A NOTE ON THE ABSOLUTE VIABILITY IN WATER OF *S. TYPHI* AND THE *DYSENTERY BACILLI*

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The genesis of this minor investigation was an inquiry by a clinical colleague about the maximal survival times of the dysentery bacilli in water. Our failure to find any precise figures for these times in the reference works that we consulted led us to make the following experiments.

Experimental Tests

Suspensions of *Salmonella typhi*, *Shigella sonnei*, *Shigella flexneri* Y, and *Shigella shigae*, each at a concentration of 1,000 million organisms per ml.—measured by opacity standards—were made in tap-water, in distilled water, and in normal saline. Ten-millilitre volumes of each of these suspensions were then kept in diffuse daylight at room temperature under aerobic conditions, and were tested for viability by the removal, at regular intervals, of a standard loopful of each suspension, which was inoculated into a tube of glucose nutrient broth. The loop employed was one of 4-mm. diameter. These transplants were incubated at 37° C. and their growth was confirmed, and checked for purity, by plating on MacConkey's agar. The plate cultures were then identified by their sugar-fermentation tests and their agglutination reactions with standard sera. If no growth was obtained from the loop transplant, 1 ml. of the suspension was withdrawn in a sterile pipette and inoculated into a fresh tube of glucose nutrient broth, which was incubated for 72 hours at 37° C. and then plated on MacConkey's agar, before the suspension was discarded as non-viable. Temperature readings were taken daily of the small room in which the suspensions were kept. The minimum temperature recorded was 45° F. (7.2° C.) and the maximum 95° F. (35° C.), giving a mean over the whole period of the experiments of 70° F. (21.1° C.).

The suspensions had evaporated to approximately half their original volume after 90 days, and to dryness after 236 days, and no growth was obtained from any of them after the addition of glucose nutrient broth to the dried residue. Before this occurred the following observations had been recorded, the figures in Table I representing the particular length of time in days.

TABLE I

	Tap Water		Distilled Water		Normal Saline	
	Viable	Dead	Viable	Dead	Viable	Dead
<i>Salm. typhi</i> ..	211	236	211	236	153	188
<i>Sh. sonnei</i> ..	68	86	211	236	153	188
<i>Sh. flexneri</i> Y ..	86	118	118	153	118	153
<i>Sh. shigae</i> ..	2	8	2	8	68	86

As this experiment was vitiated to some extent by the evaporation of the suspensions to dryness before the presumptive death of the organism in three instances, a second experiment was performed under the same storage and test conditions. Two suspensions of each organism were made in distilled water to a volume in each case of 200 ml. One of these (A) had a concentration of 500 million organisms per ml.; the other (B) had a concentration of 1,000 million organisms per ml. The readings are given in Table II.

TABLE II

	A		B	
	Viable	Dead	Viable	Dead
<i>Salm. typhi</i> ..	24	59	443	474
<i>Sh. sonnei</i> ..	82	107	168	197
<i>Sh. flexneri</i> Y ..	197	238	364	391
<i>Sh. shigae</i> ..	2	7	2	7

Conclusions

It would seem, from these observations, that an important factor in the absolute viability of *Salm. typhi*, *Sh. sonnei*, and *Sh. flexneri* Y in a chemically inert medium, such as distilled water, is the size of the cell population, at any rate up to a larger population than we have tested.

We offer no explanation of our inconsistent readings with *Sh. sonnei* and *Sh. flexneri* Y, we merely record them; but they suggest that the problem of the absolute viability of bacteria in water is a complex one that is worthy of a more profound study than we have attempted.

The strains of the four bacteria used in this study were obtained from the National Collection of Type Cultures.

A CASE OF MYOSITIS OSSIFICANS PROGRESSIVA

BY

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Myositis ossificans progressiva is a rare congenital disorder producing progressive crippling in childhood and adolescence. The subject has been reviewed by Mair (1932) and more recently by Fairbank (1950), who recorded two further cases.

This report adds another case to the literature and illustrates the characteristic course of the disease and the distressing immobility to which the patient is reduced.

Case Report

This patient, a woman now aged 24, the youngest of five children and the only member of the family to suffer from this or any relevant disease or abnormality, was normal at birth, and for three years after was in excellent health. At the age of 3 she fell while playing and injured the left side of her neck. The next day a painful red lump developed in the region of the left sterno-mastoid muscle. A week later, and without further trauma, she developed a similar mass in the left mastoid area. This was thought to be mastoiditis, and as such was submitted to operation, but no pus was found. There was no aural discharge.

Later, numerous other masses developed in the muscles of the back and arms. Some of these were likened to "bunches of grapes." As the swellings disappeared the spine was left rigid and the arms remained extended.

At the age of 7 she was quite unable to bring her hands to her mouth to feed herself, but gradually the elbows flexed, allowing a restricted range of movement, so that by the age of 9 she could feed herself, could comb her hair, and could walk without assistance.

When 11 she fell on to her left knee. This became red, tender, and swollen, and this condition persisted for six weeks. As the swelling dispersed the knee became ankylosed and has remained so. Three years later her left hip became painful and ankylosis developed. As her right knee and hip were still mobile she was able to walk, and she worked as a telephonist.

FIG. 1.—A support is essential to enable her to stand.

The right knee also became ankylosed after an injury when she was 16, and the right hip fused soon after. She could now only totter after being assisted into the erect position. At this time she had a painful exostosis of the right os calcis; this was excised, leaving a normal scar. Pain and swelling occurred in the right elbow when she was 19 and complete ankylosis ensued. The same year she was admitted to Tilbury Hospital, and appendicectomy was performed for subacute recurrent appendicitis. Recovery was uneventful, and a normal scar remains. At the age of 20 she was admitted to another hospital and the left biceps muscle was excised with the aim of mobilizing the elbow, but this was not successful. Histological examination of the muscle failed to reveal any abnormality.

The left elbow has fused recently after an attack which involved the wrist and finger flexors.

From the age of 3 to 24 there have been many acute episodes which have consisted of severe aching pain, with inflammatory-like swellings. While some were related to minor trauma, most developed spontaneously, unassociated with any known cause. Their duration was from a week to several months, and most of them left residual stiffness and new bone formation, though after some the patient reverted apparently to her previous degree of disability.

Menstruation began at 14 and was regular until 17, when her periods became scanty; they are now absent.

In March, 1950, a portion of ectopic bone was removed from the right buttock and was found to be lying in the subcutaneous fat (see biopsy report). This was followed by a course of radiotherapy to the right buttock. No further bone deposit has appeared in this site.

An arthroplasty of the right elbow was performed to enable the patient to feed herself, but this was followed by new bone formation and the return of ankylosis.

FIG. 2.—Fixed lumbar scoliosis with heterotopic bone in the muscles of the chest and trunk.

FIG. 3.—There is complete ankylosis of the cervical spine.

On examination the patient was seen to be a slim, cheerful young woman completely rigid from skull to ankles. She was quite unable to walk and could stand only after being propped against a wall or supported by a pole (see Fig. 1). She was 5 ft. 6 in. (168 cm.) in height and weighed 7 st. (44.5 kg.). Her skin was greasy from seborrhoea oleosa. Excessive hair was present on her limbs, and her breasts were small.

She had ankylosis of the whole spine and of all the large limb joints (shoulders, elbows, hips, and knees). There was a marked lumbar scoliosis, convex to right, with the pelvis raised on the left side (see Figs. 2 and 3). The shoulders were held in adduction and internal rotation. Both elbows were acutely flexed. The lower limbs were rigidly extended with the knees in contact. Some movement was present in both ankles and temporo-mandibular joints. The left ankle lay in equinus, while the right was in the neutral position. The jaw opened to a width of $\frac{1}{4}$ in. (1.9 cm.) between the teeth. There was a full range of movement of the joints of the hands and feet, though the radio-carpal movements were from 20 degrees flexion to 90 degrees extension, with gross radial deviation. Large bony-hard masses protruded irregularly over the back on each side of the spine and extended laterally to the upper limbs and to many other parts of the body, including the lower limbs and the right temporalis muscle (see Fig. 4). There were exostoses of the left fifth metatarsal bone and of the right talus, which had ulcerated through the skin. A recently developed indurated mass was seen on the anterior aspect of the left forearm, involving the flexors of the fingers. This had produced a flexion contracture of the middle finger, which could be extended only by flexing the wrist. There was bilateral hallux rigidus, but no valgus, microdactyly, or other

FIG. 4.—Diagram showing sites of new bone formation.

abnormality (Mair, 1932). The upper thoracic cage was rigidly fixed, while the lower ribs moved on respiration. The abdomen was normally supple, and the appendectomy scar well healed.

A biopsy report on June 19, 1950, stated: "The specimen is dense smooth white bone 2.2 by 2 by 1 cm., seen on section to consist of well-formed cortical lamellar bone, traversed by Haversian systems, and also central trabeculae of lamellar spongy bone enclosing adipose marrow." Extensive laboratory tests gave no abnormal values.

A radiological report stated: "There is widespread deposition of extraskelatal bone, particularly around the shoulder- and hip-joints and on each side of the vertebral column. The asymmetrical arrangement of bony bands has caused scoliosis.

Discussion

This disease is characterized by the deposit of heterotopic bone in relation to voluntary muscle. Although muscle groups appear to be involved it seems certain from the literature that the fibrous layers of fascia and aponeuroses are the primary sites, and that the process spreads into the adjacent muscle, where new bone forms (Greig, 1931). This patient illustrates many of the characteristic features. The onset within the first two years of life is common, though it has been known to begin in adults (Frejka, 1929) and to have been present at birth (Mair, 1932). The absence of anything similar in the family history is in keeping with most recorded cases, though Burton-Fanning (1901) calls attention to a father and son who were victims of the disease. It is estimated that in 75% of cases there is an associated abnormality of the hands or feet—for example, microdactyly or hallux valgus (Ryan, 1945). In this case no such malformation was present. These concomitant congenital lesions, which suggest that the origin of the disease is prenatal, are sometimes inherited (Rosenstirn, 1918).

Laboratory tests and the bone biopsy failed to reveal any abnormality. The bone appears to arise in connective tissue where haemorrhage has occurred.

While most patients are boys, no significance can be attached to this, for in a rare disease the sex ratio may well be distorted. No relationship was discovered to infection or "rheumatism." Trauma plays a varying part in the production of episodes. It may determine the location of the lesion or may be noticed and be given exaggerated importance in the initial stage of the episode.

The effect of excising a prominent piece of bone in the back and following with a course of deep x-ray therapy (1,000 r) has been tried. So far as can be determined, no new bone has formed at this site. It is improbable that radiotherapy will improve the surgical efforts, till now disappointing, to mobilize joints. No method of treatment has yet been found to have any effect on the progress of this condition, which pursues a relentless course until the whole body has been immobilized, and finally the patient succumbs to intercurrent infection.

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A CASE OF GLANDULAR FEVER WITH CEREBRAL COMPLICATIONS

BY

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Crowther (1951) described the case of a man aged 20 with glandular fever and involvement of the central nervous system, and summarized reported cases. Because of their paucity another is recorded.

Case Record

An unmarried seamstress aged 19 was admitted on August 21, 1951. Three weeks previously, while camping, she complained of persistent headache and giddiness. Seven days before admission the giddiness worsened, especially on looking to the left, objects rotating clockwise. She complained of intense malaise and pain in the back. She noticed that speech and thinking were difficult. For 48 hours before admission she was nauseated and vomited several times. Micturition was normal, the bowels were costive, and menstruation was normal. Her past history was uneventful.

On examination she was apyrexial; pulse rate 64, regular; respirations 22. She was a well-built girl with a vacant expression, drowsy, with thick speech, slow cerebration, and lack of concentration, although she answered questions rationally. There was no jaundice or anaemia; the lymph nodes were not enlarged. Neurological examination showed diminished deep reflexes in the arms and legs; abdominal reflexes were present; plantar reflexes were flexor. There was no sensory loss or paralysis. The pupils were unequal, the left being larger than the right; reaction to accommodation was brisk, sluggish to light. Retinoscopy was normal. Other systems were normal.

Drowsiness continued for four days, with some retention of urine, relieved by catheterization. She vomited bilious fluid several times and still complained of headache and giddiness, especially on moving the head. There was also considerable photophobia and she was content to lie listlessly in bed. Six days later the headache and giddiness were less severe, and she was rational, fully conscious, and orientated in time and space. Progress was uneventful, and she was discharged on September 8. Treatment was symptomatic.

When seen on September 25 and October 9 she had lost some weight, but looked and felt well. No abnormal physical signs were detected.

Investigations.—On admission, catheter-urine was normal; culture, sterile. Rectal and vaginal swabs contained no pathogens. The Widal test for enteric and abortus groups was negative. Blood urea, 34 mg. per 100 ml. White-cell count 7,800 (polymorphs 37%, lymphocytes 54%, monocytes 9%). Glandular fever cells present. Paul-Bunnell test, positive 1 in 512. Wassermann reaction and Kahn and gonococcal complement-fixation tests negative. On August 23 an x-ray film of the chest and skull was normal, and the Mantoux test negative at 1 in 1,000. On August 24, by lumbar puncture, 15 ml. of clear colourless fluid was withdrawn; pressure 100 mm. H₂O. There was a free rise and fall on jugular compression. Cerebrospinal fluid showed: cells less than 1 per c.mm.; protein, 25 mg. per 100 ml.; globulin, no increase; sugar, 75 mg. per 100 ml. Paul-Bunnell test negative. No organisms direct or on culture. On September 6 the Paul-Bunnell test was positive 1 in 256. On September 25 the Paul-Bunnell test was still positive 1 in 256. White-cell count was now 6,200 (polymorphs 45%, lymphocytes 45%, monocytes 9%, eosinophils 1%).

In London on May 7, 8, and 9 is being held the first International Home Help Conference, at which, under the auspices of the National Association of Home Help Organizers, delegates from comparable organizations in Belgium, Finland, France, Holland, Norway, Sweden, Switzerland, and other countries will discuss administrative problems in this branch of social welfare.