels and the peripheral cells of the sebaceus

gland. This is in agreement with the findings obtained by Melezer & Deme [11] who stated that the presence of alkaline phosphatase in the sebaceous glands, may play a role in lipogenesis.
(2) Lizard: The presence of alkaline phosphatase in a weak amount in all layers of the skin may be to minimise or prevent the permeabilty of the cells to prevent water loss, as the lizard is a poikilothermic animal.

Acid Phosphatase: Whose activity is generally associated with catabolic processes. In the present study it was shown that this enzyme was present in all sites of the epidermis, hair follicle and sebaceous glands of Rat skin. It is also present in the basal and superficial layers and dermis in the lizard skin. Hashimato [2] and Spier & Coneghem [13] found that all sites of the epidermis especially in granular layer one associated with nuclear disintigration that take place in upper epidermis perior to cornification. In addation it also appears that it is responsible for the break down of phospholipid as has been suggested by Maretti [14] as the later substance diminishes markedly during the processec of Keratinization and serum formation where there is a concentration of acid phosphatase at the transitonal zone and in sebaceous glands.

Glycogen: zvora [6], stated that the stratum basale and

sebaceous glands are the source of glycogen and neutral mucopolysaccharides. The present findings direct the attention to the intense reaction of PAS given by basal layer of epidermis, sebaceous gland (Rat skin) and both basal and superficial layers and dermis in lizards skin, which facilitate a source of production of energy in the process of keratinization . However the presence of PAS positive reaction in the dermis may be due to the presence of neutral mucopolysaccharides in the matrix.

Acid mucopolysaccharides: The presence of acid mucopolysaccharides in the basal cells of the epidermis, superficial layer and in hair follicles in rat, may be due to mucopolysaccharides which attract and hold different amounts of water binding cells together. Morover the presence of mucopolysaccharides around or inside hair foilicles may be associated with hair growth and formation. As regards to lizards skin, the back skin showed a higher concentration of acid mucopolysaccharides than the ventral skin. The thick back skin of lizard is more exposed to radiant heat hence the presence of acid mucopolysaccharides may hold attract and preserve a good amount of water. Therefore it prevents water loss. Also the presence of acid mucopolysaccharides in oestoderm may be associated with the formation of oestodermal plates. Therefore the distribution of acid mucopolysaccharides in lizards skin is not random but surface oriented according to the physiological needs of

the animals.

REFERENCES

1- Braun-Falco,o (1967): Abnormes verhalten der epidermalien Regeneration. Arch, Klin. Der. 229:267.

2- Hashimoto,K (1974): Histochemical studies on the skin. Amer.J.Anat. 113:35

3- Barka,A.E. (1977): Distribution of some enzymes of pig skin; acta anat. 9: 117-120

4- Furth,E (1978): Acid phosphatase in normal & diseased skin J. Derm. 13. 315-320

5- Elkan, E. (1976): MPS in reptilian skin. Isr. J. Zool. 25 (3) 73-94

6- Zvora, J. (1976): Histochem. of lipid and carbohydrate in rat skin. Folia Morphol. 24 (") 178-193

7- Sampaio,L,Dietrich, C.D. & Gianntii,O (1977): Changes of sulfated MPS in tissue during growth. Biochem. Biophys, Acta 498 (1) 123-131

8- Lillie,R.D (1953): Histochem. of MPS. Nature 31: 5836587

9- Zugibe, F.T., Kennth, D.E. & Last, J.H. (1958): New technique for lip. & MPS in the same sections. acta. anat. 108: 101 106.

10- Ebling, F, J. (1955): Endocrine factors affecting cell replacement and cell loss in the epidermis J. Endocrinol. 12: 38-42

11- Melezer, N. Deme,S (1976): Molluscum contagiosum. A histo-

chemical study. J. Invest. Derm. 23: 293

12- Spier, H.W. & Coneghem, P.V. (1968) Zur Histochemie der verhornung Arch Klin .U. Expt. Dermatol. 206:344.

13- Maretti,G.(1959): Histochemical distribution of acid phosphatase in human skin. J. Invest. Derm. 26:347.

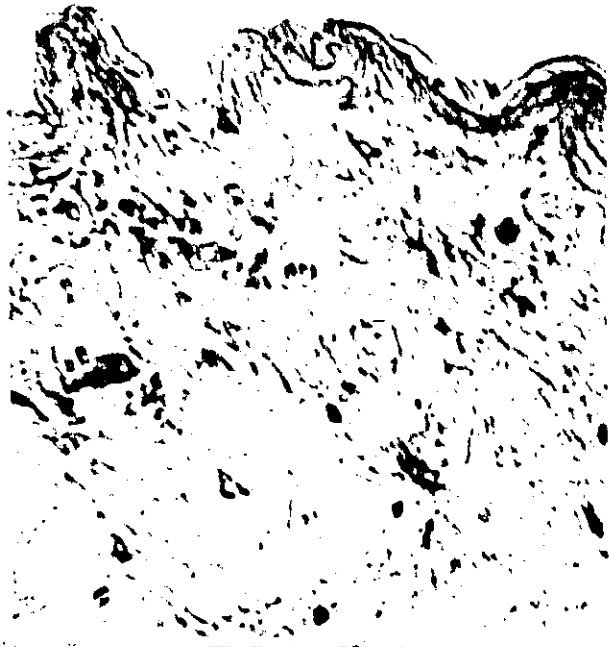

Fig 1 Section in the skin of albino rat, showing a weak reaction in the epidermis and moderate reaction in hair follicle and blood vessels(Alkaline phosphatase Gomori methods X 300

Fig. 2 Section in the skin of lizard, showing a faint reaction in the epidermis and dermis (Alkaline phosphatase Gomori methods X 300)

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Fig. 3 Section in the skin of albino rat, showing a strong reaction in the epidermis and moderate reaction in hair follicle & sebaceus glands.(Acid phosphatase X 300)

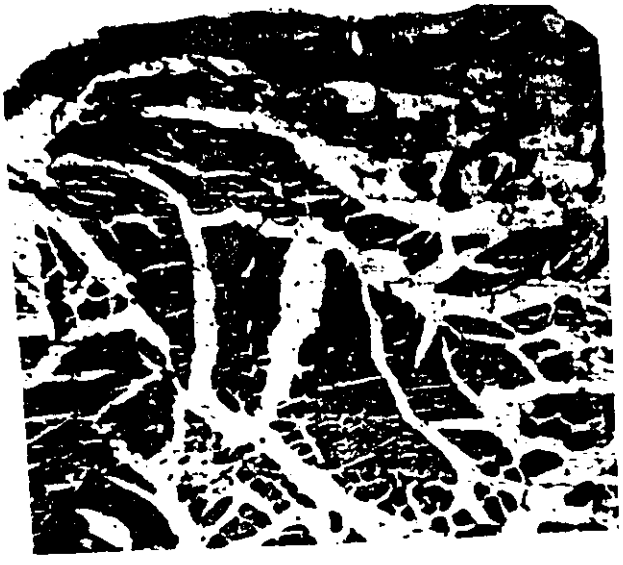

Fig 4 Section in the skin of lizard, showing a strong reaction in the epidermis. and a moderate reaction in dermis (Acid phosphatase X 300)

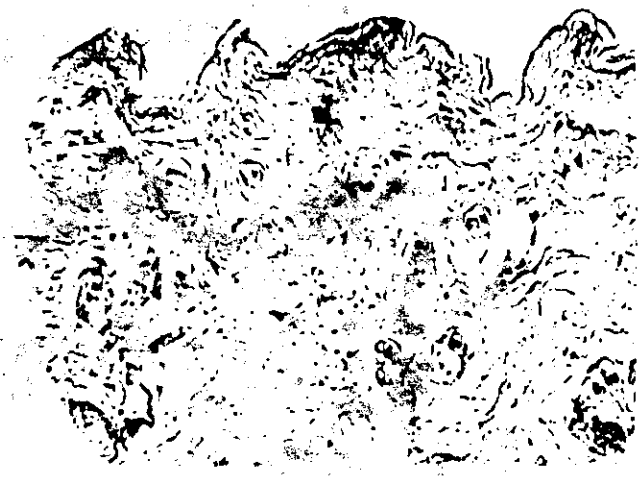

Fig. 5 Section in the skin of albino rat, showing a strong reaction in the epidermis and moderate reaction in hair follicle (PAS strain X 300)

Fig 6 Section in the skin of lizard, showing a strong reaction in the epidermis and in osteoderm (PAS stain X 300)

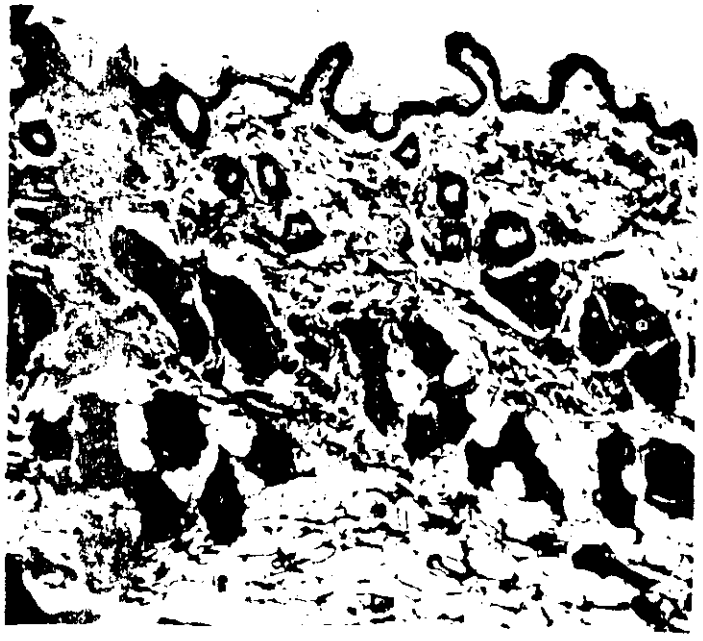

Fig. 7 Section in the skin of albino rat, showing the strong reaction in sebaceus gland and hair follicle (Alcian blue X 300)

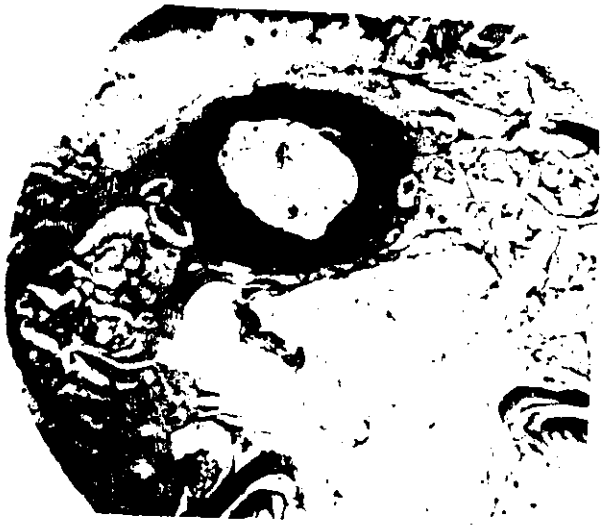

Fig. 8 Section in back skin of lizard, showing a strong reaction in osstodermis (Alcian blue X 300)

دراسة هستوكيميائية للجلد فى الفار والسحلية

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اخذت عينات من الجلد البطنى والظهرى لكل من الفأر والسحلية وقد بينت الدراسة الهستوكميائية لانزيم الفوسفاتير القلوى والفوسفاتير الحامضى والجليكوجن وعديدة السكريات المخاطية الحامضية وجود بعض الفوارق بين هذين الحيوانين.

ويرجع ذلك نتيجة الاختلاف فى النوع والطبيعة الفسيولوجية لكل منهما كما اظهرت الدراسة عدم وجود فروق محسوسة بين توزيع كل من الانزيمات والمواد السابقة فى الجلد الظهرى والبطنى فى كل من الحيوانين فيما عدا السكريات المخاطية الحامضية فانها تكون موجودة بتركيز اكثر فى الجلد الظهرى للسحلية.