Like Combes and Behrman (1948) we could find no evidence that irritants, such as Whitfield's ointment, applied before or after X-ray epilation had any but good effects.

Summary

In a five-year follow up of 365 cases of microsporon infection of the scalp treated by X-ray epilation 128 patients were examined and replies were received from a further 28. In no case was there any evidence of damage to the scalp or hair

from the radiotherapy, nor of recurrence of the ringworm.

We wish to thank Dr. Brian Russell for permission to publish this report.

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B. FAECALIS ALKALIGENES INFECTIONS WITH A REPORT OF A CASE OF SEPTICAEMIA

By I. M. LIBRACH, M.B., B.Ch., D.P.H., D.C.H.I.

Ilford Isolation Hospital

The organism *B. faecalis alkaligenes* is a member of the coli-typhoid dysentery group and has been classified with the non-lactose fermenting paracolony bacilli, members of which are known to be of varying pathogenicity to man, e.g. Kernohan (1952).

It was first isolated from stale beer by Petruschky in 1889. In 1896 he further differentiated it from *B. coli* and *B. typhosus*. He also recognized that it was pathogenic to animals and that it could cause a septicaemia. After examining 134 strains, Nyberg (1935) further classified it into two groups, (1) a non-motile bacillus with peritrichous flagellae having no fermentative reactions and which does not produce indol or alter milk, and (2) a vibrio which is motile and slightly alkalinises dextrose media. Cocco-bacillary forms have also been described by Indian workers. Chaudhuri (1944) considers *B. metalkaligenes* (Castellani) an important variant. It does not produce ammonia in broth as does the *B. faecalis* variety. He isolated it in six cases.

Reports of its pathogenicity have been world wide, most of them coming from the U.S.A., Australia, India and Egypt. I could only find six reported cases in this country since 1918. That it could cause a bacteraemia was recognized early. Wiltshire (1915) isolated it from the blood of three soldiers suffering from low irregular pyrexia of unknown origin. Hirst (1917) again isolated it 23 times from 123 blood cultures, i.e. 18.7 per cent.

Muir and Ritchie (1937) mention blood infection in cases presenting a transient febrile illness. Bacteraemia disappearing *without* treatment has recently been described (Weintraub and Neter, 1943).

Frank septicaemia with positive blood culture and intestinal haemorrhage was first reported by Lafforgue in 1908 (quoted by Andrieu *et al.*, 1936). Kraiss (quoted by Goldberger, 1938) described a further case in 1913 in a nurse of 19 years with gastro-enteritis. It is not surprising, therefore, that since then numerous records of involvement of individual organs, either in sporadic or epidemic form and at all ages from infancy to old age have been described, e.g. acute meningitis (Gatewood, 1931; Mason, 1934; McGill and Mendel, 1953), abscess of neck (Pohl and Raymond, 1941), cystitis and pyelonephritis (Beckman and Reiss, 1924; Ahad, 1942), epidemic conjunctivitis (Barrow, 1931), hepatitis (McIntyre, 1936), keratitis (Couadou and Darbon, 1948), infective endocarditis (Cole, 1952), infantile gastro-enteritis (Webster, 1919), myocarditis (Andrieu *et al.*, 1936), orchitis (Hall and Garvan, 1949), serofibrinous pleurisy (Andrieu *et al.*, 1936), polyarthritis (Goldberger, 1938), foetal peritonitis (Sloboziano and Nasta, 1931). It has been recovered from gallstone (David and Green, 1929), from renal calculi (Stuart *et al.*, 1934), from ascitic fluid, knee joint fluid and gall bladder bile (Banerjee and Sarkar, 1949). Infections have also been

described in birds and animals, e.g. red leg in tree frogs.

It is also of interest in those cases presenting as an enteric-like infection. It had been early recognized that certain cases of enteral infection bore a resemblance to true typhoid fever, although *B. typhosus* was never isolated from them. They were grouped under the term parenteric fever, which was used by Khaled (1922) in describing his Egyptian series and was revived by Chauduri in 1944. The term has been criticized in that it suggests a close relationship with enteric fever, whereas *B. faecalis* infections are usually primarily septicaemic in nature. As confusion is possible it has not been used much nowadays.

Shearman (1916) isolated the organism from the stools in a series of military cases being observed as enteric carriers. Hirst (1916) examined 100 consecutive stools from convalescent enteric and dysentery patients and also the stools of 50 normal patients. He isolated the organism 16 times in the enteric group, 29 times in the dysentery group but none from the normals. He concluded that it is an organism of low virulence to man but capable of multiplying in the bowel in certain favourable conditions and occasionally gaining access to the blood stream through a more or less damaged mucosa, producing a mild enteric-like infection. Morosoff (1928) describes *B. faecalis alkaligenes* as a secondary invader in typhoid infections. Stanisevskaya *et al.* (1928) isolated it from 80 per cent of 36 cases of enteric fever and thought it responsible for some complications.

Capt. H. F. Blood (1917) first described the clinical picture of these cases as follows, 'The onset is sudden with an evening rise of temperature for about five days, marked remission but morning temperature not quite falling to normal, then a brief intermission followed by more irregular pyrexia for a few days. The patient's aspect is pale and he has a toxic appearance out of proportion to his symptoms, which are usually indefinite. The tongue is coated with a brown fur, red at the edges and moist. The pulse is slow in proportion to the temperature. There are no spots and the spleen is not enlarged.'

Khaled (1922) in discussing 'parenteric fever' in Egypt considered that in their mode of infection, in pathology and in mechanism, there is no difference in kind between the enterica and these enteric-like cases—the only difference lies in the causal organism. Of 20 blood cultures from enteric-like cases only one, however, grew *B. faecalis alkaligenes*!

Case Report

A.R.J., aged 31 years, married and a green-grocer by trade, was admitted as a case of ? para-

typhoid fever on November 14, 1952. He gave a vague history of lassitude, malaise, anorexia and backache for *seven weeks*. For the past three days he had loose offensive motions with no blood or slime present.

Previous illnesses included pneumonia and an operation for varicose veins, causing his rejection from military service. He had never had T.A.B. injections or been abroad. He had been vaccinated against smallpox in infancy.

On examination his temperature was 100.2° F., pulse 92 and respirations 20. He was not acutely ill but looked depressed. He had a moist, very furred tongue and slightly red fauces, a pigmented area mid one-third right leg with operation scars at ankle and groin. No rash, enlarged lymph nodes or spleen present. Other systems were normal.

Progress

For the first 10 days he was pyrexial (100° to 103°), but stools were normal in consistency and colour. On November 27, 1952, he complained of tenderness in right mid forearm, followed two days later by a swollen and painful right wrist joint with a small red tender area over the ulnar aspect. By December 12, 1952, his wrist joint had subsided, full and painless movement being present. Apart from a pink maculopapular non-itching rash of trunk and limbs on December 6, 1952, further progress was uneventful and he was discharged well on December 31, 1952. He was still well when seen as an out patient three weeks later.

Investigations

Blood. November 18, 1952: Hb., 81 per cent.; white cells, 20,100; polys, 86 per cent.; lymphs, 8 per cent.; monos, 6 per cent. November 25, 1952: Hb., 85 per cent.; R.B.C., 4,140,000; white cells, 19,500; polys, 83 per cent. December 15, 1952: Hb., 76 per cent.; R.B.C., 3,700,000; white cells, 14,500; polys, 70 per cent. December 30, 1952: Hb., 80 per cent. January 21, 1953: Hb., 90 per cent.

Bacteriology. November 18, 1952: Rectal swabs and stool negative. November 29, 1952: Blood culture—*B. faecalis alkaligenes* isolated after 72 hours' incubation. The organism is very sensitive to streptomycin, less sensitive to aureomycin but insensitive to chloramphenicol. November 17, 1952, December 1, 1952 and December 10, 1952: Blood cultures negative after seven days at 37° C. (aerobic and anerobic).

Note on the cultural characteristics of the organism isolated from the blood. Only a few colonies grew on MacConkey's medium and on desoxycholate citrate agar. On MacConkey the colony was 2 mm. in diameter, colourless, circular, convex and with a smooth entire edge.

The organism was a gram-negative, non-motile bacillus. It did not ferment lactose, glucose, mannitol, sucrose, salicin, dulcitol or maltose. It did not split urea or form hydrogen sulphide or indol. It did not agglutinate any salmonella sera.

Serology. Agglutination against stock T.A.B. and salmonellae, 1 in 20. Paul Bunnell test, 1 in 32. Anti-leptospiral serum, negative. Serum agglutination against *B. abortus*, *B. shiga*, proteus XK, OX 19 and OX 2, negative. November 26, 1952: Serum agglutination against *S. flexner*, Z 1 in 40; V 1 in 60. December 12, 1952: Serum agglutination against *S. flexner*, Z 1 in 80; V 1 in 320.

Other Investigations

November 27, 1952: Blood urea, 64 mg. per cent.; mantoux, 1/1000 positive; urine (mid stream specimen), normal. November 29, 1952: E.S.R. (Westergren at room temperature), 15 mm. in one hour; X-ray examination of wrist joints, chest and abdomen, normal.

Treatment

Chloramphenicol, 6,500 mg., and penicillin,

12,000,000 units by intramuscular injection, were without effect. November 27, 1952: Streptomycin-calcium-chloride, 1 g. six-hourly for 12 days. November 29, 1952: Aureomycin hydrochloride, 500 mg. six-hourly for 10 days. Iron, ascorbic acid and anti-histamines (diphenhydramine hydrochloride).

Discussion

The course of the illness together with the cultural characteristics of the organism isolated from the blood leave no doubt that this was a case of septicaemia due to *B. faecalis alkaligenes* and complicated by a secondary septic arthritis of the wrist joint and a secondary anaemia. The rash was thought to be allergic in origin possibly from the use of antibiotics.

The joint involvement in this case is of interest in that the illness often simulates rheumatic fever but 'observation soon shows a different clinical picture' (Goldberger, 1938). Anderson (1933) described two cases who had in addition valvulitis and myocarditis, which may have been truly rheumatic in origin, but Voorhies and Wilen (1942) describe another with a four-month history

of fleeting polyarthritis. The joints showed local heat, redness, pain and swelling but no evidence of residual joint damage was seen.

The majority of cases, too, have a *long* history of ill health varying from two weeks to two months or more and present as pyrexia of unknown origin or with fleeting joint pains. Andrieu *et al.* (1936) describe a period of lassitude and abdominal pain of some days' duration *before* the temperature rises. They consider absence of rose spots an important distinguishing sign from typhoid fever.

The polymorphonuclear leucocytosis is to be noted. The majority of reported cases showed a similar finding ranging from 7,000 to 30,000 cells per c.mm., of which 70 per cent. to 90 per cent. were polymorphs. It would therefore appear to be of diagnostic importance. In true enteric fever a leucopenia with relative lymphocytosis is the rule.

The portal of entry is speculative. Goldberger (1938) thinks that infection is accidental and that most strains are non-pathogenic. The organism has been isolated from dust and contaminated water supplies in Egypt, where diarrhoea is prevalent (Khaled, 1922). Infection is also held to be common in India, especially the Calcutta area (Chaudhuri, 1944). Food contaminated with the excreta of animals has been incriminated. Duck eggs have also been found to be infected. Hygienic conditions in general, such as occur in poverty, will naturally predispose to infection. The usual history of diarrhoea or intestinal symptoms also support food or water as the vehicle. A history of injury is uncommon; Banerjee and Sarkar (1949) describe arthritis of the knee joint in a child who had a fall 10 days previously. Meningitic infections following otitis externa, otitis media, craniotomy and meningocele have also been reported and suggest trauma of varying degree to the C.N.S. as a precipitating factor. Mason (1934) thought that his case of infected meningocele in an infant probably occurred because of contamination with rectal discharges.

Infection has also been described in parturient and post-partum cases and suggests that genital infection via the uterus may occur. No apparent cause could be ascertained in the present instance, but it seems likely that the organism gained entrance through a minute crack in the skin from contaminated vegetables during his work as a greengrocer.

A seasonal incidence was considered possible by Hirst (1917), but cases usually occur throughout the year. He isolated 12 strains of the organism and thought, too, that the illness could be associated with definite and distinct classical signs, but he doubted whether it could be clearly distinguished from other *B. coli* bacillaemias. As can

be seen from the chart, this case confirms in its general characteristics to that first described by Blood (1917).

There is a difference of opinion on the value of agglutination tests. Indian authors in particular pay special attention to them. Wasti (1945) recommends the use of a standard suspension of the organism although he admits that 134 strains occur! Banerjee (1949) used a slide agglutination test of an autostrain prepared from the patient's organism. Weinstein (1951) also used the patient's organism as antigen. The question of a diagnostic titre is disputed, most recommend one of 1 in 50 or more.

Most of the cases reported showed no specific agglutination. Raeburn (1944), however, thinks they are valueless in any case because he holds that it is the exception for human sera *not* to agglutinate this organism to high titre! Banerjee describes agglutination to *B. typhosum* in his case. He ascribes this to an anamnestic reaction. Other authors have found the Widal test to be negative. In the present case agglutination against *S. flexner* Z and V occurred with a rising titre, suggesting an infection with this organism, but it was not isolated from the stool. There is, therefore, a possibility that transient flexner infection occurred which predisposed to a subsequent alkaligenes infection. Cross-agglutination or a non-specific rise is, however, more likely. Muir and Ritchie (1939) state that the serological heterogeneity of the flexner types renders application of the agglutination test difficult for diagnostic purposes because it is very susceptible to agglutination by normal sera (cf. Raeburn, 1944). They rely on isolation of the organism itself in diagnosis. The presence of *B. faecalis* alkaligenes in the blood is often taken to be evidence of contamination, but in the presence of suggestive symptoms its pathogenicity must be entertained. In reported cases it has been isolated from several hours to four weeks after being suspected, but commonly in the first seven days. In the present case it was isolated on the eleventh day after admission, a previous attempt on the third day was sterile.

Many of the Indian cases were complicated by leishmaniasis, malaria and so on and this may alter the clinical and bacteriological picture in tropical cases.

Although the illness is long and debilitating, few deaths have been reported and still fewer post-mortem findings. Hall and Garvan (1949) report a fatal case in a man aged 38 years, the findings included fibrinous pleurisy, cloudy swelling of the liver and pyaemic infarcts of the kidneys and thalamus.

Before the advent of specific therapy, spontaneous bacterial clearance usually occurred after a

long time. Nowadays the organism is usually found to be sensitive to streptomycin and aureomycin and these should be used in full doses. They were successful in the present instance. McGill and Mendel (1953) have recently treated a successful case of meningitis with polymixin B, 100,000 units intrathecally and 250,000 units six-hourly intramuscularly. It is, however, neurotoxic. Doubtless still more efficacious compounds will be discovered.

Summary

A case of septicaemia due to *B. faecalis* alkaligenes is described. The subject is reviewed and discussed. In diagnosis emphasis is laid on (1) a long history of several weeks of vague ill health associated sometimes with fleeting polyarthritides. (2) A positive blood culture. (3) The absence of gross physical signs apart from those in the large joints. (4) It is usually impossible to discover a portal of entry.

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