In conclusion, I may state that the journeys I have made in this van have practically been very comfortable; that the railway rates are too dear, and the arrangements between so many different companies cause much complexity; but the future of invalid transit rests entirely with the British public, who will eventually decide on the best and most easy method of conveying sick and injured relatives. I shall be happy to exhibit my hammock, van, and stretchers to any professional man who may be interested in this subject; and arrangements may be made for the use of this van in cases of any description, excepting those of an infectious nature.

DEVELOPMENT OF THE MAMMARY GLAND.*

By ANTHONY A. BOWLBY, F.R.C.S.,
Curator of the Museum of St. Bartholomew's Hospital.

THE manner of the development of the breast has never until recent times been the subject of much controversy; the accounts in all works which described it as occurring by a process of involution of the cells of the epiblast, and the subsequent hollowing out of the ingrowth into a series of tubes, from which the acini were developed, were generally accepted without hesitation.

The chief authority for this description was Kölliker, and, in his last edition of his *Entwicklungsgeschichte*, he depicts the origin of the mamma as being visible at the fifth month as an ingrowth of epithelium, from which by the seventh month ten to fifteen processes are protruded. Langer, while agreeing partly with Kölliker, maintained that, "the development of the mammary gland is bound up with the existence of a peculiar and independent body, in which the ducts develop without connection with the groove in the skin."

It was not, indeed, until Dr. Creighton, in his work on *The Physiology and Pathology of the Breast*, threw doubts on the accuracy of previous observers, and suggested that conclusions had been arrived at after too scanty investigation, that the possibility of the origin of the mammary gland to a great extent from mesoblast was seriously entertained. The reputation of the author, the manifest care expended on his researches, and the arguments adduced, all combined to bring into great prominence the original conclusions contained in this work.

It is, perhaps, on this account the more remarkable that, although four years have passed since the publication of Dr. Creighton's book, no further investigations have been made public in this country with a view either to confirm or to refute the accuracy of his statements.

Yet, considering the importance to pathology, as well as to descriptive anatomy and embryology, of an accurate knowledge of this subject, it appears to me that the matter ought not to be allowed to rest in its present unsettled state; and it is rather with a view of reawakening interest in it, than with any idea of settling the question offhand, that I have brought it under your notice.

The following is a brief statement of the opinions expressed by Dr. Creighton which are at variance with those of other authors. He maintains that the epiblast is not the source from whence the acini are developed, and says, "The contention of the first part of this chapter is that the acini, or secreting structure of the breast, develop from a matrix-tissue at numerous scattered points or centres; that the matrix-tissue or embryonic cells is the same from which the fat surrounding the mamma develops; and that the mode of development of the acini is, for the individual cell, exactly the same process as in the development of the fat-lobules. The mammary gland would therefore be a further specialisation of fat-tissue, and a product of the mesoblast."....."The present description agrees with that of Goodsir in the important point, that the development of acini is not by means of protrusions of the ducts so as to form infundibula or recesses at many points along their course, but that it is an interstitial development from the embryonic tissue that surrounds the ducts." (Page 99.)

As regards the development of the ducts, Dr. Creighton writes: "In the wedge-shaped body of embryonic tissue in the groin of a foetal guinea-pig less than half grown, but with the nipple already formed, there are seen, extending backwards from the nipple, certain narrow tracts of cells which are simply the embryonic cells of the part closely packed together. These tracts of closely packed cells form at various points throughout the embryonic mass independently of each other, and no continuous extension of them can be traced from the nipple."....."There is certainly no evidence of a process of growth downwards from the rete mucosum under the nipple."....."The ducts are therefore held to be formed as aggregations of the embryonic cells of

the matrix along certain predetermined lines; that preliminary point may be taken as established."

"The conclusions of this inquiry are the following. 1. The mammary acini of the guinea-pig develop at many separate points in a matrix-tissue; the embryonic cells from which they develop are of the same kind that give origin to the surrounding fat-tissue, and that the process of development of the mammary acini is step for step the same as that of the fat-lobules. 2. The ducts of the mamma develop from the same matrix-tissue by direct aggregation of the embryonic cells along predetermined lines; the ducts develop in the individual guinea-pig before the acini, whereas, in the phylogenetic succession, the ducts are a later acquisition; and this reversal of the order of acquisition of parts is in accordance with the principle

Fig. 1.—Section of the mammary gland of a fetus in the fifth month, showing the ingrowth of the epithelium into the subjacent tissues.

stated by Mr. Herbert Spencer that, under certain circumstances, the direct mode of development tends to be substituted for the indirect."

It is needless for me to summarise further Dr. Creighton's opinions; they are expressed with admirable clearness; but it deserves to be remarked at the outset that the animals selected were mainly either kittens or guinea-pigs, while the conclusions arrived at as a result of his observations, and of a consideration of the types of gland-development in other animals, are equally applied to the human mamma (see pages 136 and 137); indeed, had it been otherwise, the work would have lost much of its interest. My own investigations have

Fig. 2.—Section of the mammary gland of a fetus at the beginning of the sixth month. (The ingrowth is larger, and the bridge of epithelium yet intact.)

been conducted entirely on the human subject, the material at my disposal consisted of thirty-four breasts taken from foetuses whose age varied from four months of intra-uterine life to one month after birth. Sections were cut of the whole of these, and between 200 and 300 were mounted and examined; those which I show you to-day have been selected as most suitable for my purpose, and most of the conclusions I shall ask you to accept, may either be confirmed or negatived by an examination of them.

The age given must be taken as to a great extent approximate. I judged of it by the most ordinary and trustworthy methods. The exact time at which the first rudiment of the mamma becomes evident,

* Read in the Section of Anatomy and Physiology at the Annual Meeting of the British Medical Association in Worcester, August 1882.

admits of some variation. I could not discover anything at the fourth month, but succeeded in doing so at the fifth (Fig. 1); it consisted of a very slight thickening of the deeper cells of the epiblast, exactly similar to that which may be noticed in a developing hair, or sweat-gland. It was covered by a thick bridge of cuticle, and limited by an ingrowth of the cells forming the rete Malpighii. This ingrowth, at first simply of a round or flask shape, later on becomes bifurcated, and shows a tendency to become hollowed out at the point nearest to the horny layer of the epithelium. (Fig. 2.) This hollowing out seems to be effected by a great increase in the size of the cells which are superficial to the rete Malpighii, so that their contiguous borders form a network, the meshes of which constantly tend to increase in diameter, the cell-wall finally giving way, and its substance shrivelling up. The horny layer of epithelium which is at first spread over the mass of cells then breaks away, and a hollowed out ingrowth, lined by the rete Malpighii, results.

Before, however, this has occurred, processes of the epithelium have begun to grow downwards into the subjacent tissue, and by the seventh month have become tolerably numerous (Fig. 3). They in their turn

Fig. 3.—Section of the mammary gland of a foetus aged seven months. The ingrowth is now hollowed, the bridge has broken away, and ducts are being developed from the epithelial ingrowth.

are excavated in a manner similar to that described above, with the exception of some, which appear to be hollow at their commencement. During the last two months of intra-uterine life, the processes of epithelium penetrate still further into the subjacent embryonic tissue; they divide and subdivide, and at their extremities, and as direct outgrowths from their walls, the mammary acini are formed. (Fig. 4.) During the month immediately subsequent to birth no material changes seem to occur; and, judging from the quietude of the gland, I think it may be safely assumed that, until puberty, no further development takes place. I did not notice any material difference in the manner of the development in the two sexes, but the extent to which a gland had undergone developments in any given month was very variable. Now, as in all the 200 or 300 sections I examined, there was never any appearance of acini in the early months, as the first rudiment of the gland was entirely epiblast, as the ducts could be plainly seen to originate by a process of sprouting from the growing mass of epithelial cells; and, as the development of the acini was in every case strictly proportionate to, and in direct continuity with, the ingrowths of epiblastic tissue, I consider that the only conclusion to be arrived at is, that the acini as well as the ducts are developed from epiblast.

I shall now turn very shortly to the part played by the subjacent mesoblastic tissues, and to some of the points on which I differ from

Dr. Creighton. I have no hesitation in affirming that, in the specimens I have examined, the mesoblast acts an entirely passive part. At the fifth month it consists almost entirely of spindle-shaped cells and embryonic connective tissue, the former of which may be found

Fig. 4.—Section of a portion of the mammary gland of a foetus aged about seven months. Acini are being developed at the terminal extremity of one of the ducts.

collecting into groups where the fat is subsequently to be found. There is no mapping out of the shape of the future gland in the mesoblast, there is no independent formation of acini; and, though I am quite prepared to admit the similarity which exists between the developing fat-tissue and the cells of the acini, it is merely a superficial

Fig. 5.—Section of the mammary gland of a new-born child, showing the ducts radiating from the nipple.

resemblance, and, at any rate, in the human subject, the two cannot well be confounded.

The description by Creighton of the development of the ducts in the guinea-pig, does not obtain in the human subject; for, in this account, the ducts are said to first make their appearance as small channels in the mesoblast; further, "there is certainly no evidence of a process of growth downwards from the rete mucosum under the nipple;" and later on the same author remarks: "the ducts are therefore held to be formed as aggregations of the embryonic cells of the matrix along predetermined lines; that preliminary point may be taken as established."

But, however much it may be established in the guinea-pig, I allege that there is before you ocular demonstration of a different method of formation in the human mamma. No attempt at the formation of a duct can be discerned in the mesoblastic tissue, except in direct continuity with the epithelial ingrowth, and there is abundant evidence of a process of growth downwards from the rete mucosum under the nipple.

It will thus be seen that my observations are in accordance with the views of Kölliker, as referred to above. The conclusions drawn from them may be briefly summarised as follows.

1. The mammary gland is developed from epiblast.
2. The acini do not appear until the ducts are formed by an ingrowth of the epithelial cells of the rete mucosum.
3. The acini are developed from the epithelial cells forming the ducts.
4. The mesoblast takes no part in the formation of the glandular structures.

CASE OF PECULIAR CONGENITAL DEFORMITY OF THE LOWER LIP: OPERATION: RECOVERY.*

By T. SYMPSON, F.R.C.S.,

Surgeon to the Lincoln County Hospital.

As congenital malformations of the lower lip similar to those about to be described are of extremely unfrequent occurrence, and may, moreover, be easily and effectually treated by operation, I have thought it well to place the following examples upon record.

Last June my opinion was sought respecting the case of a vigorous,

well grown girl, aged eight, the muco-membranous and mesial portions of whose lower lip were considerably hypertrophied, and who

* Presented to the Section of Surgery at the Annual Meeting of the British Medical Association in Worcester, August 1882.

also presented on side either of the middle line of the lip and separating the muco-membranous from the transitional part, which was normal, a sulcus of semilunar form having its concavity directed forwards, and measuring three-quarters of an inch in depth by half an inch in length.

This malformation produced great deformity in an otherwise comely girl, made her an object of ridicule to her schoolfellows, and occasioned a large amount of inconvenience through the redundant portion of the prolábium being frequently caught between the teeth during mastication.

I expressed my conviction that there would be no difficulty in forming a shapely lip by means of an operation. Accordingly, on June 14th, the child was placed under the influence of chloroform, the growth and pouches were excised by an elliptical incision, and the edges of the wound accurately approximated by several sutures of Chinese silk. On the 18th, the sutures were removed, and on the 21st, the wound was found to be quite healed.

The photographs now shown afford a fair idea of the appearance of the lip before and subsequent to operation. The first was taken on June 13th, and the other on July 27th.

Microscopical examination showed the growth to consist of dense connective tissue.

The father and mother of the child are strong and healthy, but the mother displays the same peculiarity of her lip as her daughter, though in a minor degree. The lips of three other children—a sister of my patient, and her two brothers—are similarly malformed. The lips of the grandfather and grandmother, as well as those of their two sons, are quite normal in form, and they are not aware that any of their relations, other than those just referred to, show anything exceptional with regard to their lips.

Grandfather, aged 63	} lips normal.
Grandmother, aged 60	
Maternal uncle, aged 34	
Maternal uncle, aged 31	
Father, aged 38	} Two pouches in lower lip.
Mother, aged 35	
First child (girl), aged 11	
Second child (girl), aged 8 (the patient)	
Third child (boy), aged 5	
Fourth child (boy), aged 6 months

The grandmother, whose upper incisors were formerly prominent in a very marked degree, attributes the condition of her daughter's lip to a habit in which she indulged when pregnant with her of biting her lip. The daughter is her oldest child.