other cases investigated. The reaction was observed in ten cases, of whom six had symptoms of "irritable heart" and four had not.

In the heart cases at half to one minute after the injection a bright red blush appeared on the face and neck and spread to a greater or less extent over the trunk as an intense erythema, passing off in the course of four or five minutes and leaving a blotchy erythema on the shoulders that faded more slowly. This was accompanied by a feeling of heat in the head and to a less extent in all parts of the body. In some instances the patient's breathing deepened or quickened, and he spoke of a sensation of dizziness. In the four cases without symptoms of irritable heart no comparable reaction was observed. In two instances a slight flushing of the face was seen, one of the cases speaking of a sensation of heat in all parts of the body and the other of slight warmth of face, while in the remaining two no objective or subjective phenomena of any kind occurred.

The rise of pulse-rate and of systolic blood pressure were calculated as in Table I. The rise of pulse-rate varied from 0 to 60, and was almost consistently greater in the heart cases than in the controls, averaging 25.5 in the first group and 10 in the second. The rise of 60 in Case No. 18 was exceptionally high, and in this case the erythema was exceptionally intense and widespread. The patient was very nervous and changed colour readily under ordinary conditions of emotion and exertion.

The rise of blood pressure varied from 22 to 5 mm. of Hg, and no distinction between the two groups could be ascertained in this direction.

Erythema was absent in one of the six heart cases and but slight in a second, while it was absent in two of the four controls and slight in the other two. The sensation of heat was absent in two of the heart cases but marked in the others, while it was marked in one of the controls, slight in another, and absent in the remaining two. Respiratory hurry and a sense of dizziness was experienced by three of the six heart cases and by none of the controls.

The observations on the ten cases investigated have been tabulated in Table II, Cases 15-20 being cases of "irritable heart." It will be seen that the distinction between the two groups of cases is interfered with by Case 19. This patient was habitually nervous and excited, but immediately following the drug his breathing became easier and he became quite calm. The breathing remained quite easy during the remainder of the forty minutes during which he was under observation, but the nervousness returned ten minutes after the injection.

TABLE II.—Results of Injection of 0.02 gram of Apocodeine.
(Cases 15-20 "irritable heart"; 21-24 control.)

Case No.	Rise of Pulse-rate.	Rise of Systolic Blood Pressure in mm. of Hg.	Erythema.	Sensation of Heat.	Respiratory Discomfort.	Dizziness.
15	14	5	+	+	+	+
16	16	10	+	—	+	+
17	19	10	+	+	—	—
18	60	21	++	++	—	—
19	27	22	—	—	—	—
20	17	14	Sl.	+	+	+
21	12	8	—	—	—	—
22	16	14	Sl.	+	—	—
23	12	15	Sl.	Sl.	—	—
24	0	7	—	—	—	—

According to Dixon,³ apocodeine affects the ganglionic junctions of the involuntary nervous system, causing inhibition without preliminary stimulation. A rise in pulse-rate with small doses he considers due to inhibition of the vagus at its ganglionic junctions, while larger doses cause slowing of the heart and an intense redness of the skin from inhibition and paralysis of the sympathetic ganglionic junctions, and later of the nerve endings. The intense

erythema observed in the cases of irritable heart was quite out of proportion to the rise of pulse-rate, and it is difficult to explain it as a result of this rise, but it is reasonable to suppose that it resulted from inhibition of the sympathetic nervous system, causing dilatation of skin vessels. The feeling of warmth may be regarded as arising in the same way.

In dealing with a condition that appears to differ chiefly from that of healthy men in that the threshold for normal reactions is lower, it is difficult to obtain definite and indisputable proof of specific abnormalities, and conclusions not warranted by the methods of investigation must be avoided, but the differences in the reactions of the two groups of cases justify a conclusion that in some respects the sympathetic nervous system is more susceptible to depressing influences in cases of "irritable heart" than in healthy men.

Summary.

Cases of "irritable heart" and healthy subjects have been compared in respect to their reaction to adrenalin and apocodeine. In the case of each drug minute doses produced a greater action in the patients than in the controls. It is concluded, therefore, that the sympathetic system of nerve fibres, using the term in its physiological rather than in its anatomical sense, is relatively unstable in that it appears to be more susceptible to the stimulating and depressing influences respectively of these drugs.

REFERENCES.

¹ Gaskell: *The Involuntary Nervous System*. ² Gaskell: *Ibid.*; also work of Langley and others. ³ *Journal of Physiology*, 1904, xxx, 97.

THE PSYCHONEUROTIC FACTOR IN THE "IRRITABLE HEART" OF SOLDIERS.

BY

B. S. OPPENHEIMER, CAPTAIN M.R.C., U.S.A.,

AND

M. A. ROTHSCHILD, 1ST LIEUTENANT M.R.C., U.S.A.

(From the Military Heart Hospital, Colchester, England.)

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," "Neuro-circulatory asthenia," etc., are employed to describe the affection or the group of chief symptoms. The class 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 pathological condition can be found to which to ascribe the clinical symptoms. The underlying pathogenetic 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 relation 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 symptoms in many instances is so striking that one naturally considers the relation to the psychoneuroses, just as the circulatory phenomena among certain cases of war psychoneuroses must have led neurologists to wonder where the dividing line is to be drawn; in truth there is a borderland where the two dominions overlap. Some even believe that the "irritable heart" represents merely the cardiac difficulties of soldiers suffering from war neuroses. Again, it is evident that a certain number of cases of "irritable heart" have 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 are not congenital or even hereditary in character also occurs, particularly when dealing with soldiers who belong 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 analyse the detailed histories of one hundred 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 upon 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 Captain Julian M. Wolfsohn in his valuable paper¹ on the predisposing factors of war psychoneuroses were utilized, and also the statistics on one hundred wounded soldiers used by him as controls. We have taken the liberty of reprinting two of his tables, but have incorporated our observations on cases of "irritable heart" in a column between those he has published for the psychoneuroses and those for control soldiers. In both tables (I and II) 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 cases were invalided for "irritable heart" only, and the statistics obtained from these are placed in the middle column in both tables.

TABLE I.—Percentage of Characteristics named in Family History of Cases suffering from Neurosis, "Irritable Heart" of Soldiers, and Controls:

	Neurosis.	"Irritable Heart."	Controls (Wounded).
	Per cent.	Per cent.	Per cent.
Nervousness	64	45	15
Alcoholism (parents and grand-parents)	50	15	24
Teetotalers (parents and grand-parents)	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)	5	15	4
Stigmata	10	17	0
Positive history for one or several of above	74	56	38

* Figure incomplete.

A positive family history (Table I) 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 cent. among the controls; in regard to insanity and epilepsy there are 23 per cent. and 15 per cent. respectively in the families of cases of "irritable heart," and none among the controls.

Personal History.

In Table II the contrast between cases of "irritable heart" and the controls is still greater. The percentage of cases with a positive personal history of psychoneuroses is 51 among cases of "irritable heart," 12 among the controls, and of those with positive family and personal history there are 46 per cent. among the former group and but 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, the prevalence of previous nervousness, of a history of epilepsy or fits, of previous breakdown, 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; this latter fact may account for the low percentage

TABLE II.—Percentages of Characteristics named in the Personal History of Cases of Neuroses, of "Irritable Heart" of Soldiers, and of Controls (that is, Wounded).

	Neurosis.	"Irritable Heart."	Controls (Wounded).
	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 valuable paper; in his figures, however, epilepsy only was considered, whereas we have also included "fits" which may or may not have been true epilepsy.

(18 per cent.) of married men in this group as compared with 28 per cent. among the controls and 42 per cent. among the psychoneurotics.

Of the 100 cases analysed, 61 gave a positive family or personal history for psychoneurotic factors. Of these, 46 gave a positive family and personal history—a group which we will call Group I to distinguish it from Group II, which consists of 39 cases with a negative family and personal history. As regards previous occupations in civil life, it is remarkable that cases in Group I followed largely sedentary and light occupations (10 sedentary, 27 light, and 9 heavy), whereas of those in Group II some did light, but more did heavy work (2 sedentary, 17 light, and 20 heavy). The average duration of foreign service proves less in the average in Group I than in Group II; thus the average foreign service of Group I is thirteen months, and of Group II nineteen months; but the real difference between the two types is seen in a comparison of the character of the military service rendered; only 4 out of 46 in Group I did full duty, as contrasted with 33 out of 39 in Group II.

Character of Service.

It is very evident, after detailed study of the cases, that the patients in Group I, from a military point of view, gave such a poor account of themselves as to make one doubt whether it was worth the time and expense devoted to them in training, etc. On the other hand, those in Group II certainly did at least the military duty of an average soldier.

The Causes of Invaliding.

The causes of invaliding were studied in all the 100 cases, and it is notable that among the cases in Group I there is frequently, in fact in 20 out of 46 cases, nothing definite; on the other hand, in Group II 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 difference 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 I cases and in only 12.8 per cent. of Group II.

By the rather vague term "constitutional" asthenia* is meant an inferiority or 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 more 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 dyspnoea 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 haemorrhagic, the exudative, the lymphatic or the spasmodic, and those having a dyscrasia or belonging to certain types such as the vagotonic, angiospastic, erethistic, feminine, eunochoid, 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; 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.

Juvenile or Developmental Vaso-neurotics.

From a study of the personal histories, it is believed that many cases of "irritable heart" of soldiers are the mature individuals who during their developmental period presented vaso-neurotic symptoms. Of the 46 cases in Group I, 32 cases (70 per cent.) showed symptoms of constitutional physical asthenia before the age of 17. Of these, 13 had symptoms as long as they could remember. Of the remaining 19, the age at which symptoms of constitutional weakness first manifested themselves ranged from 8 to 16, at an average of 11.8 years for those who could recall approximately their age when the symptom or symptoms appeared. (Two other patients dated 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 children² especially associated with orthostatic albuminuria.³ These symptoms usually arise in children at the school age, 8 to 14, and are "chiefly those referable to the cardiovascular system, namely, dyspnoea on exertion, palpitation, precordial pain, headache, fainting, hypersusceptibility to cold."

It seems highly probable to us, therefore, that the adult cases of "irritable heart" which give a previous history of similar symptoms at the prepuberty age, or as far back as they can recall, have been children who are then recognizable as suffering from "vaso-neuroses," "dilatative weakness," etc.

Difference in Symptomatology of the Two Groups.

In comparing the symptoms in the two groups of cases—that is, those cases with and those without psycho-neurotic factors in their family and personal histories—it is noteworthy that, in general, soldiers in Group I complain almost invariably of chest pain among their other symptoms—indeed, these patients are apt to "stick it" until pain develops, then they become alarmed and report sick. Patients of Group II 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 II 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 dyspnoea or pain. The post-infectious cases of "irritable heart" are more apt to present 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 understand Dr. Rivers correctly, certain cases of shell shock result in repression neuroses, the anxiety neuroses, while those resulting from exhaustion or infection manifest themselves as *exhaustion* neuroses (neurasthenia). Similarly, in a general way among cases of "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 post-infectious group, who have fatigue symptoms, but rarely much pain.

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THE CHEMOTHERAPEUTIC TREATMENT OF GONORRHOEA.

BY

J. E. R. McDONAGH, F.R.C.S.

In two previous articles¹ I have described the action and use of colloidal manganese in gonorrhoea, and shown that this drug was most efficacious in the acute stage. As every day lost before commencing treatment is important, and as there is some delay after injecting manganese before its maximum oxidizing power is reached, it occurred to me to precede manganese by a metal, which would act instantaneously by dissociating certain hydrogen and hydroxyl groups in the serum. For this purpose I used a colloidal preparation of palladium, which is now known as "pallamine."* Palladium has the action of liberating the hydroxyl group (OH) from H.OH and temporarily fixing the hydrogen group (H). The moment the discharge appears 0.5 c.cm. pallamine should be injected intramuscularly, and the same dose repeated two or three days later. In some cases a third injection may be given, but no more than three, because the disease is sure to be aggravated. This aggravation is probably due to the liberation of the temporarily adsorbed hydrogen, which increases the "acidity" of the serum or depresses the important hydroxyl (OH) ion concentration. Irrigations are carried on in the usual way, but the moment the discharge ceases to be purulent, zinc permanganate or zinc sulphate 1 in 10,000 should take the place of potassium permanganate.

Patients get well quicker on a milk than on an ordinary diet, and at present I am prescribing potassium nitrate or methylene blue internally, on the theory that the liberated hydrogen can be used by reducing the former to a nitrite and the latter to its leuco-base, two products less innocuous than hydrogen. When potassium nitrate is being taken sodium chloride should be eliminated from the diet as far as possible.

As to whether these two drugs really aid the cure I am not able to say, as to make sure would necessitate experiments carried over several months. If the case is not well by the sixth day, 0.5 c.cm. colloidal manganese should be injected intramuscularly, and repeated every second or third day until no sign of the disease is left. As a rule one to three injections are necessary. It is unwise to exceed the dose of pallamine above given, except in cases of recurrent purulent urethritis when other methods employed to stop the discharge have proved unavailing. In such a case 1 c.cm. can be injected with benefit. The injection of manganese at the same time as pallamine has not given good results, but injecting them alternately has proved efficacious, though it is not so good as injecting pallamine first and colloidal manganese afterwards. After the first injection of pallamine the discharge becomes thinner, although it may not diminish very much in quantity.

* In the British army "constitutional" is a term used on certain documents of the medical boards as an equivalent of the term "pre-enlistment"; a condition is termed constitutional if it existed before enlistment.

† We examined 30 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."

* Pallamine can be obtained at Crookes's Laboratories, 50, Elgin Crescent, W.11.