

had been my main object, I could have got more; but supposing cranberries to contain malic acid, and knowing that, at least minute of lime taken internally will produce succinic acid in the urine, my aim was to find it here; but in this respect I was disappointed, as even the extract by ether showed, by evaporation under the microscope, nothing but the characteristic crystals of hippuric acid.

ART. VI.—*A Contribution to the Pathology of Epithelium.* By ARTHUR VAN HARLINGEN, M.D., Chief of the Skin Clinic, Hospital of the University of Pa. (With illustrations.)

The Epithelium in Seborrhœa, Psoriasis, and Eczema.—The microscopic examinations of epithelium, of which notes are here given, were made some time since. I had originally undertaken them with the view of gaining some practical aid in the differential diagnosis between seborrhœa, psoriasis, and eczema,¹ as these affections are found occurring in the scalp. When they involve other portions of the body at the same time as the scalp, it is comparatively easy to distinguish between them. When, however, they are found in the latter locality alone, the diagnosis often becomes a matter of considerable difficulty.

The product of disease consists in each case chiefly of epithelial cells, mingled to a greater or less extent with the local glandular secretions, and although, in typical cases, the colour and lustre of the epidermic masses, their arrangement, whether in patches or generally diffused, and the like naked eye appearances might serve in making a decision, yet it appeared probable that in a certain number of instances, where these signs might fail, much aid could be obtained by a microscopic examination. It would seem plausible that, as in extreme and typical cases such difference in gross appearance is presented, so in like manner the microscopic structure of the constituent elements should present peculiarities in each disease which should be characteristic, and that these peculiarities should prove decided, invariable, and easily ascertained. But the differences in structure should be apparent upon microscopic examination, even in non-typical and uncertain cases, where the gross appearances might not be distinctive of the disease; the microscope, therefore, should serve and might be made to aid in the diagnosis of these affections in practice.

In the course of the investigation, however, the number of examinations multiplied and were extended beyond the limit originally laid down, so that they included the epithelial product in various other diseases. The

¹ I refer, of course, to the squamous form of eczema, and to the dry form of seborrhœa—S. sicca.

idea then suggested itself of extending the range of research, until it should embrace an examination and comparison of the appearances of the epithelium in all those affections of the skin in which this plays a prominent part.

Circumstances have thus far prevented my carrying out the plan proposed to its entire extent, and I think it better to publish the notes of examinations already made, although these extend only to a limited number of diseases, than to postpone making them known until an opportunity occurs of completing the investigation. I present, therefore, in this paper, the notes of microscopic examinations of the product of disease in seborrhœa, psoriasis, and eczema. This product being almost entirely epithelial, it was the study of the epithelial cells which engaged my attention.

For purposes of comparison, I have arranged the appearances noted under the nine heads following, in order :—

1. General appearance of the product of disease.
2. The reagents employed, and the microscopic power used. (The latter when not specified was an ordinary objective of one-fifth of an inch focal distance with a low eye-piece, giving an amplification of between 237 and 250 diameters.
3. The facility with which the cells absorbed the staining fluid.
4. The diameter of the cells.
5. Nature of the cell contents (granular, oily, etc.).
6. Outline of the cells, whether smooth or irregular, their shape, their tendency to flatness or curling at the edges.
7. The presence or absence of nuclei together with the general appearance of these.
8. The connection between the cells, whether close and firm or loose.
9. Presence or absence of granular matter, debris, etc. in the microscopic fields, extraneous to the cells.

The notes of examinations given below will generally be found to include some record under each of these heads. Occasionally, when the examination has not been made complete, or in many cases where a full history has been wanting, the case has nevertheless been placed upon record as being sufficiently characteristic for the purpose.

I will now proceed to give the results of examination in various cases of seborrhœa of both head and body, including not only typical instances, but some where the appearances were not altogether characteristic. The first case given is one of typical aspect and average duration involving both head and body, the subsequent ones will be seen to vary as regards the different conditions, of duration, severity, age of patient, and the like.

CASE I. *Seborrhœa Corporis et Capitis.*—J. H., age 41. Disease of some years' standing. Ordinary "dandruff" of the scalp, and a patch of seborrhœa the size of the palm over the sternum. *Body.* Scales taken

from the diseased patch were yellowish, oily looking, adherent, and could be made into a ball between the thumb and finger. *Microscopic examination.* Treated with water and aniline, coloured well, though the staining material penetrated with difficulty owing to the amount of oily matter present. Apparently two sets of cells, a larger varying between .0256 mm. and .0384 mm., averaging .0307 mm., and a smaller not measured. Cell contents decidedly granular with occasional distinct oil globules. Edges thin and flat; not inclined to curl or fold up. Nuclei common, sometimes abundant and containing what seemed to be a vacuole. The place of the nucleus was frequently occupied by a lighter circular area. Considerable granular matter in field.

Scalp. Scales pearly-white, thin, and easily separable. *Microscopic examination.* Treated with aniline and water, the cells coloured well. Average diameter .0333 mm., though some were much smaller. Cell contents rarely granular. Outline usually distinct, with little tendency to curling on the edges. Large bright nuclei common. Cells loosely connected. Little granular but considerable oily matter in field.

CASE II. Mild Seborrhœa Capitis.—J. V., age 76. Slight "dandruff" of the variety usual in aged persons. Of many years' standing. Scales pearly-white, tending to aggregate in small flakes, and coherent. *Microscopic examination.* Cells seemed thin and small; their diameter was not measured. Few possessed a nucleus. They showed a decided tendency to roll together and curl on the edges. No granular matter in field.

CASE III. Severe Seborrhœa Capitis.—Emma N., age 17. Has had "dandruff" ever since she can remember. Much worse during past year. Scalp thickly covered with characteristic eruption. The scales presented the usual pearly, greasy lustre, and tended to clieg together. *Microscopic examination.* Treated with aniline; the cells coloured well. Diameter not noted. Cell contents usually granular. Outline smooth and regular. Cells presented a sacculent appearance as if recently formed. Nuclei common. Considerable granular matter in field.

CASE IV. Severe Seborrhœa Capitis.—H. McK. Disease of twelve years' standing. Scalp covered with characteristic scales. *Microscopic examination.* The scales were macerated in ether for some weeks, and were then treated with water and carmine, coloring fairly well. Diameter of cells averaged .0333 mm. Contents not distinctly granular. Outline distinct and regular; no tendency to curl on edges. Large distinct nuclei (or nuclear spaces) common; showing no colour with carmine but remaining light and clear with heavily tinted borders.

CASE V. Seborrhœa Faciei et Capitis.—No history. *Microscopic examination.* *Face.* Treated with water and aniline, cells stained poorly, outline regular and no curling at edges. Few nuclei, and those only dimly outlined. Little or no granular matter in field. *Scalp.* Treated with aniline, cells stained deeply. Nuclei tolerably frequent. No granular matter in field.

CASE VI. Seborrhœa Corporis.—D. Wilson, severe on face, with seborrhœa of the body: Scales adherent. *Microscopic examination.* Cells thin, transparent, dry looking, irregular in outline. No nuclei. Cells usually flat.

CASE VII. Seborrhœa Corporis.—No history. Two kinds of scales were taken for examination, one large and compact, the other small, loose, and friable. *Microscopic examination.* Macerated in ether for four

weeks. Treated with water and aniline. Diameter of cells varied between .0333 mm. and .0384 mm. Cell contents not granular. Outline generally smooth and regular, few cells curled on edges. A few cells contained a large, bright area, instead of the usual nucleus; many contained a small, faint, light area. Nuclei uncommon. In one cell a central dark spot was observed, with a bright areola.

CASE VIII. *Seborrhœa Corporis.*—No history. *Microscopic examination.* Examined with water and aniline. Rather lighter colour than usual. Diameter averaged .0332 mm. Contents of cells decidedly granular; in some cases there was apparent fatty degeneration. Many cells polygonal in shape, others irregular. Outline according to drawing smooth and regular; some cells curled upon edge. A number had faint nuclei. Connection between individual cells not very close, they were separated without much difficulty. Little granular matter in field.

On comparing the results of examination in the above cases, one is struck by the fact that the product of disease is seborrhœa capitis, that is the epithelium, presents microscopic characters quite different from those shown by the epithelium in seborrhœa of the body. The following table will show these differences:—

Seborrhœa Capitis.

1. The cells stain deeply.
2. Average diameter .0333 mm.
3. Contents usually occasionally granular, and then very indistinctly so.
4. Outline distinct and sharply defined. Usually flat, occasionally curled.
5. Nuclei common, large and distinct. Usually light, but in one case stained darkly.
6. Occasionally granular matter in field.

Seborrhœa Corporis.

1. The cells stain poorly, possibly on account of oily matter in the field.
2. Average diameter .0256 mm. to .0384 mm.
3. Contents highly granular, excepting in one case when other was used.
4. Outline frequently indistinct. About same as to flatness.
5. Nuclei rare and faint. Occasionally their place seemed to have been taken by an oil globule; in other cases the minute nucleus was surrounded by a bright halo.
6. Usually granular matter in field.

The following cases of psoriasis were examined in the same manner as those of seborrhœa just given.

CASE IX. *Psoriasis Corporis et Capitis.*—L. E., age 38. Typical case of generalized inflammatory psoriasis. *Body.* Scales taken from the forearm appeared yellowish-white with a dry, pearly lustre, were quite friable, disintegrating easily. *Microscopic examination.* Treated with water and aniline, the cells coloured well. Diameter varied between .0256 mm. and .0384 mm. They were, for the most part, small cell contents, not granular. Cells flat, not curled on edges. Outline usually smooth and regular, sometimes more or less jagged, edges not thin. Nuclei uncommon, usually small and indistinct, occasionally containing a central granule or nucleolus. Cells loosely connected. No granular matter in field. *Scalp.* Scales resembled precisely those taken from the body. They were yellowish-white and friable, but not quite as dry and powdery as the latter, owing probably to their admixture with sebaceous material. They were easily compressible under the glass cover, showing some oily streaks. *Microscopic examination.* Treated with aniline,

cells colored well. Diameter varied between .0282 mm. and .0410 mm., usually small. Cell contents granular, not at all like fatty degeneration. Outline of cells usually smooth, occasionally thin and jagged. Decided tendency to fold together, and curl on the edge. Nuclei anastomosing, and when present commonly indistinct. Occasionally large, bright nuclei were observed, but these were rare. Cells loosely connected. Considerable granular matter in field.

CASE X. *Psoriasis Corporis et Capitis*.—J. A., age 66. An average case as to duration and appearance. *Microscopic examination. Body.* Treated with aniline and water, the cells colored well. Diameter varied greatly, ranging from .0250 mm. to .0501 mm. Nuclei unusual and small. Some cells polygonal and regular in outline, most irregular, curled and folded on edges. Little granular matter in field. *Scalp.* Cells colored pretty well. Diameter varied between .0395 mm. and .0501 mm. Cells generally transparent; a few had granular contents. Outline usually smooth and distinct, occasionally folded or curled on edges. Nuclei rare, small, and indistinct. Considerable granular matter in field.

CASE XI. *Psoriasis Corporis et Capitis; chronic*.—Kate R., age 21. Generalized psoriasis, mild and non-inflammatory. 'Three years' duration. *Microscopic examination. Body.* Treated with aniline and water, cells colored well. Diameter varied between .0282 mm. and .0435 mm. Cell contents faintly granular. Cell outline smooth, occasionally curled on edges. Nuclei rare, small, and faint. *Scalp.* Colored poorly. Average diameter .0280 mm. Cell contents decidedly granular. Outline jagged. Flat, not curling on edges. Nuclei very rare. Not much granular matter in field.

CASE XII. *Psoriasis Corporis et Capitis*.—Kate F., age 29. Average case of inflammatory psoriasis. *Microscopic examination. Body.* Treated with water and aniline, colored poorly. Smaller cells averaged .0307 mm., larger .0384 mm. in diameter. Contents not granular. Outline indistinct, curling on edges. Nuclei tolerably frequent, small, and pale. Cells closely adherent. No granular matter in field. *Scalp.* Cells colored well. Average diameter .0333 mm. Contents not granular. Outline smooth and distinct. Many cells showed small, pale nuclei. Connection loose. Considerable granular matter in field.

Comparison of the foregoing notes of microscopic examinations in psoriasis, gives the following characters as tolerably constant: The usual appearance of the scales is more yellowish than those of seborrhœa, particularly the pearly-gray scales of *S. capitis*. They were ordinarily quite dry, friable, and almost powdery, occasionally, however, cohering with very considerable tenacity. The scales from the body were particularly dry, contrasting strongly in this respect with the oily, almost waxy appearance of the scales in *S. corporis*. Sometimes the cells took colour very well, but, however, they stained slightly, if at all. They were evidently less sacculated than the cells of seborrhœa. The cells varied considerably in size, ranging from .0250 mm. to .0501 mm. in diameter. Two sizes were usually noted, a smaller, averaging .0250 mm. to .0307 mm., and a larger, averaging .0384 mm. to .0501 mm. The scales from the scalp contained, perhaps, the greater proportion of large cells. As regards cell contents, these were noted in one case as being granular, in

the others us faintly or not at all so. Certainly, nothing even remotely suggesting fatty metamorphosis could be observed. The cell outline was frequently irregular, with thin, indistinct, or jagged edges, though these were occasionally smooth and regular.

The cells in psoriasis corporis are generally flat, though occasionally curled and folded together; those from psoriasis capitis commonly show the latter aspect. Nuclei are rare, and when present are, with rare exceptions, small and indistinct. Considerable granular matter is observable through the microscopic field in psoriasis capitis, very little in P. corporis.

The following cases of eczema were examined in a manner exactly similar to that pursued in seborrhœa and psoriasis.

CASE XIII. Acute Eczema Erythematosum Capitis et Corporis.—J. C., age 65. Disease of some weeks' duration, generalized, almost universal, presenting the usual appearances. *Microscopic examination.* *Body.* Treated with water and aniline, cells coloured well. Diameter varied between .0307 and .0384 mm.; contents usually faintly granular. The use of a higher power $\times 1000$, showed the granular appearance to be due to wrinkling of the surface. No oil globules observed. Outline thin and not well defined. Cells usually flat, though some curled on the edge. Very few cells contained nuclei, and these were small. Occasionally a small dark point surrounded by a bright ring was observed. Cells easily separated. No granular matter in the field. *Head.* Cells coloured well. Size varied a good deal, smaller cells averaged .0307, larger oblong ones .0307 mm. by .0538 mm. Contents markedly granular. Cells quite flat, usually looked thick with smooth outline, occasionally thin with jagged edges. Nuclei rare and indistinct. Much granular matter in the field.

CASE XIV. Eczema Squamosum Capitis.—E. C.; no history. *Microscopic examination.* Cells thin and transparent, smooth and regular outline. Curled on edges in many cases. Distinct nuclei common. Connection of cells loose. Considerable granular matter in field.

CASE XV. Eczema Squamosum Capitis.—Julia L., age 18 months. Has suffered some months with impetiginous eczema, generalized over body. On head has recently assumed the squamous form. *Microscopic examination.* *Scalp.* Cell contents not granular. Cell outline distinct and smooth; curled and folded on edges. Nuclei rare and indistinct. Little granular matter in field.

Comparing the results of examination in these various cases of eczema, we find the following characters common to all, or nearly all. The cells were transparent, and took colour well. In only one case (eczema erythematosum) was their size accurately measured. In this case there seemed to be two varieties of scales, one composed of more or less regularly polygonal cells, the other of irregularly oblong cells. The former were the smaller; their diameter averaged .0307 mm. The oblong cells averaged .0538 mm. in length by .0307 mm. in width. The larger oblong cells from the scalp in this case were noted as granular, but in no other case were such contents noted. This may therefore be regarded as for some reason exceptional, and the epithelial cells in eczema may be stated to be transpu-

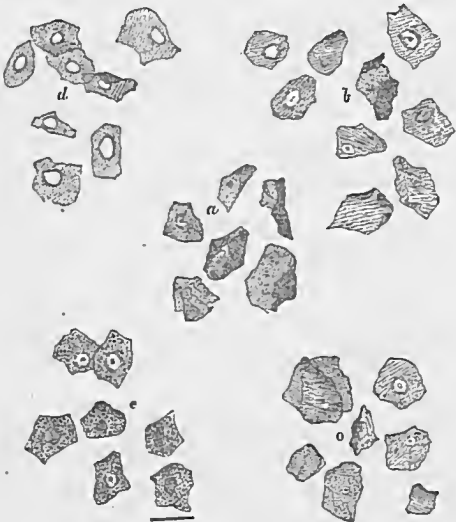
rent, and without oily or granular contents. In outline the cells were sometimes thin, irregular and jagged; in one instance, the exceptional one named, they were smooth and thick. In the latter case the cells were flat, in all the others folded and curling. Nuclei were faint and rare; in the case particularly alluded to above, the nucleus was frequently small and surrounded by a halo. The cells did not adhere. There was granular matter in the field in the case of eczema capitis, but not in those of E. corporis.

Examining collectively the results of the investigations given above, with a view to comparing the relative character of the affections under consideration, it will be seen that they naturally fall into two classes. The first includes psoriasis capitis and corporis, eczema capitis and corporis, and seborrhœa capitis; the second is represented by seborrhœa corporis alone. The product of disease in the first class consists of epithelial cells and granular (schaceous) matter; the cells for the most part derived from the epidermic layer of the skin. In each of the diseases belonging to this class, the epithelium resembles that found in the others, while at the same time it preserves certain slight but distinct characters of its own. In psoriasis the cells are yellowish, dry, staining with difficulty, and presenting contents faintly or not at all granular. Nuclei are rarely present, and are pale and indistinct. There is, in addition, a tendency to curl on the edges. The cell outline is jagged and irregular. In eczema, the cells are transparent, smooth, stain fairly, and present no granular contents. The cell outline is thin and irregular. Nuclei are faint and rare. In seborrhœa capitis, the cells are smooth and regular in outline, stain deeply, only occasionally present granular contents and these are indistinctly so. Unlike either of the other varieties of epithelium, the cells in seborrhœa capitis possess large and distinct nuclei.

The general resemblance and differences noted seem to suggest the probability that these cells are, in the case of each separate disease, the product of a different layer of the epidermis. Thus, psoriasis probably involves only the most superficial layers of the epidermis, including for the most part those cells whose life is nearly expended, whose nucleus is gone, and whose protoplasm has lost its suzerainty. (See illustration.) Eczema penetrates to a deeper layer, the cells involved are full and smooth on the edge, not contracted and jagged as in psoriasis. Their protoplasm is still active, it becomes stained with aniline, and a nucleus is more frequently observed. Finally, the cells of seborrhœa capitis are still more full of life, the nucleus is more common, the protoplasm more active, staining deeply under the influence of the colouring material. I am not prepared to say that the epithelium in seborrhœa capitis is derived from a deeper layer of the epidermis than that in the other affections examined, but that it comes from the lining portion of the sebaceous ducts, in part at least, is evident from the fact that on lifting an adherent scale of seborrhœa, one is able

at times to perceive that it includes an exact cast of the funnel-shaped opening of the sebaceous duct.

I must at this point express a doubt, suggested by the results of these examinations, as to the propriety of calling this affection *seborrhœa* at all. It does not consist essentially in an excessive flow of abnormal sebum, but in the exfoliation of epidermis, mingled indeed with sebaceous matter to a greater extent, perhaps, than is the case in the other squamous affections of the scalp, but nevertheless presenting epidermis as its principal pathological product.



a, Normal epithelium; b, psoriasis capitis; c, psoriasis corporis; d, seborrhœa capitis;
e, seborrhœa corporis.

More truly a *seborrhœa* is the affection which I have placed in the second class. *Seborrhœa corporis* presents indeed so peculiar an aspect that I must give a few words to a description of the eruption itself. It consists essentially in certain circumscribed patches of light or dark-yellow greasy scales, usually found upon the chest or upper part of the back, easily detached from the skin underneath, leaving a red shining and greasy surface. Examined microscopically, the scales are seen to contrast strongly with those of *seborrhœa capitis* (see illustration). They stain poorly, partly

on account of the excess of oily matter always present in the field. The contents of the cells are highly granular in all cases; the outline of the cells is flat and indistinct; nuclei are rare and faint; there is usually a large quantity of granular matter in the field. These cells may in fact be regarded as in a state of fatty metamorphosis, and as directly derived from the sebaceous glands, and the affection has evidently a much closer affinity with *seborrhœa oleosa* than with the affection known as *seborrhœa sicca capitis*.

ART. VII.—*A Contribution to our Knowledge of Beef-tea.* By HORACE BINNEY HARE, M.D., Physician to the Episcopal Hospital, Philadelphia.

THE general use which has been made of the various forms of beef-tea, and the difference of opinion with regard to its value, seem to me to justify the belief that some addition to our knowledge of the composition of the forms most commonly in use will be of interest to the profession.

While working in the Chemical Laboratory of the Pathological Institute in Leipzig, under the direction of Professor F. Hofmann, I was led to make certain analyses of what is commonly known as Beef Extract made according to the receipt given below. During the past winter I pursued the investigation further, and now present the results of my analyses.

As will be seen by a glance at the tables, only the amount of albumen and salts was directly estimated, while the figures given under "other organic matter" were obtained by subtraction of the albumen known to be present from the amount of organic matter found by incineration.

In the soups made without heat no gelatin was to be expected, and in the others, if any was present, which is to be doubted, it has been estimated together with the albumen and colouring matter.

The method of analysis employed, chosen after some experiment, was the same in each case. After the preparation of the soup, a weighed quantity of it was treated with a large excess of alcohol, enough in each case to precipitate the albumen completely. The mixture was allowed to stand twenty-four hours, then filtered, the albumen dried and weighed, then incinerated, and the weight of the ash subtracted. When the soup contained fat, which was, however, the case only when heat had been employed in its preparation, this was carefully removed after the liquid had grown cold and before the analysis was begun.

Another portion of the soup was weighed, evaporated to dryness, and the solid matter thus obtained. The solid matters incinerated gave the relative amounts of organic and inorganic matter.