fine fibrosis there; and that this region would escape in an alcoholic cirrhosis, where the heart factor did not come in, and a simple coarse cirrhosis only with atrophy in that case result.

Be this how it may, however, I believe that cardiac inefficiency, even when not advanced enough to disclose itself by the usual physical signs of heart disease or a general dropsy, is a factor in the causation of the more acute cirrhosis of the enlarged alcoholic liver, and of the ascites which may accompany it.

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ON DIPHThERIAL STOMATITIS.*

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By diphtherial stomatitis is here understood a stomatitis produced by the diphtheria bacillus associated or not with other microbes. The term does not include cases in which the membrane or exudation is present on the uvula and adjacent soft palate, for this localisation of the lesion is included under faucial diphtheria and is not uncommon, although in such cases the tonsils are mostly also implicated. Diphtherial stomatitis is therefore restricted to cases in which the characteristic lesion is situated on the inner side of the lips or cheeks, the floor of the mouth, tongue, or hard palate. It may be either primary or secondary, according as the membrane or exudation appears first in these situations or follows upon a faucial diphtheria. The following are instances of primary diphtherial stomatitis:

CASE I.—A man, aged 35, had been ill for some five or six days with soreness of the mouth and gums, and fever of the breath, but there was no change from the normal in the temperature, pulse, or respiration. Two elongated patches of membranous exudation appeared on the under surface of the tongue parallel to the frenum. The tongue was not swollen. It was thought at first by Dr. Hawtin, who was in attendance, that the case might be one of mercurial stomatitis, but the patient had not taken any mercury, nor was there any evidence of syphilis. In addition to the appearances above named, there was also a patch of membrane on the inner side of the lower lip when I saw him a few days later. The patches were made up of a thick dirty-white looking membrane and a bleeding surface was left when the membrane was stripped off. The glands under the jaws were slightly enlarged. The patient was treated with disinfectant mouth washes. A bacteriological examination was made of the membrane, and a short bacillus obtained from it having the morphological appearances of the short diphtheria bacillus. It stained unevenly, often presenting a lighter centre with a constriction opposite this centre. It gave Neisser's reaction. The individual bacilli were often arranged in parallel fashion. As very little change was noticed in the mouth during the next few days, 2,000 units of antidiphtherial serum were injected. In a day or so the patches of membrane gradually became less and eventually disappeared, so that the patient was well in a week.

There were one or two difficulties in this case. As regards the bacteriological examination, it might be urged that the bacillus found was the so-called pseudo-bacillus. The short diphtheria bacillus is admittedly much more apt to give rise to doubt as regards its identity than the long segmented form. To those who recognise the pseudo-bacillus as such, the distinctions between it and the short diphtheria bacillus are based on several features, but more particularly on its non-pathogenic properties. Unfortunately no experiments were made upon this point in my case. As mentioned above, the micro-organism gave Neisser's reaction, but all are not by any means prepared to look upon this reaction as distinctive of the diphtheria bacillus. To sum up, in the above-named case a bacillus was found morphologically indistinguishable from the short diphtheria bacillus, and this microbe was obtained from a lesion bearing all the appearances of diphtherial membrane. Under these circumstances, I think it right to conclude that the micro-organism was the bacillus of diphtheria.

The clinical difficulty consisted in the absence of general symptoms. Nevertheless, cases of unquestionable diphtheria are occasionally seen where there is a more or less complete absence of general symptoms. There are also well-authenticated cases of membranous rhinitis due to the diphtheria bacillus where there have been absolutely no other symptoms

than the slight local ones. From some such cases true faucial diphtheria has been known to arise in other members of the household. This absence of symptoms has been mentioned by some writers on diphtherial stomatitis (Forchheimer,¹ Goodall,² and others). The first-named observer says that diphtheria of the mouth, when primary, may run its course insidiously, and is overlooked or is not recognised until further complications develop. The absence of general symptoms cannot therefore be looked upon as excluding diphtheria.

CASE II.—A girl, aged 15, was suffering from what Dr. Shaw, her medical attendant, thought was an ulcerative stomatitis. A swab was forwarded to the laboratory of the Leeds Medical School. The diphtheria bacillus was obtained from it by cultivation. The case was removed to the Fever Hospital, and by the kind permission of Mr. A. E. Pearson, the medical superintendent, I saw the child there on January 28th. There were at this time five patches, three on the upper and two on the lower lip on the inner side. The longest patch was oval, about $\frac{1}{2}$ in diameter, of a whitish blue colour, and intimately adherent to the mucous membrane. A swab was taken from one of the patches. The child was observed to be constantly wiping the patches with her handkerchief. Mr. Hardwicke, the assistant medical officer, kindly forwarded me this handkerchief for examination. Tubes containing coagulated hydrocele fluid, sheep's serum, and agar respectively were inoculated from the swab. An abundant growth of the diphtheria bacilli was present in the serum tube in about seventeen hours, and a sparse growth in the hydrocele tube. A typical Neisser's reaction was obtained. The growth on the agar tube consisted almost exclusively of the staphylococcus pyogenes aureus. After several attempts the diphtheria bacillus was separated out and obtained in pure culture; the difficulty consisted in the agar plates being constantly overgrown with the staphylococcus. This was no doubt due to the fact that what appeared to be a single colony of the diphtheria bacillus really contained some staphylococci, as was proved on more than one occasion by microscopical examination. The bacillus was eventually grown on the various media, and all the varieties (long, short, medium-sized, as well as the long and short clubbed forms) were obtained. Six small pieces were cut out of the handkerchief mentioned above, and hydrocele tubes were inoculated from them. In each case a short diphtheria bacillus was obtained. The other microbes present were the staphylococcus aureus and the sarcina lutea. In three weeks' time six more tubes were inoculated as before, and the short bacillus again developed in all the tubes.

The staphylococcus now hardly grew at all, but the sarcina abundantly. It was thus quite easy to plate out the diphtheria bacillus, and to obtain it in pure culture. Various media were inoculated, and the different morphological forms were obtained. Thus inoculation was successfully made upon hydrocele fluid, agar, glycerine agar, and glucose agar. Specimens prepared from the last-named medium showed diphtheria bacilli of all lengths, including some enormous clubbed forms as well as short clubs. Taking into account the morphological appearances and the staining reactions, as well as the characters of the colonies on the various media, I do not think that the micro-organism which was obtained both from the swab and also from the handkerchief could be any other than the true diphtheria bacillus. [A similar examination of the handkerchief was made at the end of a further two and four weeks respectively with similar positive results.]

The subsequent history of the case, kindly furnished to me by Mr. Hardwicke, was as follows: The patches remained in the same state for about a week; they were then frequently painted with carbolic acid in glycerine (1 in 10). They rapidly diminished in size, and the patient left the hospital quite well on the thirty-sixth day of the disease. There were never any general symptoms, nor was there any albumen in the urine.

CASE II was undoubtedly one of genuine diphtherial stomatitis. So far as was known, the child had not been exposed to the diphtherial infection. The ease with which the diphtheria bacillus could be obtained from the handkerchief afforded a striking illustration of one possible method of spread of the disease. The handkerchief kept in a sterilised bottle contained living diphtheria bacilli seven weeks after the child had last used it. I intend to further examine it from time to time until I obtain negative results. It was also interesting to note that the staphylococcus aureus perished before the diphtheria bacillus.

A primary genuine diphtherial stomatitis is undoubtedly very rare. Many textbooks hardly mention it. In Baginsky's recent work upon diphtheria it is only barely referred to. The best accounts that I have been able to find of it have been by Henoch,³ Forchheimer,¹ Schech,⁴ Sanné,⁵ Henoch says that diphtheria may begin upon the mucous membrane of the lips as greyish white patches (ultimately becoming confluent) which resemble the plaques of aphthous stomatitis. In one case seen by him the disease began on the mucous membrane of the lips, then spread to the tongue and finally proved fatal by laryngeal complications. In three cases seen in his clinic Henoch thought that the diphtherial infection must have ensued upon erosions in the mouth. In two cases which he refers to the disease affected the floor of the mouth and the ligaments of the tongue, and one of these cases recovered. Forchheimer has seen two cases in which a primary diphtherial stomatitis spread to the larynx. Schech says that he has also seen two cases. In one case the patient had used a

* A paper, with some additions, read before the Yorkshire Branch of the British Medical Association, January, 1900.

tooth-brush belonging to an individual who had diphtheria. While admitting the error committed by Bretonneau and first refuted by Bergeron⁶ of looking upon ulcero-membranous stomatitis as genuine diphtheria, Sanné in 1876 recognised and described a genuine diphtherial stomatitis which might be not only secondary but also primary.

On the other hand, Holt⁷ says that in his experience diphtherial stomatitis has always been associated with deposits upon the tonsils and pharynx.

Recently Goodall² has related a case in a woman, aged 36 in whom there was a diffuse swelling in the floor of the mouth, and a fold of membrane was seen running antero-posteriorly on each side. There were no general symptoms and no fœtor *ex ore* except that from carious teeth. A wedge-shaped piece was excised. A fibrinous exudation was present in which numerous bacilli having the characters of the diphtheria bacillus were found. No cultivation experiments were made.

Flexner⁸ gave details of two cases in which membrane or exudation was found in the mouth during the last few days of life, death being due to other causes. In one case of a man, aged 67, with granular kidney, the lesion was present on the lips and gums. The diphtheria bacillus was found, but experiments showed it was of only slight virulence. In the other case, in a man aged 37, the lesion was on the lips. The diphtheria bacillus was found, but its virulence was also small. In the ward where the first patient was, a nurse developed characteristic diphtheria.

Wharton⁹ recorded a case in a boy aged 6. There was a patch of membrane on the tongue, which latter was much swollen. A deep incision was made into the tongue, as pus was suspected, but none was found. The glands were swollen, and the temperature 101°. The patient recovered. The bacteriological examination was made by Revenel and A. C. Abbott. Diphtheria bacilli were found, which were fatal to a guinea-pig in seventy-three hours.

Thiercelin, quoted by Jurist,¹⁰ saw a case in a woman aged 30, in which the membrane was situated on the under surface of the tongue and floor of the mouth. The glands were enlarged, and there was much fœtor of the mouth. The diphtheria bacillus was obtained by cultivation from the lesion.

It is interesting to note that the diphtheria bacillus has been discovered in noma of the mouth. Freymuth and Petrusky¹¹ related such a case in a boy aged 8, who was convalescent from typhoid fever. Here the disease involved the mucous membrane about one of the upper teeth and the corresponding part of the cheek. A thorough bacteriological examination was made by Petrusky. It may be mentioned that the same authors¹² had previously recorded a case of noma of the vulva and diphtheria of the fauces. The diphtheria bacillus was also found in the vulvar lesion.

Both these cases were treated with antidiphtherial serum, and both recovered.

It is thus obviously important to bear in mind that the diphtheria bacillus (associated with other microbes) may possibly cause noma.

Secondary diphtherial stomatitis is also rare but is commoner than the primary form. Some authors like Schech,⁴ Lewis Smith,¹³ Henoch,³ say that it mostly begins in fissures and ulcers already present in the mouth. The membrane may be found on the inner side of the cheek, tongue, lips, and has sometimes been known to extend beyond the mucous membrane of the lip on to the skin (Osler¹⁴). The presence of the diphtheria lesion in the mouth as well as on the fauces is usually taken as indicating a severe attack of the disease. Quite recently I saw a case of this kind with Dr. Umanski (Leeds) in a child, aged 4. The whole of the uvula and soft palate were covered with membrane. There was a patch of membrane on the inner surface of the lower lip about the size of a threepenny-piece. The child died about the fifth day of the disease. It was injected with antidiphtherial serum (4,000 units), but this treatment was only begun late in the disease, within the last twenty-four hours of life.

Among 400 cases from which I have examined material from suspected diphtheria during the last two years, in only 4 was the membrane stated to be in the mouth. In 2 of these (Cases 1 and 11) the diphtheria bacillus was found. In the other 2 cases a staphylococcus and a streptococcus with

the staphylococcus respectively were alone found. Serum or hydrocele fluid media were used in all cases.

DIAGNOSIS.

The question naturally arises as to whether it is possible to have a membranous or ulcero-membranous stomatitis which is due to some other cause than the diphtheria bacillus. The result of the teaching of the Tours School was such that for many years cases of ulcero-membranous stomatitis were looked upon as diphtheria until Bergeron proved that an ulcero-membranous stomatitis occurring in epidemics among soldiers was not diphtherial in character. Sevestre and Gastou¹⁵ showed in 1891 that the staphylococcus pyogenes aureus could give rise to an ulcero-membranous stomatitis. Mongour criticised the results obtained by Sevestre and Gastou, and one objection raised by him carries with it great weight. The authors only used agar or gelatine media, and not serum. In Case 11, certainly and probably also in Case 1, the diphtheria bacillus would have been overlooked if serum media had not been employed. Notwithstanding this it appears to be proved that the staphylococcus can set up a membranous or ulcero-membranous stomatitis.

More recently Beco¹⁶ described a diphtheroid stomatitis. Out of 13 cases, 7 were observed in the convalescent stage of scarlet fever. In nearly all cases he found the staphylococcus aureus. It is stated that the small plaques of membrane could be picked off with the forceps. I do not propose to discuss the exudation or membrane found in the throat in some cases of scarlet fever. The streptococcus has been frequently found in it, but in some cases of the combined scarlet fever and diphtheria infections the diphtheria bacillus has also been present.

Hall¹⁷ recorded a case in a girl, aged 19, with acute nephritis, in which there was membrane on the tongue and also on the inner side of the cheeks and lip. Dr. Alexander found the staphylococcus aureus and albus present. Some twelve years ago E. Fraenkel¹⁸ stated in an interesting contribution to the study of aphthous stomatitis that he had found the staphylococcus citreus in 2 cases and the staphylococcus flavus in 1 case of this complaint. He supported by his pathological investigations Henoch's view that the earliest stage of aphthous stomatitis is not vesicular, but that the lesion consists of a fibrinous exudation. It is also interesting to note in this relation that Rupp¹⁹ saw a case in an infant, aged 22 months, in whom there was diphtheria of the fauces and aphthæ on the lips, tongue, and floor of the mouth.

Jurist¹⁰ has recently recorded a case in which the floor of the mouth and under surface of the tongue were covered with thick membrane. A careful bacteriological examination was made by Dr. A. C. Abbott, but only the streptococcus was found. Bernheim²⁰ has also described a diphtheroid stomatitis which might be mistaken for diphtheria. He investigated 30 such cases. The microbe found presented several points of resemblance to the diphtheria bacillus. The author was, however, quite unable to cultivate it on the ordinary media in use.

There can thus be no doubt that a membranous stomatitis may be due to several different microbes, including the diphtheria bacillus, and that it may be impossible to distinguish a genuine diphtherial stomatitis from other forms (conveniently classed at present as diphtheroid stomatitis) by a mere inspection of the mouth or by the presence or absence of general symptoms. Hence the importance of making a bacteriological examination in cases of membranous stomatitis in order to recognise the actual contagium of the disease, and to isolate the cases of genuine diphtherial stomatitis. The ease with which this last-named disease could be spread is well illustrated by the second of my cases recorded above.

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