approximately 82° C., their length of stay varying from a few minutes to half an hour according to the demand for them. This temperature was high enough to kill many of the more delicate organisms, and indeed 10 out of the 20 swabs were sterile. This compares very favourably with the other 24 kitchens, where only 17 sterile results were obtained from among 595 swabs.

Though this investigation was not concerned with the bacteriological examination of the "food-handlers" in the kitchens, advantage was taken of the visit to inspect the sanitary arrangements and washing facilities provided for them. In most cases these were unsatisfactory. In 14 places no washing facilities were available either within or immediately adjacent to the sanitary convenience, and hands had to be washed, if indeed they were washed at all, in the same kitchen sink as the crockery and cutlery. This provides a sure path of infection by intestinal pathogens.

Conclusion

It would seem from this brief survey that in communal feeding-centres the cleaning of eating utensils is very unsatisfactory, and that pathogenic organisms are likely to be spread among the users of different articles. The lack of modern equipment such as washing machines, the difficulty of obtaining soap and washing powders, and the scarcity of drying towels renders very difficult the important and necessary task of feeding people in a hygienic manner. The finding of dysentery bacilli on the cutlery in one out of only 25 kitchens is rather disquieting, and may suggest the origin of the sporadic case of "diarrhoea"; and the finding of pathogenic streptococci 14 times and of pathogenic staphylococci 36 times may help to explain the high incidence of septic mouth lesions so common in the last few years. The prevalent method of washing and drying infected crockery and cutlery appears to do little in the way of destroying their pathogens.

Very great interest was shown by the proprietors of the premises visited, and every help was given to facilitate the investigation. Results were keenly awaited, and they were eager to know what measures could be adopted to remedy defects. It would seem that public health propaganda for improvement in kitchen hygiene, together with suggestions as to the methods to be followed, would be welcomed, especially if accompanied by bacteriological evidence showing its necessity.

My grateful thanks are due to the Medical Officer of Health for approval and permission to work in his district; to the Chief Sanitary Inspector, without whose co-operation and active help this work could not have been done; and to my technicians, Mr. P. G. R. Browne, Mrs. R. Udall, and Mr. H. Gillies, for much willing help in the preparation of media.

REFERENCE

Topley and Wilson (1946). *Principles of Bacteriology and Immunology*, 3rd ed., p 1584.

For the 1946-7 academic year 248 graduates and others of like status from overseas have been awarded British Council scholarships, which enable them to take a wide range of postgraduate courses of study in this country. The scholarships are normally for one year, but extensions are granted in suitable cases. In addition the British Council has helped to place many students who have come under the auspices of overseas authorities or privately. The Council during the year established a students' welfare department to deal with the reception and non-academic welfare of scholarship holders, and to help them to gain a general knowledge of British life and institutions. To this end vacation courses, which enable those residing in London to visit the provinces and vice versa, as well as term-time talks, discussions, shows of documentary films, and other events are arranged. These facilities are available also to students sponsored by the Colonial Office, the Indian and Sudan Governments, and to other overseas students. The year's British Council scholarship holders have come from some fifty Empire and foreign countries, and include 36 taking medical subjects.

THE SURGICAL TREATMENT OF CHRONIC FRONTAL SINUSITIS

BY

V. E. NEGUS, M.S.

In my experience few complaints produce so much disability or suffering as chronic infection of the frontal sinus. In a great number of instances this suffering appears to be unnecessary, and I am therefore impelled to record my suggestions as to how unsatisfactory results may be avoided.

In the first place it is necessary not to exaggerate the incidence of frontal sinusitis, and to avoid operating under a mistaken diagnosis. The prominent symptom of frontal headache is attributable in many instances to neuralgia of various types or to migraine, but with no cause in the frontal sinus. The incidence of sinus headaches may, according to Proetz (1943), be no more than 5%; but when there is such a cause the case is difficult to cure. It is not my intention to enter into a discussion on the differential diagnosis of frontal headaches, but rather to suggest means of relief when the cause has been established.

Two Important Points

First, it is necessary to eliminate all contributory factors in the nasal fossae; this advice may seem obvious, but in a large number of unsuccessful cases referred to me this elementary detail has been overlooked. The treatment referred to is the care of infection in the maxillary and ethmoidal cells, the straightening of a high deviation of the septum, and the removal of an enlarged and obstructing middle turbinal body. Several patients I have seen have been submitted to more than one external operation, while the septum has been so twisted as to make the nasal fossa on the affected side quite inadequate for ventilation and drainage.

The second recommendation concerns direct treatment of the infected frontal sinus after all preliminary measures have been taken to provide a satisfactory outlet to the fronto-nasal duct, as outlined above. I do not believe that internal operations on the frontal sinus are satisfactory; evidence is afforded by a number of patients so treated who have subsequently come under my care and have required an external operation for their cure.

The most skilled operator in this region that I have seen was Dr. Max Halle, of Berlin, but even though I admired his dexterity in creating a free passage into the frontal sinus, the difficulty of clearing all infected ethmoidal cells by the intranasal route, together with the tendency of the exposed bony canal to reclose, has prejudiced me against this and other similar methods.

One comes, therefore, to the final determination that in cases with chronic infection of the frontal sinus associated with the usual symptoms of headache, difficulty in concentration, depression, and so on, the correct treatment is an operation by the external route. It remains then to decide what method is desirable.

Method

Attempts at obliteration of the frontal sinus are, in my experience, usually unnecessary, generally disfiguring, and often ineffective. I have had to operate on several patients who had elsewhere been submitted to attempted obliteration of the sinus. The anatomical structure is such that unless a new and permanently enlarged fronto-nasal duct is created an inefficiently drained recess will be left in the lower part of the sinus, with continual suppuration and the continuance of the symptoms which the operation is intended to relieve.

If an adequate fronto-nasal duct is provided the frontal sinus is in the great majority of cases able to return to a normal state, provided the lining mucosa has not been disturbed. In four cases I have had to remove the anterior wall of a shallow sinus to obliterate outlying recesses. In these the mucosa failed to recover after reconstruction of the fronto-nasal duct; but such cases are rare, and even with them it is essential to provide a free communication between the remains of the sinus and the nasal fossa, so that the first operation is not wasted. In this connexion it is interesting to note that in five cases in which previously unsuccessful attempts at obliteration had been made I have secured a good result by establishing an adequate fronto-nasal duct while at the same time reconstructing the frontal sinus by means of a saccular skin-graft. Not only has suppuration been eliminated thereby, with cure of the previous symptoms, but a good cosmetic result has been attained by restoring the contour of the forehead.

Reviewing the records of over a hundred patients on whom I have operated, the conclusion has been arrived at that a cure can usually be obtained by re-establishing ventilation and drainage of the sinus, the lining being undisturbed and allowed to return to normal. I do not believe that curettage of the cavity is necessary or desirable. I have, in various instances, found pockets of infection in such cases and have had to reoperate, sometimes replacing the denuded lining of the sinus by the insertion of skin, as referred to above. A considerable number of the patients I have dealt with had had one or more previous operations on the frontal sinus, and one young man had undergone, according to his own account, a total of seventeen.

Leaving, therefore, the anterior wall and the lining of the sinus, one has to decide on the route to adopt. I am of the opinion that a short incision, curving round the inner margin of the orbit, well away from the inner canthus, gives the best approach. A clear view is provided for clearance of any remaining infected or obstructing ethmoidal cells; there is no danger of damage to the trochlea or lacrimal sac if the orbital periosteum is carefully detached. The base of the skull is visible and safety is attained in enlarging the opening between the sinus and the fossa. It is unnecessary to remove more than a small portion of the floor of the sinus, but it is essential to take away a considerable part of the nasal process of the maxilla, as advocated by Howarth. Approach by an incision lower down seems to me to be inconvenient and to make permanent restoration of the fronto-nasal duct difficult or impossible. The operation described above allows of the gentle removal of exuberant hyperplastic mucosa when necessary, but curettage is carefully avoided. Examination of the posterior wall of the sinus for possible caries is, in my opinion, unnecessary, for the reason that even if present it is better left alone, in the certainty of ultimate recovery. This applies, naturally, to the usual chronic case and not to those isolated instances where an extradural or a frontal-lobe abscess is suspected. In not one of over a hundred cases have I had reason to regret leaving the posterior wall and its covering mucosa intact.

Finally, one comes to the means of maintaining the integrity of the fronto-nasal duct; this is readily attained by insertion of a skin-graft, applied to the raw orbital periosteum and to the exposed margins of the bone at the entrance of the frontal sinus. The graft is tucked into position after the insertion of a large tube of rubber or plastic material; it is not wrapped round the tube, since no graft is required over the nasal septum or posterior wall of the frontal sinus. Details of the operation are given elsewhere (StClair, Thomson, and Negus, 1937). In ten days the tube is removed, and no subsequent dilatation or passage

of sounds should be necessary, as the new duct maintains its patency and provides adequate ventilation and drainage.

Conclusion

The operation requires care and meticulous attention to detail, but in the hands of my colleagues and myself it has proved most satisfactory in curing the symptoms without disfigurement. It is advisable, however, again to emphasize the signs and symptoms that require an external operation. Unilateral frontal headache, worse in the morning, either repeated daily over a prolonged period or recurring in acute or subacute attacks; clinical and radiological evidence of infection in the frontal sinus; evidence that maxillary sinusitis has been adequately treated and that freedom to the nasal orifice of the frontal sinus in the nasal fossa has been attained: these are the factors that indicate blockage of the fronto-nasal duct, either permanent or recurrent, and these are the reasons for which the external operation should be performed.

REFERENCES

- Proetz, A. W. (1943). *Ann. Otol., etc., St. Louis*, 52, 409.
Thomson, StClair, and Negus, V. E. (1937). *Diseases of the Nose and Throat*, 4th ed., Cassells, London.

A SIMPLE METHOD OF ESTIMATING PENICILLIN AND OTHER BACTERIOSTATICS

BY

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The methods in current use for the estimation of penicillin have been reviewed by Garrod and Heatley (1944). They include titration in broth, inhibition zones on solid media, turbidimetric methods, and the inhibition of haemolysis by a β -haemolytic streptococcus. Most of these methods require comparatively large volumes of test fluid, or are not easily applied in a routine clinical laboratory where many estimations of body fluids may be needed.

The method presented here utilizes the fermentation of glucose in a serum-water medium, with acid production and subsequent clotting of the serum as an indicator of growth. It combines the advantages of using small amounts of test fluids, easily available materials, a clear-cut end-point, with few manipulations and sufficient accuracy for all clinical purposes.

Technique

The glucose-serum medium (see below) is inoculated with 10 c.mm. of a 24-hour broth culture of the Oxford strain of staphylococcus per ml. of medium, and well mixed. Several 25-c.mm. volumes of the seeded medium are placed in a row on the paraffin-waxed surface of a glass slide. An equal volume of the serum or other fluid to be estimated for penicillin content is mixed with the first 25-c.mm. volume of medium on the slide, and serial dilutions are then made along the row by transferring 25 c.mm. of the mixture to the next volume, and so on. The last volume is left unmixed, as a control. The 25-c.mm. mixtures and the control are then taken up into capillary tubes, the ends sealed in a flame, and the tubes incubated overnight. This gives 1:2, 1:4, 1:8, etc., dilutions of the fluid under test and will correspond as end-points to 0.04, 0.08, 0.16, etc., unit of penicillin per ml. in the original fluid.

It will be found an advantage to use a Pasteur pipette graduated in four or five 25-c.mm. divisions. This is the only special piece of apparatus required, and may be used for all manipulations.

The capillary tubes should be about 1 mm. bore, to give a fluid column 2 to 3 cm. long. Too long a column reduces the rate of growth in its middle section.

Test Organism.—Any organism which is penicillin-sensitive, which will grow readily in fluid serum media and ferment