

were at their height. It is important to keep the pro-agglutinoid zone in mind, lest through an insufficiently high dilution a tube in the pro-agglutinoid zone should be read as a wholly negative result.

While Zinsser, basing his opinion on the work of Bechtold⁶ and that of Neisser and Friedman,⁷ considers the assumption of pro-agglutinoids unnecessary, their existence would serve to make clearer some of the phenomena noticed. That the pro-agglutinoids not only completely inhibit the agglutination in the lower dilutions but partially inhibit it in the higher dilutions is possible. This supposition is borne out by the fact that when the titer of a serum comes down, the pro-agglutinoid zone precedes it, and with the total disappearance of this zone, a secondary rise on the agglutinin titer appears, which is difficult to account for in any other fashion.

CONCLUSIONS

1. Definite agglutinins for all three organisms are developed after the use of Army vaccine. They are equal after alternating doses and triple vaccine, the methods are equally effective, and the time-saving element in the latter is obvious.
2. Previous vaccination has the effect of repressing agglutinins for the specific organism.
3. Fluctuations in agglutinin content occur after vaccination, in normal cases, and are of little diagnostic value in cases of fever.
4. There is no relation between the systemic and the local reaction, after vaccination, and the units of agglutinins produced.

THE PSYCHONEUROTIC FACTOR IN THE IRRITABLE HEART OF SOLDIERS *

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In 1871, Da Costa published his observations "On the Irritable Heart" as seen among soldiers invalided for this malady during the Civil War. During the present war this condition has again become prominent and names such as "disordered action of the heart" (D. A. H.), "effort syndrome," "debility" and "neuro-circulatory asthenia" are employed to describe the affection. The group includes all cases which present a well defined syndrome in which certain nervous and circulatory symptoms are associated with increased susceptibility to fatigue and in which no definite pathologic condition can be found to which to ascribe the clinical symptoms. The underlying pathogenic process is still unknown; and when we speak of the psychoneurotic factor in the "irritable heart" of soldiers, we do not imply an immediate causal relationship between the two, or that the

symptoms of the two originate in the same way, but rather that possibly both groups may result from some common but as yet unknown cause.

It is probable that at present under the term "irritable heart" are included types of cases which are fundamentally quite different. The prominence of the nervous system in many instances is so striking that one naturally considers the relationship to the psychoneuroses, just as the circulatory phenomena among certain cases of war psychoneurosis must have led neurologists to wonder where the dividing line is to be drawn; in truth, there is a borderline where the two dominions overlap. Some even believe the irritable heart represents merely the cardiac difficulties of soldiers suffering from war neuroses. Again, it was evident that a certain number of patients with irritable heart had suffered from symptoms of the condition long before enlisting, some dating the onset to the formative period or even to childhood. The question whether some cases were not congenital or even hereditary in character also occurred, particularly when dealing with soldiers who belonged to the group called constitutionally asthenic. Then there is the serious and, in the American Army, immediate problem of dealing with recruits with such histories who break down in training.

With these matters in mind we decided to analyze the detailed histories of 100 unselected cases to see whether such an analysis would throw any light on these questions or give definite confirmation to certain impressions which had been gained in the course of daily routine observations. Our study was based on the clinical material in the large Military Heart Hospital at Colchester, which admits almost exclusively soldiers invalided from the British Expeditionary Force.

For purposes of comparison the same characteristics selected by Capt. Julian M. Wolfsohn¹ in his paper on "The Predisposing Factors of War Psychoneuroses" were utilized, and also the statistics on 100 wounded soldiers used by him as controls. We have taken the liberty of reprinting two of his tables, but have incorporated our observations in cases of irritable heart in a column between those he has published for the psychoneuroses and those for control soldiers. In both tables (1 and 2) it will be seen that the percentage of the various characteristics named are in general highest in the psychoneurotic group, intermediate in the irritable heart group, and lowest in the control group of cases.

FAMILY HISTORY

It must be made perfectly clear that we were investigating the family history of cases of irritable heart for factors considered causal for psychoneuroses. The patients were invalided for irritable heart only, and the statistics obtained from these are placed in the middle column in both Tables 1 and 2.

A positive family history of one or several of the characteristics selected was obtained in 56 per cent of cases of irritable heart and in 38 per cent of the controls; but the contrast between the two classes becomes far more striking when certain of the individual items are compared. Thus with reference to nervousness in the family history, there are 45 per cent. among the irritable heart group and only 15 per

6. Bechtold: *Ztschr. f. phys. Chem.*, 1904, p. 48.

7. Neisser and Friedman: *München. med. Wchnschr.*, 1914, 51, 465.

* From the Military Heart Hospital, Colchester, England.

This paper is abbreviated for publication in *THE JOURNAL* by the omission of Table 6, which is a long table of "Character of Service and Cause of Invaliding," arranged in groups, of each individual, with his age, civil occupation, period of total military service and of foreign service. Reprints of the complete paper may be obtained by writing to either of the authors.

1. Wolfsohn, J. M.: *The Predisposing Factors of War Psychoneuroses*, *THE JOURNAL A. M. A.*, Feb. 2, 1918, p. 303; *Lancet*, London, 1918, 1, 177.

cent. among the controls; in regard to insanity and epilepsy there are 23 and 15 per cent. respectively, in the families of cases of irritable heart and none among the controls.

PERSONAL HISTORY

In Table 2, the contrast between cases of irritable heart and the controls is still greater. The total number or percentage of cases with a positive personal

TABLE 1.—PERCENTAGE OF CHARACTERISTICS NAMED IN FAMILY HISTORY OF PATIENTS SUFFERING FROM (1) NEUROSIS, (2) "IRRITABLE HEART" OF SOLDIERS, AND (3) CONTROLS

| | Neurosis | | Irritable Heart (Wounded) | | Controls | |
|--|-----------|-----------|---------------------------|-----------|-----------|-----------|
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| Nervousness | 64 | | 45 | | 15 | |
| Alcoholism (parents and grandparents) .. | 50 | | 15 | | 24 | |
| Teetotalers (parents and grandparents) .. | 30 | | 15* | | 16 | |
| Irritability of temper | 36 | | 27 | | 12 | |
| Insanity | 34 | | 23 | | 0 | |
| Epilepsy | 30 | | 15 | | 0 | |
| Tuberculosis (immediate family) | 12 | | 13 | | 4 | |
| Tuberculosis (relatives) | 6 | | 15 | | 4 | |
| Stigmata | 10 | | 17 | | 0 | |
| Positive history for one or several of foregoing | 74 | | 56 | | 38 | |

* Figure incomplete.

history is fifty-one among cases of irritable heart, twelve among the controls, and of those with positive family and personal history there are 46 per cent. among the former group and only 6 per cent. among the latter. As to the individual items, the predominance of certain characteristics among cases of irritable heart as contrasted with the controls should be especially noted, namely, presence of stigmata, prevalence of previous nervousness, a history of epilepsy or fits, of previous breakdowns, of moodiness, and of enuresis. It is well known that sufferers from irritable heart are apt to be teetotalers and are sexually not very active; the latter fact may account for the low percentage (18) of married men in this group as com-

TABLE 2.—PERCENTAGES OF CHARACTERISTICS NAMED IN THE PERSONAL HISTORY IN CASES OF (1) NEUROSIS, OF (2) "IRRITABLE HEART" OF SOLDIERS AND OF (3) CONTROLS (I. E., WOUNDED)

| | Neurosis | | Irritable Heart (Wounded) | | Controls | |
|--|-----------|-----------|---------------------------|-----------|-----------|-----------|
| | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. | Per Cent. |
| Stigmata | 34 | | 12 | | 4 | |
| Previous nervousness | 66 | | 46 | | 12 | |
| Fears | 50 | | 31 | | 8 | |
| Head injury | 38 | | 5 | | 12 | |
| Epilepsy and "fits" | 8* | | 5 | | 0 | |
| Tobacco (excessive) | 8 | | 1 | | 4 | |
| Alcohol (excessive) | 6 | | 0 | | 16 | |
| Alcohol (teetotaler) | 48 | | 36 | | 20 | |
| Married | 42 | | 18 | | 28 | |
| Moody | 55 | | 27 | | 8 | |
| Previous breakdown | 2 | | 21 | | 0 | |
| Enuresis | 12 | | 14 | | 4 | |
| Frights in childhood | 4 | | 19 | | 0 | |
| Excessive religion | 6 | | 6 | | 0 | |
| Positive personal history | 76 | | 51 | | 12 | |
| Positive family and personal history | 70 | | 46 | | 6 | |

* As stated in the text, the data in the neuroses and the controls are reprinted from Captain Wolfsohn's paper; in his figures, however, only epilepsy was considered, whereas we have also included "fits" which may, or may not, have been true epilepsy.

pared with 28 per cent among the controls and 42 per cent. among the psychoneurotics.

Of the 100 cases analyzed, sixty-one gave a positive family or personal history for psychoneurotic factors. Of these, forty-six gave a positive family and personal history, a group which we will call Group 1 to distinguish it from Group 2, which consists of thirty-nine cases with a negative family and personal history (Table 3). A comparison of other facts in

these two large groups, 1 and 2, of cases of irritable heart is shown in Tables 4 and 5. As regards previous occupations in civil life, it is noteworthy that patients in Group 1 followed largely sedentary and light occupations, whereas of those in Group 2 some did light but more did heavy work. In Table 5 it is shown that the average duration of foreign service is six months less among Group 1 than in Group 2; but the real difference between the two types is seen in a comparison of the character of the military service rendered; only four out of forty-six in Group 1 did

TABLE 3.—PERCENTAGES OF CASES OF IRRITABLE HEART OF SOLDIERS SHOWING POSITIVE FACTORS IN THE FAMILY OR PERSONAL HISTORY, PREDISPOSING TO PSYCHONEUROSIS

| | Neurologic History | | Percentage |
|----------------|--------------------|----------|------------|
| | Family | Personal | |
| Group 1 | + | + | 46 |
| Group 2 | — | — | 39 |
| Group 1A | + | — | 10 |
| Group 1B | — | + | 5 |

full duty, as contrasted with thirty-three out of thirty-nine in Group 2.

CHARACTER OF SERVICE

The character of service of each of the 100 men is also given in abstract in Table 6, and it is very evident that the patients in Group 1 from a military point of view gave such a poor account of themselves as a whole as to make one doubt whether it was worth the time and expense devoted to them. On the other hand, those in Group 2 certainly did at least the mil-

TABLE 4.—OCCUPATION

| | Sedentary | Light | Heavy |
|---|-----------|-------|-------|
| Personal and family history positive (Group 1) .. | 10 | 27 | 9 |
| Personal and family history negative (Group 2) .. | 2 | 17 | 20 |

itary duty of an average soldier, and many of them gave most valuable and prolonged service. In such patients, invalidated for irritable heart, as have neuropsychic factors in their family and personal anamnesis, the value of the military service rendered has been found to be negligible (Table 6).

THE CAUSES OF INVALIDING

The cause of invaliding is given for each of the 100 cases in Table 6, and it is worthy of note that among the cases in Group 1 there is frequently, in

TABLE 5.—AVERAGE AGE AND DURATION AND CHARACTER OF SERVICE

| | Group 1 (46 cases) | Group 2 (39 cases) |
|--|--------------------|--------------------|
| Average age | 27 years | 25 years |
| Duration of foreign service | 13 months | 19 months |
| Number of patients that did full duty | 4 | 33 |
| Number of patients that had no foreign service | 9 | 2 |

fact, in twenty out of forty-six cases, nothing definite; on the other hand, in Group 2 there is more frequently a definite precipitating cause, such as an infection like trench fever or dysentery, prolonged service, gassing or shell explosion.

CONSTITUTIONAL PHYSICAL ASTHENIA

The sharp contrast between the two groups goes further than differences in their family and personal histories as regards neuropsychic factors, occupations in civil life, or duration and character of foreign service. A history of constitutional asthenia was obtained in almost 70 per cent. of Group 1 cases and in only 12.8 per cent. of Group 2.

By the rather vague term "constitutional asthenia,"² is meant a relative inferiority or an anomaly in the assemblage of inherent characteristics, both functional and morphologic, which go to make up the organism. Among the constitutionally asthenic we include those who have always been short of breath, have been unable to play the most strenuous games or keep up physically with the average of their fellows, have fainted or become dizzy easily, have blushed readily, perspired too profusely, and have suffered from cold extremities. There appear to be two types of such individuals, first, those who are weak and poorly built, or may have a "habitus," and second, those who to all appearances are muscular, strong and robust, and yet for some unknown cause have had symptoms such as dyspnea on exertion from youth up.

One may also include under this term patients who have a habitus, such as the narrow chested or splanchnoptotic, those who have given evidence of a diathesis such as the hemorrhagic, the exudative, the lymphatic or the spasmophilic, and those having a dyscrasia, or belonging to certain types such as the vagotonic, angiospastic, erethic, feminine, eunuchoid, etc.; or those showing definite evidence of disturbance of the endocrine organs. Attention has been directed for many years to this whole question of constitution by F. Kraus, and it is impossible to enter into the subject here; but it must be emphasized that apart from neuropsychic factors, there is a constitutional tendency in certain individuals which predisposes them to the development of the irritable heart syndrome. Moreover, such a history of constitutional asthenia was present in 70 per cent. of Group 1 cases and in only 12.8 per cent. of Group 2. And it is this condition which is meant when the cause of invaliding in Table 6 is indicated as "nothing definite."

JUVENILE OR DEVELOPMENTAL VASONEUROTICS

From a study of the personal histories, it is believed that many patients with irritable heart of soldiers are the mature individuals who during their developmental period presented vasoneurotic symptoms. Of the forty-six patients in Group 1, thirty-two or 70 per cent. showed symptoms of constitutional physical asthenia before the age of 17. Of these, thirteen had symptoms as long as they could remember. Of the remaining nineteen, the age at which symptoms of constitutional weakness first manifested themselves ranged from 8 to 16, and averaged 11.8 years for those who could recall approximately their age when the symptom or symptoms appeared. (Two other patients date the appearance of their symptoms to their twenty-second and twenty-third year, respectively; but as the symptoms appeared so late, it is not certain they belong to the same group.)

Apparently hitherto no attention has been paid to a very important fact, that a syndrome identical with that of irritable heart occurs not infrequently in children,³ especially associated with orthostatic albuminuria.⁴ These symptoms usually arise in children at the school age, from 8 to 14, and are "chiefly those

referable to the cardiovascular system, namely, dyspnea on exertion, palpitation, precordial pain, headache, fainting, hypersusceptibility to cold." To quote Bass and Wessler again:

In spite of the absence of any demonstrable increase in the size of the heart, all of these children nevertheless had definite symptoms. . . . Twelve of the fifteen had definite signs of abnormal function, five had booming first sound, three had apical systolic murmurs; four had marked accentuation of the second pulmonic sound; four showed apical signs of marked overaction, and four showed increased heart dullness to the left.

In the illustrative case history that follows this description, they note "hands cold and cyanotic, marked dermatographia, Chvostek's sign positive." Moreover, orthodiagraphic study of these cases showed that although the hearts do not dilate after exercise, a considerable number of them fail to become smaller under these conditions. In all these particulars, then, these cases formerly called "dilative weakness,"⁵ resemble the irritable heart.⁶ In fact, the juvenile cases are identical in symptomatology with the syndrome as seen in soldiers. It seems highly probable to us, therefore, that the adult patients with irritable heart who give a previous history of similar symptoms at the prepuberty age, or as far back as they can recall, have been children who are recognized as suffering from "vasoneurosis," "dilative weakness," etc. Indeed, we have been able to follow in civil practice one boy with a positive family history, whose symptoms began with cyclic vomiting in infancy and childhood, who had dyspnea, palpitation and occasionally pain on walking up-hill in his teens, and at 18 years of age presented the characteristic clinical picture of neurocirculatory asthenia with overacting heart, very diffuse apex beat, loud systolic murmur, etc.

DIFFERENCE IN SYMPTOMATOLOGY OF THE TWO GROUPS

In comparing the symptoms in the two groups of cases, that is, those with and those without psychoneurotic factors in their family and personal histories, it is noteworthy that in general, soldiers in Group 1 complain almost invariably of chest pain among other symptoms; (indeed, the men are apt to "stick it" until pain develops; then they become alarmed and report sick). Patients of Group 2 rarely complain of chest pain, but suffer more from exhaustion and weakness; they are "done up," to use their own expression. One case may be cited belonging to Group 2 which illustrates that an acute infection may be the cause of the irritable heart, that these symptoms may then disappear and leave simply exhaustion. The patient referred to broke down after prolonged service and trench fever with breathlessness which disappeared after a fortnight, leaving him with weakness, exhaustion and nervousness, but no dyspnea or pain. The post-infectious cases of "irritable heart" are more apt to prevent exhaustion symptoms and only exceptionally pectoral pain.

There is perhaps a certain parallelism between these two groups of "irritable heart," and cases of war neuroses. If we understood Captain Rivers correctly, certain cases of shell shock result in repression neurosis, the *anxiety* neurosis, while those resulting

2. In the British Army "constitutional" means merely "pre-enlistment"; a condition is termed constitutional if it existed before enlistment.

3. Martius: Kong. f. Inn. Med., 1899, 3, 41.

4. Bass, M. H., and Wessler, H.: Heart Size and Heart Function in Children Showing Orthostatic Albuminuria: An Orthodiagraphic Study, Arch. Int. Med., April, 1913, pp. 403-417. This paper gives the references to the literature on the subject.

5. We examined thirty unselected cases of "irritable heart" and found one with orthostatic albuminuria. Orthostatic albuminuria usually disappears at puberty, but may remain in adult life. We have observed Chvostek's sign repeatedly among soldiers suffering from irritable heart.

from exhaustion or infection manifest themselves as *exhaustion* neurosis (neurasthenia). Similarly in a general way, among patients with irritable heart there are those belonging to the constitutional group, who suffer from chest pain, etc., and those who belong to the exhaustion or the postinfectious group who have fatigue symptoms, but rarely much pain.

SUMMARY

As stated at the outset, we do not know the fundamental pathology of the syndrome known as the "irritable heart" of soldiers. It is almost certainly not a clinical entity. In general, there are two large groups of cases whether investigated from the standpoint of neuropsychic factors in the family and previous history, or from that of preenlistment and constitutional symptoms. In half the cases one observes, there is a positive family and previous history of factors considered predisposing to psychoneuroses, and in almost 70 per cent. of these there is a history of constitutional asthenia. It is this particular group (1) that inclines one to the view that an irritable weakness of the whole nervous system, including the innervation of the entire circulatory system, may account for the varying neuropsychosomatic symptoms.

There are all the remaining cases to be considered, however. It may well be that the resistance of individuals in Group 2 was perfectly normal, but that they were subjected to a strain or infection, sufficiently prolonged or intense to exhaust their reserve. The normal individuals, when they do break down, seem to present symptoms of exhaustion; the relatively inferior individuals show both excitation and exhaustion.

The burden to the Army of cases of irritable heart may be lightened by the early recognition of cases belonging to Group 1. As yet we do not know how many individuals having similar family and previous histories for neuropsychic factors (with or without preenlistment symptoms) give valuable military service and are not invalided. Until such statistics are available, it is practicable to recommend that only special boards be guided in the disposition of recruits by such anamnestic data.

In a type case of Group 1, the patient has a positive family and personal history for neuropsychic factors: in civil life followed a sedentary or light employment, tolerated about one year of foreign service, but that usually at light duty. He is apt to break down finally, not from a definite precipitating cause, but because he is fundamentally relatively inferior. He almost invariably complains of chest pain among his other symptoms.

In a type case of Group 2, the patient has a negative family and personal history, in civil life followed some occupation involving hard labor, stood about one and one-half years of foreign service, and that usually at full duty. He is more apt to give a history of a definite precipitating cause, such as prolonged service or acute infection, which invalided him. He complains more of exhaustion and weakness, and only rarely of chest pain.

Individuals of Group 1 who were invalided gave a history indicating that the value of their military service was almost negligible, while before breaking down many of those in Group 2 gave unquestionably valuable service.

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PROPHYLACTIC TREATMENT IN THE
PREVENTION OF VENEREAL
DISEASE

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During the past couple of decades, the trend of medicine has been steadily and progressively toward preventive rather than curative medicine. In no domain of medical science has this principle been more strongly exemplified than in the sanitary measures that are being utilized to protect the health of the soldier in the United States Army. For a long time the great bane of all armies has been the venereal problem, and the same applies to navies. The United States government, realizing the great necessity of curbing this evil, has adopted certain regulations which have been of the greatest service. These regulations are four in number:

1. General orders concerning venereal diseases, requiring men who expose themselves to the danger of contracting venereal diseases to report at once for prophylactic treatment on return to the camp; with trial by court martial for neglect of duty, for any soldier who fails to comply with such instructions, and loss of pay while absent on account of sickness.

2. Thorough physical inspection of all the enlisted men of each organization, twice in each month, by a medical officer accompanied by the company or detachment commander.

3. Abolition of alcohol from the Army.

4. Establishment of "vice zones" around military camps, forts and cantonments.

APPLICATION OF THE REGULATIONS

The object of this article is to show what can be obtained by the judicious application of the foregoing regulations in the individual regiment or smaller organization, which is the working unit in the Army. I know of no better way to illustrate the efficiency of these procedures than to cite my experiences as regimental surgeon in the Three Hundred and Fiftieth Field Artillery, Ninety-Second Division, National Army, located at Camp Dix, N. J.

The Ninety-Second Division is composed entirely of colored troops, and our regiment is made up of drafted men from the state of New Jersey. From the formation of this regiment, Nov. 8, 1917, to April 19, 1918, only nineteen cases of venereal disease have developed which did not exist prior to draft. Of these, twelve men did not apply for or receive prophylactic treatment. These men were all tried by Summary Court under General Order 45, and appropriately punished under military regulations. During this time 1,561 prophylactic treatments were given, and only seven men thus treated contracted venereal disease. Of the seven who contracted venereal disease notwithstanding prophylactic treatment, all were cases of over twenty-four hours' duration. Five were gonorrhoea, one chancroid, and one syphilis. This shows the efficiency of prophylactic treatment; it also demonstrates the value of early treatment whenever possible, as four out of the seven cases developed during the Christmas and New Year's vacations, when the men had four and one-half days' leave, and all four of these admitted relations on the first day of leave,