LECTURE NOTES ON DERMATOLOGY

Bethel Solomons

FIFTH EDITION

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FIFTH EDITION

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PREFACE TO FIFTH EDITION

A great amount of this revised edition consists of new material, especially in regard to recent innovations in treatment and the reorientating of old concepts in relation to aetiology. The importance of immunological mechanisms is introduced as far as is pertinent. Many outmoded remedies have been discarded.

Dr W.H. Jopling has revised the section he wrote on leprosy, whilst the account of syphilis and Reiter's disease by Dr J.K. Oates remains unchanged, and to both of them I am very grateful. I also wish to thank Mrs Fiona Dalton for retyping the book.

The essential aim of the book remains the same, i.e. as an introduction to dermatology for students, and an easy reference for general practitioners.

I am grateful to the Photographic Department, Chelmsford and Essex Hospital, for providing several illustrations.

Finally, as always, I am indebted to the patience and cooperation of the publishers.

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London W1N 1PE

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CHAPTER 1
ANATOMY, PHYSIOLOGY AND PATHOLOGY

ANATOMY AND PHYSIOLOGY

Apart from its apparent function as an elastic envelope to walk about in, the skin has several other important qualities. It is waterproof and airtight, although some substances may be absorbed by it.

It acts as a form of thermostat, the heat of the body being regulated by the blood vessels and by sweating.

It protects underlying organs from physical, chemical and other injuries.

It acts as a relay station between external influences and internal organs by means of its tremendously complicated network of nerve terminals.

It acts as an organ of expression, betraying the innermost feelings: anxiety by sweating; fear by pallor; and anger by redness.

It is an important store for water, containing 18–20 per cent of the total water content of the body although this amount decreases with age. It is mainly distributed in the dermis.

Histology

The skin is divided into three principal layers:

1. the epidermis;
2. the dermis;
3. the subcutaneous tissue.

Epidermis

The *epidermis* is subdivided into four layers:

(a) the basal layer or stratum germinativum;
(b) the malpighian or prickle cell layer or stratum spinosum;
(c) the granular layer or stratum granulosum;

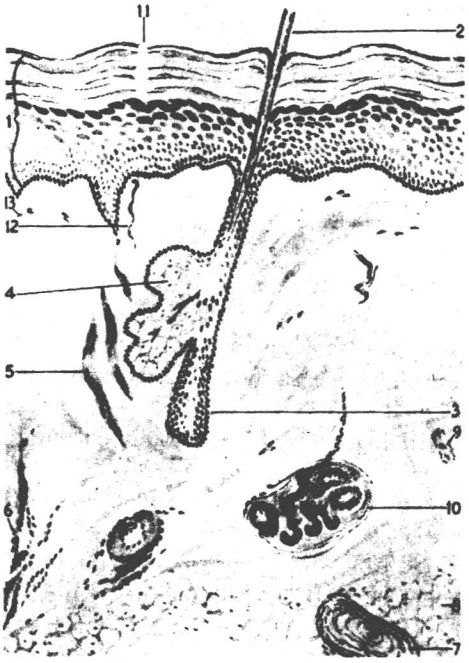

Fig. 1. Diagram of constituents of the skin. 1. Epidermis. 2. Hair. 3. Hair follicle. 4. Sebaceous gland. 5. Muscle fibres of M. arrector pili. 6. Blood vessel. 7. Pacinian body. 8. Fat lobules. 9. Cutaneous nerve. 10. Sweat glands. 11. Sweat duct opening. 12. Terminal nerve fibrils. 13. Collagen bundles.

(d) the horny layer or stratum corneum (Fig. 1). (An extra layer, the so-called lucid layer, lies above the granular layer, and is found only on the palms and soles.)

The cells in the basal layer gradually evolve into the cells of the horny layer at random, and make their way to the horny surface, changing only in shape and size, as they pass through the malpighian and granular layer.

The *basal layer* lies deepest in the epidermis, and next to the dermis. It consists of two types of cell:

(i) basal cells;

(ii) melanocytes.

Basal cells are columnar in shape, their long axis being at right angles to the dermis beneath them. They contain a dark-staining oval or elongated

nucleus which lies in deeply basophilic cytoplasm. They are joined to each other by intercellular bridges.

Melanocytes are dendritic cells in which melanin is formed. Melanocytes all arise from the neural crest. Epidermal melanocytes appear as a haphazard horizontal arrangement above the dermal junction.

The malpighian layer is also called the prickle cell layer, because the cells appear to be held together by prickles; they are actually intercellular bridges, which provide greater stability to the polygonal prickle cells.

The granular layer is composed of one to four rows of diamond-shaped cells, filled with deeply basophilic granules.

The horny layer normally contains no nuclei and is continuously shed from the surface. Only by means of the electron microscope can intercellular spaces be seen. Its hardness is due to keratin (see p. 8).

The epidermis also possesses the following appendages:

1. the eccrine glands;
2. the apocrine glands;
3. the sebaceous glands;
4. the hair;
5. the nails.

THE SWEAT GLANDS

There are two varieties in man, the eccrine and the apocrine. They regulate heat, causing heat loss by evaporation, and they improve the grip. They arise as downgrowths from the epidermis.

THE ECCRINE GLANDS

These exist all over the skin, but not in mucous membranes, the total number varying between 2 and 5 million; the numbers vary greatly according to the site. There are, obviously, many more on the palms than the legs. The gland starts as a coil in the dermis, and opens invisibly on the skin surface. The secretion is a clear watery fluid, 99–99.5 per cent, also containing chlorides, lactic acid, urea, nitrogen and other substances.

THE APOCRINE GLANDS

These are large sweat glands, whose ducts open into hair follicles to which they are attached, and rarely on to the surface of the skin. They are coiled tubular glands, with a duct leading down to a coil of secretory tubules. They are found in the axillae, anogenital areas, nipple and areola, but do not develop fully until puberty. Modified apocrine glands occur in the

external ear, producing wax, and on the eyelids, where cystic blockage may occur. The product of the glands is a whitish, sterile fluid, containing proteins, carbohydrates and other substances. It is evoked in response to stress, pain, fright or sexual activity.

THE SEBACEOUS GLANDS

These are found all over the body, except on the palms, soles and dorsa of the feet. They are most numerous on the scalp, face, forehead, and chin. The glands have no lumen and their secretion is the result of decomposition of their cells, most of it being discharged through the sebaceous duct into a pilosebaceous follicle. They are multilobulated, and appear as a pouch hanging on the outer side of the follicle. The secretion is known as sebum and contains fatty acids, cholesterol and other substances. The exact function of sebum is still in dispute.

THE HAIR

A hair consists of a root containing non-keratinized cells, and a shaft composed of keratinized cells. The shaft extends from the skin surface to the free end of the hair. The root and its lower end are called the hair bulb and contain the hair matrix cells. They comprise all the part below the skin surface, and lie in what is called the hair follicle. A pointed projection of the dermis protrudes into the hair bulb, and this is the papilla. It is luxuriantly supplied with nerves and blood vessels, and contains melanin which is responsible for the pigment of dark hair.

The distribution of the hair is universal except for the palms, soles, dorsal aspect of the distal phalanges of the hands and feet, the penis, the labia minora and the lips.

There are three types of hair:

1. downy or lanugo hairs which cover the face (except the beard and moustache areas), hands and limbs;
2. long soft hairs, which cover the scalp, beard, moustache, axillae, and pubes;
3. stiff hairs which are found on the eyebrows, eyelids, and in the nose and auditory meatus.

Hair growth varies according to the area. The average daily rate of scalp hair growth is 0.37 mm, and a hair may continue growing for from 2 to 6 years before falling. An average number of scalp hairs is 100 000, and the usual daily loss is 20 to 100. This is comforting consolation for those who imagine they are going to lose all their hair when they find a daily number on their brush or comb.

The reason baldness does not occur as a result of this constant fall is due to the cyclical growth of hair. In every hair follicle there is a resting period followed by a growth period; the loss of hair is not noticeable because neighbouring follicles have differently timed cycles, and are at the same time at different phases of the cycle. These phases are known as the anagen phase (the active growing phase), the resting or telogen phase, and the intermediate or catagen phase.

On other areas such as the trunk, eyebrows and limbs the growing period of the hairs lasts about 6 months, so that the hairs do not grow to a great length.

The influences on hair growth are complex and perplexing. The male hormone testosterone maintains the sex hairs of men and women. It also provokes the growth of beard hair, yet its presence is a condition for the development of male scalp baldness. Eunuchs never become bald. Other hormones have little effect on hair growth, except for the pituitary which, through its connection with the adrenals and the gonads, has an indirect influence.

The function of the hair is to protect the skin against minor harmful influences; for example, eyebrows direct sweat away from the eyes, and the nasal vibrissae filter air. It also acts as a thermoregulator, a promoter of sweat evaporation, is a sensitive tactile organ, and provides sexual attraction.

The health of the hair depends on the health of the individual. The visible hair is a dead structure, and no amount of singeing, brushing or oiling will alter its fundamental vitality, although its appearance may be improved.

NAILS

Nails are translucent, compact, solid plates of keratin. The matrix lies beneath the nail-fold. The paronychium is the soft tissue surrounding the nail border.

The average *growth rate* is 0.1 mm daily. A finger nail takes about 100–150 days to reproduce itself, and a toe nail about three times as long. Growth may be affected by disease, and nail shedding, splitting or ridging may accompany long illnesses, or malnutrition. In some cases there is no obvious cause for such nail disorders. Nail growth is increased by nail-biting and, like hair, is accelerated in summertime.

Their *function* is the indispensable one of picking up small objects. They are also bright ornaments to the fingers, and, in disease, may often be indicators of internally situated disorders.

Dermis

The dermis may be divided into two parts:

1. the papillary;
2. the reticular.

The *papillary part* lies snugly against the epidermis above. The papillae strike up into it at irregular intervals, so that the alternating areas of epidermis which drop down produce the effect of a draped curtain. These epidermal drapes are called rete pegs.

Most of the papillae contain blood vessels, and some contain nerve elements, such as tactile corpuscles.

The *reticular part* contains connective tissue bundles, below which lies the subcutaneous tissue.

The dermis contains the following structures:

(a) connective tissue fibres;
(b) cellular elements;
(c) blood vessels;
(d) nerves;
(e) muscles;
(f) lymphatics.

CONNECTIVE TISSUE FIBRES

There are three varieties:

(i) collagenous;
(ii) elastic;
(iii) reticulin.

Collagen fibres form 75 per cent of the total. Collagen is an albuminoid substance of which the bundles are comprised. These present a wavy appearance, and are held together by a ground substance. Fibroblasts lie between the bundles.

Elastic fibres run parallel or obliquely to the collagen, and enclose the bundles.

Reticulin fibres are composed of collagen fibrils, and probably ensure stability between dermis and epidermis.

CELLULAR ELEMENTS

A. In health

1. Migratory cells

(a) Leucocytes lie sparsely around blood vessels and lymphatics.

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(b) Histiocytes resemble fibroblasts, having large round or oval kidney-shaped nuclei. They are also called reticulin cells. Their function is to absorb specific material, and form reticulin fibres. Under certain conditions they may change into epithelioid cells (see below).

2. Fixed cells

(a) Fibroblasts are spindle-shaped with elongated nuclei.

(b) Mast cells are histiocytic and spindle-shaped with an oval or round nucleus. They produce heparin and histamine. Normal skin contains few of them.

B. In disease

Apart from polymorphonuclear leucocytes, and lymphocytes, which play their accustomed roles in inflammatory disease, other cells sometimes play a diagnostic part in skin disorders.

Eosinophils are significant in dermatitis herpetiformis.

Macrophages are phagocytizing histiocytes, and when fused, appear as multinucleated foreign body giant cells. As such, they particularly appear in gout.

Epithelioid cells are altered histiocytes and together may form Langhans giant cells, and as such appear in tuberculous, sarcoidal and syphilitic lesions.

Plasma cells occur in most chronic inflammatory conditions. The functions of the plasma cell are the synthesis of antibodies and gamma globulin.

Foam cells are histiocytes ingesting lipoids, and are easily identified in the lesions of xanthoma.

BLOOD VESSELS

The blood supply nourishes the skin and removes its waste products, as well as playing an important role in the regulation of body temperature.

A capillary plexus exists between the dermis and the subcutaneous tissue, and in the sub-papillary area. Always varying, its position can never be accurately defined. The deep vessels have three layers of cells, the superficial vessels have one.

The glomus consists of an arterial segment, the Sucquet-Hoyer canal, and a venous segment, and is found on the tips of the fingers, toes, under the nails, in the palms, soles, in the ears and centre of the face. It is a local temperature regulator.

NERVES

The skin is supplied from non-medullated and medullated fibres, which reach it from bundles in the subcutaneous tissue.

The sensations of touch, spatial discrimination, and temperature on hairless skin such as the palms, soles, lips, nipples, penis and clitoris are considered nowadays to be mediated through the free sensory nerve endings in the epidermis.

MUSCLES

Smooth or involuntary muscle is found all over the skin, except on the neck, and in the facial muscles of expression. Smooth muscle is attached to the hair follicles, as arrectores pilorum which on contraction produce 'gooseflesh', the tunica dartos of the scrotum, and the fibres of the areola of the nipple.

LYMPHATIC VESSELS

Few exist, and in the dermis present a spongy network, passing to deeper and larger plexuses in the subcutaneous tissue.

SKIN SURFACE LIPIDS

These cover the surface with a watery greasy film called sebum, whose function is debatable.

The production of these lipids varies in different areas, and individuals. They increase as adolescence approaches, and decline with advancing age, the levels in males being higher than in females. Hypersecretion, or abnormal sebum composition seems to be involved in the aetiology of acne, although its role is far from clear.

KERATIN

This is a fibrous protein, found in the horny layer of the epidermis, hair and nails. It is resistant to digestion by trypsin and pepsin, and is insoluble in water, dilute acids, alkalis and organic solvents.

WATER

The skin contains 18–20 per cent of the total water content of the body. There is continuous invisible evaporation from the surface.

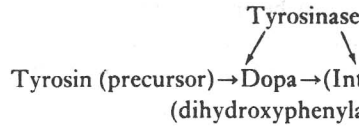
PIGMENTATION

The colour of normal skin originates from:

1. melanin;

2. oxyhaemoglobin;
3. reduced haemoglobin;
4. carotene.

Melanin results from the enzymatic oxidation of tyrosine by tyrosinase, and during the reaction dopa acts as a catalyst.



Both melanogenesis and melanin pigmentation are also influenced by genetic and hormonal factors.

ABSORPTION

This occurs to a considerable degree, and the skin's absorptive capacity is greatly increased by abrasion. Hormones can be rubbed in, and it has been shown that iodine sprayed on the skin may be detected in the urine 20 minutes later. It has also been proved that water may be absorbed.

SENSATION

There are four types of sensation: pain, touch, cold and warmth, which are distinguished objectively and subjectively.

1. Pain sense. Pain may be caused by physical, chemical or mechanical irritation.
2. Touch sense. Touch spots are irregularly placed and are more concentrated where discrimination is acute. Touch stimuli are received from hair follicles, and the intervening skin.
3. Itching sense. This arises from terminal nerve-endings close to the skin surface (itching does not occur when the epidermis is absent).
4. Temperature sense. This sense is probably mediated through the free sensory nerve endings in the epidermis.

PATHOLOGY

The pathological changes found in skin diseases are often not diagnostic. The pathologist has to rely to a great extent on the clinical information supplied to him, which frequently is too trivial to be of much assistance. It should be a cardinal rule that a good description of the case be sent with the specimen. Even so, in many cases, the pathologist may only state that the findings are compatible with the clinical ones, such is the close

histological resemblance of certain skin diseases. In some conditions, however, his report reveals or confirms the diagnosis.

The terminology of the dermatological pathologist contains some words peculiar to the speciality, and others which are used generally in pathology. It is essential to know some of the former, so that the more obvious minutiae of histological sections may be understood.

The following are the commonest changes in the epidermis.

1. Hyperkeratosis, which is hypertrophy of the horny layer. This is most classically seen in a corn.
2. Parakeratosis is the retention of nuclei in the cells of the horny layer. It is well illustrated in psoriasis, and other scaly conditions.
3. Acanthosis is an increase in the depth of the prickle-cell layer. It occurs, for example, in psoriasis and warts.
4. Spongiosis is intercellular oedema, a part of the picture of dermatitis and eczema.
5. Acantholysis is a detachment of epidermal cells from each other, which produces clefts, vesicles and bullae in the epidermis. It occurs in the bullous condition called pemphigus.

The following are the commonest changes in the dermis.

1. Hypertrophy or atrophy of fibrous tissue, as in a keloid, or senile skin, respectively.
2. Capillary changes, as in lupus erythematosus, or scleroderma.
3. Collagen degeneration, as in senile skin, or scleroderma.

Immunology

The role that immunological processes play in skin diseases is as yet poorly defined. Many suggestions related to such processes are tentative. It has, however, been shown by many investigators that such relationships exist in lupus erythematosus, systemic sclerosis, pemphigus, the early stages of sarcoidosis, in the erythema nodosum of leprosy, and perhaps in dermatitis herpetiformis.

Investigators' nets have been widely cast in other directions too. They have peripherally covered contact dermatitis, urticaria and atopic eczema, for example, diseases whose basic mechanisms are poorly understood. Investigations may yet show that immunology is a very important aspect of skin disease, and, more importantly, provides clues to more effective prophylactic and/or curative treatment for the unfortunate patient.

Allergy is an unusual or increased reaction following an initial exposure to any external agent, physical, chemical or biological, which is commonly

harmless to most individuals. Most allergic reactions have their basis in an immunological reaction, i.e. an interaction between antigen and antibody. The commonest skin conditions reflecting an allergic state are urticaria, atopic eczema and contact dermatitis, and are dealt with elsewhere.

For detailed consideration of immunological reactions see an immunological textbook.

CHAPTER 2
HISTORY, EXAMINATION AND DIAGNOSIS

The traditional approach to a patient with a skin disease has usually, in the past, been a matter of observation. That is to say, examination and description of the lesion preceded any investigation into the history of the patient's condition. Almost all skin diseases can be diagnosed in this manner, because the signs necessary to make a diagnosis are immediately visible. Too often this method causes one to abbreviate history taking, a course which has many pitfalls. It minimizes the doctor–patient relationship from the start, when good rapport between them is often essential to effective treatment.

The recognition of the various types of lesion which may occur is the first essential towards making a diagnosis, a task sometimes more difficult than it sounds, but before this is done the patient should be put at ease, and of course all the senses must meanwhile be alert to pick up clues to the diagnosis as the patient approaches the doctor, just as in the diagnosis of a disorder of any other system. The author, in fact, believes that a personal approach is more rewarding than the impersonal one. The patient who has pruritus ani, or a submammary rash, or lesions elsewhere on a clothed area, be it chest, abdomen, back or groin, should be questioned generally, so that an idea of the evolution and the symptomatology of the disease can be acquired. The patient will become more cooperative and relaxed, and subsequently his equanimity will be maintained when submitted, naked, if necessary, to the analytical gaze of the physician.

While bearing in mind the importance of the doctor–patient relationship it is not a necessity in, for example, the removal of warts.

Whichever method is applied, the skin disease must not be treated separately from the patient, for treating the part will never cure the whole.

In skin disease, as in diseases of any other system, it is essential to keep an open mind about the diagnosis during the history and examination. In a weak moment, one may be unintentionally misguided by a doctor's letter accompanying the patient, or by the patient's idea of the diagnosis. Sometimes the dermatologist may be confronted by a patient who speaks

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