cases without realizing that the patient made mountains out of molehills. The difficulty with his larynx was really such a molehill. Why, then, did he take it for a mountain? To answer this question, and to make such mistakes impossible to him in the future, involved some kind of exploration of the processes actually at work in the patient's mind—processes of which he was just as ignorant as he was in the case of his larynx, his notions about them bearing frequently little relation to the actual facts. Such an exploration frequently benefited the patient, but an exact knowledge of how best to carry it out, and of just what happened in his mind when it was carried out, seemed still to be lacking.

The Chairman, Dr. W. H. R. RIVERS, F.R.S. (Cambridge), drew attention to the fundamental agreement which underlay the differences of opinion apt to show themselves in a discussion, and pointed out that mistakes and undue enthusiasm were natural in a study so young as the subject of psychotherapy.

THE DEFENSIVE VALUE OF NORMAL MUCUS FORMATION, AND THE THEORY OF CATARRH.

By F. G. CROOKSHANK, M.D. LOND., F.R.C.P.,

PHYSICIAN TO THE FRENCH HOSPITAL, LONDON, AND TO ST. MARK'S HOSPITAL FOR DISEASES OF THE RECTUM.

THE interesting note by Mr. Benians, entitled "Air-way Infections,"¹ draws attention to some points of physiological, clinical, and epidemiological interest that have not hitherto been accorded sufficient importance.

Certainly, physiologists have not told us much as to the conditions of mucus formation, and, by denying it the right to be called an act of "secretion," have tended to obscure appreciation of the evident purpose which our belief in the economy of nature warrants us in recognizing.

It is true that the formation of mucus is held to be an exfoliation, or degeneration, by many writers of the kind who sees, in lactation, a form of suppuration—forgetting that there is no inherent distinction between physiological, degenerative, and pathological processes. One and the same process may be (1) physiological when efficient, and conditioned by accustomed stimuli; (2) pathological when tentative, and conditioned by unaccustomed stimuli, and (3) degenerative, when a confession of failure on the part of the organism to respond properly to stimuli within the range of custom. What is physiological *now* has once been pathological, and may perhaps one day come to be regarded as degenerative.

The normal formation of mucus, then, must be regarded as physiological and purposive; in Samuel Butler's sense, it represents an intelligent act on the part of the organism. What is its purpose, and what are the consequences of failure in its due performance?

It seems pretty clear that a layer of mucoid matter must, in the first place, protect the delicately vascular underlying membrane from the direct action of atmospheric changes—changes in temperature, humidity, composition, and the like—as well as from the no less direct action—mechanical or chemical—of solids and liquids in contact with it.

Mr. Benians, however, goes further, and suggests that the mucoid layer may not only prevent the absorption and inhibit the action of bacterial ferments and toxins by and on the mucous membrane, but may actually prevent invasion of the body by the organisms themselves. If his hypotheses be well founded, the maintenance of a proper state of mucus formation becomes of great importance; and interference with such a proper state constitutes an etiological factor that cannot be neglected when discussing the origins of certain forms of ill health.

The customary view is, I suppose, that interference with mucus production is a result of bacterial or protozoal attack; the notion suggested by Mr. Benians's paper is that when from one or another cause—whether vasomotor, hormonal, or nervous—mucus production is seriously disturbed, not only may mechanical, chemical, and other agents do harm, but scope may be given to the activities

of organisms which are habitual, occasional, or accidental denizens of the "mucoid layer."

There are not a few clinical facts which seem to me to support Mr. Benians's propositions.

Some years ago, when frequently dealing with cases of typhoid fever, diphtheria, and scarlet fever, I made the practical observation that oily preparations such as paraffin, applied by means of an atomizer, are far more efficacious as cleansers of the tongue, throat, and nose than is either the conventional glycerin of borax or any of the watery solutions used for swabbing and syringing. As I then said (and long clinical experience has confirmed me in the opinion) "such preparations soothe the mucous membranes, prevent breaking the surface, and inhibit the growth of organisms by encapsulating them."²

It seems to me that in such cases the paraffin acts by way of taking on the duties of the normal mucus when (as in the worst cases of pharyngeal infection from the point of view of absorption and general invasion) the mucous membrane is obviously "tight," shiny, and glazed.

It is precisely in these cases that old-fashioned demulcent drinks would act as Mr. Benians assures us mucilage in laboratory experiments does act, and that old-fashioned clinicians would prescribe remedies calculated to render free the "secretion" of mucus.

The chemistry of the gastro-intestinal mucus has not as yet been fully elucidated, but certain clinical facts are indisputable; amongst them this, that whilst hyperacidity is apparently associated with deficiency of mucus, gastric ulcer is rarely met with in cases of "mucous catarrh" or "mucous dyspepsia." According to Sahli³ gastric "mucus" is held in solution by hydrochloric acid, but is precipitated in cases of hypoacidity. Mucus deficiency, then, may well be a factor to be reckoned with in the production of gastric ulcer, by reason of the exposure consequently entailed to mechanical, chemical, peptic, and sometimes bacterial agents.

So far as the intestines are concerned, we have on the one hand the fact that paraffin is at present found to be the best clinical remedy when motions are hard and dry (from absence of mucus, amongst other things) and when the mucous membranes available for inspection appear desiccated rather than succulent; whilst, on the other, the grosser intestinal parasites—tape-worms, round-worms, and thread-worms—best carry on their relatively harmless lives when protected by the excess of mucus invariably present where they are. Indeed, as everyone knows, the best way to get rid of thread-worms is to give repeated doses of those preparations of rhubarb which inhibit excessive secretion of mucus, and of alkalies which loosen what is already there; whilst, until the protecting mucus in which the head is ensconced is cleared away, no dose of male fern will do its helpful work in respect of taenia. In fact, in respect of the grosser parasites, an excess of mucus seems to act just as Mr. Benians thinks normal mucus may act in respect of "carried" bacteria.

The production of mucus in the true dysenteries is pretty clearly pathological, in the sense in which the word has been just defined, but a fact pointed out by Roger, of Paris, some time ago,⁴ raises some important issues relative to the pathogeny of certain bowel diseases that should not escape notice. Roger has shown by experiment that the coagulation of mucin into such large masses as those seen in certain cases of "mucous enterocolitis" may be the result of biliary insufficiency, since, *in vitro*, bile inhibits the coagulation of mucin by the normal intestinal ferment called mucinase.⁵

Again, the protective effect of mucus is clearly seen in respect of the genital organs of both men and women; for the inhibition, under nervous influences, of the mucoid flow in women is well known, and very probably, like temporarily abnormal conditions of the male urethra due to strong drink, plays a part in facilitating actual invasion of the mucous membrane by organisms of various sorts.

It is, however, perhaps the state of the respiratory mucous membranes that is, in most respects, of greatest interest; and in the light of the hypothesis of the protective importance of the mucoid layer, the rationale of some old-fashioned clinical methods seems clear. I refer to the use of demulcents and of mucilaginous preparations generally, in the acute stages of a catarrh; to the administration, first of medication directed towards the loosening, and later towards the diminution, of mucoid

secretion; and to the care necessary to avoid premature inhibition, by opiates, of its secretion and removal.

Certainly we may wish to understand the underlying processes that affect the secretion of mucus, and if, as is perhaps the case, the primary change, in a catarrh, is not so much one of bacterial infection as a change in the physiological equilibrium of the mucous membrane that allows scope to bacterial activities, it seems likely that, when we do attain such understanding, we may come to appreciate how it is that, during the epidemics we call "catarrhal," there are associated cases and groups of cases, with affection of the cerebro-spinal system, not "catarrhal" in our modern sense, and yet a part of the "epidemic."

To Fernel, Benedetto, Ballonius, and other physicians of the sixteenth century these nervous forms of disease were alternative to those we now call "catarrhal"—whether respiratory or gastro-intestinal—and the epidemiological unity of what we now call encephalitis, myelitis, and the like with what we now call influenza was explained by them in terms of the famous doctrine of "catarrh," whereby an "excretion" of the central nervous system, if "repulsed," set up nervous disease, but, if determined to a mucous membrane, produced bronchitis, diarrhoea, and so forth.

To these physicians, then, a "defluxion" through the ethmoid safeguarded the brain against encephalitis; we, in thought, reverse the process and consider cerebro-spinal meningitis, encephalitis, and poliomyelitis as due to organisms reaching the nervous system by the ethmoid route, after having set up or failed to set up a preliminary "catarrh" of the nasopharynx. But we may well consider anew whether the factor which turns the scale to the one side or the other may not be sometimes a condition of the mucous membrane depending on vasomotor or trophic disturbances, and sometimes an alternative condition of the meningeal and cerebro-spinal structures.

In a word: although the explanations of Fernel and Benedetto may seem to us absurd, were they not right in discerning an essential and epidemiological unity between cases that seem to us, clinically, to be totally antipathetic?

Again, Mr. Benians's notion, that it is possible that a primary alteration in the state of the mucous membranes may allow harmlessly "carried" micro-organisms to gain access to the blood and lymph channels and spaces, is perhaps to be collated with a rather curious passage, in Falconer's celebrated account of the influenza of 1803,⁶ that seems to deserve citation. On the occasion of a *post-mortem* examination on a young woman who had died of influenza, upon opening the trachea it was observed that, "on viewing the inner membrane of the trachea with a magnifying glass, ulcers were clearly perceived at the edges of the small holes which supply the trachea with mucus, to defend it from the acrimony of the air."

Now here again is an instance of an observation, worthy of attention, that has been rendered a little ridiculous by the assumption of a particular explanation. It may, however, be put side by side with what is said by Micheli, who in a very valuable paper⁷ seeks to explain the "incontestabile unità fondamentale" of the many diverse clinical forms manifested during the present epidemic period by suggesting that groups of different habitual or occasional microbic inhabitants of the tracheo-bronchial mucosa become suddenly awakened into or permitted virulence by the superintention of a hypothetical "virus primitivo."

In Mr. Benians's hypothesis micro-organisms replace Falconer's "acrimony of the air," and an alteration in the state of the mucosa replaces Micheli's "virus primitivo."

There are obviously, therefore, several points to be considered relating to these matters which would seem not unsuitable for the application of such judicious hypothesis as may stimulate further observation and inquiry. And inquirers might be well advised to adopt as their motto the sufficiently hackneyed but nevertheless still pointed sentence of Baglivi:

Novi veteribus, non opponendi, sed quoad fieri potest, perpetuo jungendi foedere.

REFERENCES.

- ¹ BRITISH MEDICAL JOURNAL, 1920, i, p. 668. ² *Essays and Clinical Studies*, 1911, p. 176. ³ *Diagnostic Methods*, second edition, 1918, p. 475. ⁴ *La Presse Médicale*, 1913. ⁵ *Universal Medical Record*, April, 1913, pp. 297-300. ⁶ *Annals of Influenza* (Thompson), 1852, p. 258. ⁷ *Sull' Influenza: Il Politecnico*, 1920, Sez. Med., 2, 4.⁸

A CASE OF ENCEPHALITIS LETHARGICA
TREATED BY HEXAMINE.

BY

SAMUEL CRAWSHAW, M.B., CH.B.VICT.,

ASHTON-UNDER-LYNE.

THE following case of lethargic encephalitis, in which recovery followed large doses of hexamine, is worthy of record, although I do not wish to attach too much importance to a single case.

I first saw the patient, a girl aged 12 years, on the evening of January 25th, 1920.

The parents definitely fixed January 17th as the day on which she became really ill, but careful inquiry elicited the fact that for quite a week previously she had been unusually quiet, had not wanted to play, and had slept a great deal. They also told me that on the last day she was at school she had gone to sleep on her desk and that the teacher had failed to rouse her, so let her sleep till close of school, and then sent her home with some other girls. She never made any complaint of headache or other pain; she simply wanted to be left alone. Gradually this lethargy became so deep that they could not get her to take food, and for several days she had nothing. For several days, too, she had passed both urine and faeces without seeming to be aware of the facts.

I found her lying in bed on her back with her legs straight down and close together; her arms were close to her sides; with bent elbows and clenched hands lying on the chest near the chin; her mouth was wide open, and her eyes slightly so. She was breathing regularly, but rather deeply, though not noisily. Her face was placid but expressionless. When spoken to loudly she would open her eyes a little, and for a moment seemed to be looking at one, but then relapsed into her former state. The conjunctivae were slightly congested; the pupils were equal and reacted sluggishly to light, and there was a slight corneal reflex. When the lids were raised she moved her eyes slowly from side to side, but the movements seemed to be quite aimless, as if she did not see. There was no squint or ocular paralysis. When I came to move the limbs I found that a distinct effort was required, owing to a certain degree of tonic rigidity which involved all the muscles of the body; it could be overcome easily, and when the limbs were put into a new position they remained there for a short time, but gradually resumed their previous position. A distinct effort was required to close the mouth, and when the effort was relaxed it opened rather quickly. Attempts to move the arms from the sides, straighten the elbows, or unclench the hands met with distinct resistance; and the same was true if any attempts were made to move the joints of the lower limbs. It was not a temporary contraction of the muscles brought about by the moving of the limb, but a continuous condition and the muscles felt firm. These passive movements elicited no sign of pain or consciousness. The muscles of the neck were in the same condition; the abdominal wall was strongly retracted, the abdomen being typically scaphoid. It seemed to me that the superficial reflexes were abolished, but there was a very marked *tache cérébrale*. The knee-jerks were distinctly lively, I think exaggerated, and a slight but positive Babinski's reflex was present. In both cases the reaction seemed to be more marked on the right side. I tried to get her to swallow by placing a few drops of water on the tongue and allowing it to trickle into the pharynx, but there was no response.

There was no sign of any injury anywhere. The ears appeared to be normal. There was no oedema nor any acetone in the breath. Heart and lungs were normal. Temperature 99°.

After my examination I was standing at the bedside looking at her. Her chest was partially uncovered by the clothes when she opened her hands, grasped the clothes, and made an attempt to pull them up. It was very feeble and unsuccessful, but accompanied by a marked tremor of the hands. Her mother told me she had at times tried to do things like that, and occasionally had spoken a word or two, but they could make no sense of it.

Beyond the usual childish ailments and an attack of tonsillitis about eighteen months previously, there was nothing to note in the medical history, and she had been