outnumbered those of group III by more than 3 to 1, the proportion of type 80 strains was 72%.

Type 80 strains were associated with a variety of infective conditions, some of which may have been acquired in hospital. The proportion of type 80 strains among staphylococci recovered from different sources ranged from 32% (skin lesions) to 48% (wounds, burns, and fractures). There was no indication that type 80 infections occurred as part of a definite "outbreak"; between 20% and 60% of each of five batches of strains received over 17 months were of this type.

The high incidence of penicillin resistance among type 80 strains accords with experience elsewhere. These staphylococci, possessing a distinctive lytic pattern and a marked insensitivity to penicillin, seem to form a group of considerable pathogenic potentiality. From the lysogenic standpoint, the 98 strains classed as type 80 were not homogeneous, nine strains liberating a phage to which all the remaining type 80 strains were sensitive. It would appear that type 80 strains, like type 52A strains, possess properties which favour their growth and spread in man; further data relating to their prevalence among the patients and staff of hospitals in tropical Africa would be valuable.

Summary

Strains of *Staph. aureus* type 80 formed 40% of 248 cultures of coagulase-positive staphylococci recovered from patients suffering from various infective conditions in Uganda. Type 80 strains were by far the commonest phage type in this series, and nearly all (97%) were penicillin-resistant. Strains of this type appear to be responsible for serious infections; their prevalence among hospital workers deserves study.

We are indebted to Dr. A. B. Raper and Dr. E. C. Buck for strains of staphylococci, and to Dr. R. E. O. Williams and Dr. Joan E. Rippon for typing phages and helpful information.

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Speaking at the conference of the National Society for Clean Air on October 1, the Minister of Housing and Local Government, Mr. HENRY BROOKE, said that on the industrial side we ought to see a substantial improvement within the next five years or so. The period allowed by the Clean Air Act for alterations to plant expired in the middle of 1963. During this time all the necessary improvements to furnaces and boilers would have to be carried out—the fitting of mechanical stokers, and the provision of instruments for observing and checking smoke. There ought also to be a steady growth in the fitting of dust and grit arrestors to furnaces. In the processes which came under the Alkali Act there should also be improvements coming along by then. For instance, in the gas and electricity and pottery industries the process of shutting down older works would have gone yet a stage further; and it was the older works which so often were responsible for the most smoke.

Medical Memoranda

Arteriovenous Fistula Following Blunt Trauma

Recently we had occasion to treat an arteriovenous fistula which seemingly resulted from a non-penetrating wound and had no features to suggest a congenital origin. A review of the modern literature failed to reveal a similar fistula following trauma by a blunt instrument which did not penetrate the tissues.

Post-traumatic arteriovenous fistulae and false aneurysms are a frequent complication of penetrating wounds in war. In civilian life congenital arteriovenous fistulae are often encountered, but an arteriovenous fistula or false aneurysm following a non-penetrating wound is a rarity. The case under discussion represents another form of aetiology of arteriovenous fistulae which is uncommon enough to be of interest to others.

CASE REPORT

A man aged 21 was referred because of a history that he had been struck on the left temple by a hockey ball. He was not rendered unconscious, but noted the immediate formation of a swelling at the area of impact, which in three to four hours' time had assumed the size of half a goose's egg. The skin was not broken nor was there any bleeding. On the evening of his injury he noticed a "buzzing" sensation just in front of the left ear. Within the next few days the swelling disappeared, but he continued to be aware of a whirring sensation in the area of trauma, noted when recumbent with the head turned so that the left side was down. It was only the persistence of this annoying buzzing in front of the ear for four months that led him to seek medical attention. Close questioning failed to disclose any history of previous penetrating injury in the left temple area or any skin lesion such as a capillary naevus or angioma.

On examination the pulse rate and volume were normal; blood pressure 130/80 mm. Hg. The significant physical findings were limited to the left temporal area, where there were several conspicuous subcutaneous veins anterior to the ear. Light palpation disclosed a systolic thrill, and on auscultation there was a continuous murmur with a crescendo in systole. Firm pressure upon the superficial temporal artery abolished the bruit; lighter pressure over the dilated veins caused marked engorgement of the veins of the scalp, and the bruit again disappeared. In view of the history and findings a diagnosis of post-traumatic arteriovenous fistula of the superficial temporal artery and vein was made, and at operation the superficial temporal artery and vein were exposed and found to have a fistulous communication. Accordingly a quadruple ligation was performed with excision of included vein, artery, and fistula. Recovery was uneventful and the patient has noted no further symptoms.

COMMENT

The pathogenesis of the fistula presents the point of major interest in this case. The patient absolutely denied any abnormal prominence of the veins of his temple, peculiar vibrations, or whirring prior to the traumatic episode. In fact, there was nothing to suggest that he might have had a small arteriovenous fistula which was enlarged by the blow. It seems most likely that the two vessels lying in close proximity must have been ruptured partially by the severe force, forming a communicating haematoma between them. A vascular channel subsequently developed and remained patent after resorption of the confined haematoma. Owing to the anatomy of the temporal region the haematoma was enclosed in a small space limited by the epicranial aponeurosis and its attachments to the zygomatic arch. There was little chance of dissection of the extravascular blood such as would be allowed in the areolar tissues surrounding vessels in most parts of the body.

Large haematomas are, of course, frequent after blunt trauma, and it is surprising that more arteriovenous fistulae do not develop. As stated above, a special anatomical situation must necessarily exist in which vessels rupture into a confined space. The open venous channel affords the line of least resistance for the blood under arterial pressure, rather than diffusion of the blood into the tissues such as normally occurs. If the vascular shunt is maintained the channel will gradually become organized and lined with endothelium, and an arteriovenous fistula will have been established.

I thank Professor Sir James Paterson Ross for allowing me to publish this case and for advice and help in the preparation of this paper.

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Empyema Caused by *Pasteurella septica*

In the fatal case of empyema described below, *Pasteurella septica* was isolated both during life and after death. This organism is not infrequently isolated from the upper respiratory tract in man, but its importance as a pathogen is extremely difficult to assess. In Britain it has only twice been incriminated as the causal agent in infection of the respiratory tract—once in a case of sinusitis (Bartley and Hunter, 1947), and once as the cause of repeated exacerbations in a case of bronchiectasis (Cawson and Talbot, 1955). Elsewhere, cases of empyema caused by *P. septica* have been described, but only nine reports can be regarded as adequately substantiated by the bacteriological findings.

CASE REPORT

A 76-year-old woman was admitted to hospital on December 20, 1955, complaining of pain in the right hypochondrium and vomiting for three days. On examination she was dyspnoeic and pyrexial—99.2° F. (37.3° C.). Right subcostal tenderness and guarding were present, but there were no other abnormal findings. She had a remittent pyrexia for two days, and then developed grunting respirations and a rust-coloured sputum. Signs of a right lower-lobe pneumonia with pleural effusion were confirmed by x-ray examination. A blood count revealed a leucocytosis of 22,900/c.mm. Treatment with penicillin (crystalline) intramuscularly, 500,000 units six-hourly, produced temporary improvement, but after two more days signs of congestive cardiac failure developed. There now seemed to be an effusion only at the right base, and, in view of the continued deterioration, chest aspiration was performed. A small volume of blood-stained pus was withdrawn, which contained numerous polymorphonuclear leucocytes and minute Gram-negative coccobacilli. Culture yielded a heavy pure growth of *P. septica*. Penicillin was instilled into the loculus entered, and chlortetracycline was given orally, but in spite of all supportive therapy the patient became increasingly feeble, dying on January 16, 1956.

Necropsy Findings.—Necropsy was performed four hours after death. A fibrino-purulent pleurisy involved the lower lobe of the right lung. In the right costophrenic recess there was a collection of 50 ml. of thick yellow pus, walled off by dense fibrous tissue. No gross consolidation was detected in the lungs, but histological examination showed the right lower lobe to be the site of an organizing pneumonia. Other positive findings were confined to the kidneys, which were contracted and coarsely scarred, and the large intestine, which presented an appearance compatible with a uraemic colitis. Cerebrospinal fluid taken at necropsy gave a urea level of 322 mg./100 ml. A specimen of the empyema pus produced, as before, a heavy growth of *P. septica*. The organism was not recovered from material taken from the lungs, trachea, fauces, liver, spleen, heart blood, or cerebrospinal fluid, nor did Gram stains on all organs sectioned show any evidence of Gram-negative coccobacilli. The

final post-mortem diagnosis was "chronic pyelonephritis, pneumonia with empyema occurring as a terminal event."

Bacteriological Findings.—In films prepared from the empyema pus the organism was seen to be a coccobacillus measuring approximately 1.5 by 0.5 μ . Bipolar staining was easily demonstrable, but capsules were not seen. The organism was Gram-negative and non-acid-fast. Its cultural characteristics were typically those of *P. septica*. It grew easily on blood agar and on nutrient agar, but not at all on MacConkey's agar. Two notable features were a peculiar brownish discoloration produced on blood agar after 48–72 hours' incubation, and a semen-like odour given by cultures on this medium. Biochemical reactions were again typical, with the single but important exception of the production of acid from lactose. The antigenic structure and pathogenicity of the organism were investigated by Dr. G. H. Tee. He found it to be agglutinated to a titre of 1:5,120 by an antiserum prepared against a lactose-fermenting organism which had been isolated from a cat-bite and which appeared to be *P. septica*. He also inoculated two mice intraperitoneally with 0.1 ml. of an 18-hour broth culture of our organism diluted 1:100. Both mice died within 24 hours, and were found to have peritonitis with free fluid in the abdominal cavity. A pure growth of an organism with similar properties was recovered from their spleens. Finally the organism was tested against antibiotics, using a standard dried-disk technique; it was found to be sensitive to penicillin, streptomycin, chloramphenicol, the tetracycline group, and polymyxin, but resistant to erythromycin.

COMMENT

Two features in this case are noteworthy. First, it adds to the slowly accumulating body of evidence implicating *P. septica* as a definite potential pathogen in the respiratory tract in man. When Schipper (1947) reviewed human infections with *P. septica*, he divided them into two main groups—local infections due to animal bites, and infections, usually systemic, not obviously attributable to any direct cause. It seems to us, however, that cases of respiratory infection might well be separated from this second rather vague group, with consequently increased emphasis on their frequency and importance. The relatively large series of cases of bronchiectasis, including two complicated by empyema, reported by Olsen and Needham (1952) lends support to this view.

The second feature is of primarily bacteriological interest, and concerns the unusual property possessed by our strain of *P. septica* of producing acid from lactose. There is no published reference to a lactose-fermenting strain being isolated from man. However, such strains have often been described by veterinary workers (Jones, 1921; Rosenbusch and Merchant, 1939), and were referred to by Allin (1942) in a review of cat-bite infections. Moreover, Tee (1956, personal communication) has obtained from sputa several strains of lactose-fermenting organisms which otherwise seemed typically *P. septica*. There is therefore strong evidence that the production of acid from lactose is a property of certain not uncommon strains of *P. septica*, and that such strains may on occasion be pathogenic for man.

We are indebted to Dr. G. H. Tee for his invaluable assistance in carrying out the serological and pathogenicity tests; to Dr. C. S. S. Don for permission to publish the clinical details of the case; to Dr. A. Nicol for the necropsy report; and to Dr. R. W. Fairbrother for his advice and encouragement.

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