THE BACTERIOLOGY OF AIR-RAID WOUNDS EXAMINED WITHIN FORTY-EIGHT HOURS OF INFLECTION

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It was suggested by Stokes and Tytler (1918) and by Fleming and Porteous (1919) that in the war of 1914-18 pyogenic cocci, in particular *Streptococcus pyogenes*, entered wounds chiefly during their treatment in hospital. Miles *et al.* (1940) have found evidence of hospital infection of wounds during the present war.

In order to determine whether pathogenic bacteria are carried into wounds when they are inflicted it is necessary to examine the bacteriology of very early wounds. In Table I are shown the kinds of bacteria cultivated from 31 air-raid wounds examined at an Emergency Medical Service hospital during 1940. Through the kindness of the surgeons the material examined was collected at operation when the wounds were undergoing their first surgical cleansing. Pieces of the external wounds, wound tracks, and any foreign bodies were taken into sterile Petri dishes from the surgeons' forceps.

TABLE I.—*Bacteria obtained from 31 Air-raid Wounds within the First Forty-eight Hours of their Inflection. (Ps. pyocyanea and Proteus were absent in all cases.)*

Case No.	Str. pyogenes	Staphylococci		Bact. coli	Diphtheroid Bacilli	Aerobic Spore-bearing Bacilli	Non-haemolytic Streptococci	Str. viridans	Micrococci	Cl. welchii	Other Clostridia
		Coagulase +	Coagulase -								
1						+					
2	+		+			+				+	
3						+			+		
4			+								
5*											
6		+							+		
7											
8											
9*											
10			+					+			
11											
12*											
13*											
14				+		+			+	+	
15						+					
16*				+		+	+		+		
17				+		+					
18			+	+	+	+		+	+	+	
19	+	+		+	+	+					
20			+	+		+				+	
21						+				+	
22*			+								
23											
24			+							+	
25			+								
26						+					
27									+		
28			+		+		+		+	+	+
29			+	+		+			+	+	
30			+			+					
31			+	+		+					
Total	2	2	13	6	3	10	3	2	6	8	1

* No bacteria obtained.

The bacterial population of an early wound is considerable, and small swab samples often yield no bacteria. In order to test larger samples, pieces of excised tissue were either cut up with sterile scissors or ground with sterile glass fragments in a sterile glass hand-mill, and then inoculated into large tubes containing 30 c.cm. of broth, with or without added sterile blood, serum, or liquor. (Liquor is an anticoagulant which inhibits some of the bactericidal power of normal blood—see von Haebler and Miles (1938).) The necessary manipulation inevitably increased the risk of contamination from the air; stress is therefore not to be

laid on the frequent occurrence of aerobic spore-bearing bacilli and coagulase-negative staphylococci (see Table I), although all possible precautions to prevent contamination were taken, short of working in a bacteria-free atmosphere. Fluid cultures were subsequently plated on to blood-agar plates, which were incubated aerobically and anaerobically. Fragments of the wounds and wound tracks were also smeared direct on to blood-agar plates.

The frequency with which different kinds of bacteria were found among these wounds differed from that observed among older wounds in that pyogenic cocci were rarer while coagulase-negative staphylococci, aerobic spore-bearing bacilli, and *Clostridium welchii* were more common. Six of these early wounds yielded no bacteria. Pyogenic cocci were obtained from three, *Str. pyogenes* and coagulase-positive staphylococci together from one, and each separately from the other two. The wound which yielded both *Str. pyogenes* and coagulase-positive staphylococci was a small scalp wound on the head of a child whose tonsils were large and inflamed. A blood-agar plate culture from the wound eight hours after its infliction gave one colony of *Str. pyogenes*; a few days later Group A streptococci were abundant in both wound and throat. Unfortunately the streptococci from both sources were untypable, but from the evidence it is probable that the wound became infected from the patient's throat, possibly by way of her fingers.

Cl. welchii was found in 8 of the 31 wounds. In one case it produced enough gas and damage in a haematoma around a fractured tibia to lead to amputation. In a second case a piece of metal entered the chest wall, penetrated the abdomen, and lacerated the liver, from a piece of which, excised thirteen hours after injury, *Cl. welchii* was obtained. A pleural effusion subsequently developed in which *Cl. welchii* was present in large numbers, producing much gas. In the remaining 6 cases *Cl. welchii* gave no clinical evidence of its presence.

For comparison, Table II shows the figures for 29 limb wounds of more than five weeks' duration and 13 air-raid wounds of more than forty-eight hours' and less than three weeks' duration, all of which were treated by the closed-

TABLE II

Kind of Bacteria	31 Air-raid Wounds less than 48 Hours Old	13 Plastered Wounds between 48 Hours and 3 Weeks Old	29 Plastered Wounds more than 5 Weeks Old
Str. pyogenes	2	5	20
Staphylococci :			
Coagulase + ...	2	9	19
Coagulase -	13	5	7
Bact. coli	6	4	15
Ps. pyocyanea	0	1	8
Proteus	0	2	7
Diphtheroid bacilli	3	10	21
Aerobic spore-bearing bacilli	10	2	5
Non-haemolytic and viridans streptococci	5	3	5
Micrococci	6	0	1
Cl. welchii	8	1	2
Other Clostridia	1	2	5
No bacteria	6	0	0

plaster method. Bacteria were much more plentiful in the wounds of these two groups than in the earlier wounds; the cultures from them were made on blood-agar plates, aerobic and anaerobic, and in cooked meat medium.

Discussion

Most of these early wounds were small ones which healed by first intention; their subsequent bacteriology was not followed. Comparison between small wounds which heal by first intention and larger open wounds treated by the closed-plaster method is fair only because there is no

obvious reason why different kinds of bacteria should be carried into them at the time of their infliction. Failure to isolate a given kind of bacterium from a wound is not conclusive proof that no bacteria of that kind were present; on the other hand, the methods of culture employed in this investigation are reasonably sensitive, and the most probable explanation of the failure to isolate pyogenic cocci from more than three wounds seems to be that they were not present in those from which they were not obtained.

Summary

Str. pyogenes and coagulase-positive staphylococci were each obtained from two wounds out of 31 early air-raid wounds examined within forty-eight hours of their infliction. *Cl. welchii* was obtained from 8, of which 6 showed no clinical evidence of its presence. Six of the wounds yielded no bacteria of any kind.

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Medical Memoranda

Narcolepsy

The following is a case of narcolepsy which showed a spontaneous remission of the specific sleep component of the syndrome in eighteen months, and in which the cataplectic component improved but still remains.

CASE REPORT

The patient was a healthy married man, aged 40, who had no previous medical history, and whose personality did not present any evidence of psychopathy. In December, 1939, he was playing at cards under average circumstances when he unaccountably fell asleep. From that date until January, 1941, he became liable to diurnal naps, but, contrary to most recorded cases, he felt no prodromal desire to sleep. The attacks reached their greatest intensity about February, 1940, at which time they averaged three or four a day, each lasting from a few seconds to ten minutes. Simultaneously with the onset of this disability his sleep rhythm, formerly very regular, became disturbed, and though able to get off to sleep early, he would awake frequently, but found no difficulty in going off once again. His dreams, formerly infrequent and neutral, now became very frequent and universally unpleasant, especially those of long-past incidents. The quality of his sleep had no effect on the subsequent day's attacks. Boredom and monotony, intense artificial light as when playing cards, a huge meal, would tend to induce an attack. He never fell to the ground, and in fact was always sitting when the attack occurred, except on one occasion while standing at a lecture, when the losing of his balance woke him up. After an attack he had a feeling of well-being. There was no preknowledge of an impending attack. There were no paraes-thesiae, visual or auditory phenomena, or hypnagogic hallucinations. The depth of sleep was "dead asleep," and the waking was instantaneous and unaccompanied by any features of abnormal sensation, behaviour, or thought.

Approximately one month after the above attacks had been established he began to notice cataplectic phenomena. The first of these was a blurring vision "like as if you were to squint," and referable to diplopia. Accompanying this was a sensation which was unpleasant "because it made it awkward to speak," and which was described as a "pulling" of the lower jaw between the angles and the chin. The sensation was analogous to that produced by simulating a risus sardonicus. A very short period after the foregoing sensation in the jaw he would "experience a momentary shock" in "all my joints," "just as if you were startled by nearly being run over." The ocular and mandi-

bular sensations were not momentary, and would last "as long as the emotion" provoking them. The provocative emotion was in the majority of instances that of mirth. But certain states of tension, such as "standing in front of an officer" or after "making a difficult billiard shot," had also induced an attack.

The above cataplectic syndrome followed the narcoleptic syndrome in its general progress, but the manifestations of the two syndromes were completely independent, and were dissimilarly provoked and displayed with reference to time. The narcoleptic syndrome had little, if any, effect on his behaviour or personality; but on account of his cataplexy, whereas formerly he had been a man given to mirth and known for his repertoire of amusing, especially salacious, stories, he gradually had to control this tendency until it was completely inhibited. The telling of these anecdotes would invariably precipitate an attack at the climax of the joke. Matinal attacks of hypnagogic cataplexy had occurred in which he had woken up "as in a trance," "continuing with my dream but unable to move until I wilfully woke my body up." There was no history of amnesic episodes. During the period under review he gained 7 lb. and became relatively impotent. Desire remained, but he got a poor erection, and achieved an orgasm with ejaculation with great difficulty. There were no headaches or epistaxis. The patient was of average build, above average intelligence, and free from family history of similar complaints. He had a history of head injury during childhood, when he had had concussion on two occasions. There was no immediate antecedent period of physical or psychic stress. Radiographs of the skull were negative, as were serological tests. Erythrocytes numbered 6,500,000 per c.mm.

The narcoleptic syndrome had made a complete remission by December, 1940, but the cataplectic syndrome, though considerably less, has persisted to date and has not apparently improved with benzedrine.

DISCUSSION

In considering the clinical manifestations of the narcoleptic syndrome, this case may be said to show the majority of the classical features of the illness. To the psychiatrist the most interesting feature was its lack of effect on the patient's personality.

With reference to the relation between the narcoleptic syndrome and epilepsy, it has been pointed out by Daniels (1934) that the dissimilarities outweigh the similarities. Nevertheless, it appears reasonable to assume that the two patterns of neural response overlap somewhat. A much more interesting problem of overlapping is involved when we consider the problem of sleep inclination to certain phenomena of hysteria. At the onset of a fugue it is extremely frequent for the patient to be seized with an overwhelming desire to sleep, and this feeling he usually proceeds to gratify. On awakening—perhaps within an hour, or, if in the evening, some eight hours later—he remains in his disorientated state until, maybe, he comes for treatment. It is unusual for the patient to relate or to know of this fact, and in consequence I can find little reference to it in the literature. The amnesic period of the fugue usually appears to include a short period prior to the sleepiness. Under hypnosis, however, the patient relates all these circumstances. In one patient, who remained in a state of partial disorientation for many weeks, there were recurrent attacks of sleepiness under emotional stress, which all disappeared following treatment.

The neuropsychiatric ground-pattern of hysteria still awaits elucidation, and in a separate paper I have advanced evidence to show a connecting link in the case of the anxiety attack with known lesions in the region of the third ventricle. Here again in the topic under discussion is a symptom (a feature also in many hysterical fugues) which occurs in a setting the organicity of which is not open to doubt and whose site of production appears to be in the neighbourhood of the third ventricle. Finally, it appears justifiable to refer to the disturbance of nocturnal sleep rhythm and impotence, which are two cardinal features in involutional melancholia and which occur in the syndrome here recorded.

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