It will be seen that the staphylococcus failed to develop in the control sample. It is also of interest to notice that the sulphanilamide was relatively effective against *B. subtilis*, presumably preventing the development of spores as well as inhibiting the multiplication of vegetative forms.

Experiment 3

To three bottles of oxalated horse blood collected without any aseptic precautions was added sulphanilamide to give concentrations of 1:1,250, 1:2,500, 1:5,000. A fourth contained no sulphanilamide. The bottles were plated immediately after the addition of the sulphanilamide, were stored in the refrigerator, and plated at intervals. The results are given in Table III.

TABLE III

	Initial	8 Days	15 Days	21 Days	29 Days	35 Days	42 Days	49 Days
1:1,250...	10	72	300	250	12	26	20	45
1:2,500...	18	500	80	480	17	17	23	12
1:5,000...	19	124	500	368	95	480	1,600	Uncountable
Control....	120	800	1,150	Uncountable				

The contaminants were a mixture of various cocci and sporing bacilli as in Experiment 1. This experiment is perhaps the most informative of the series, since it approximates most closely to natural conditions. There are some anomalous counts in this table, but in general it will be seen that the two higher concentrations of sulphanilamide have, after some initial increase, prevented the development of the contaminants. A true condition of bacteriostasis has been achieved.

Discussion

The observation that sulphanilamide in comparatively low concentrations exerts a preservative effect in blood stored at refrigerator temperatures is confirmed. Novak recommends the addition of 20 mg. of sulphanilamide to 100 c.cm. of blood. This may be expressed as 1:5,000, a concentration which in one of the experiments reported here did not prove adequate. The use of higher concentrations, up to, say, 1:1,000, would seem to offer a solution of the problem of storing blood in the refrigerator, provided the initial contamination is very small, as it should be if adequate precautions are taken in drawing blood. Where complete sterility is achieved there is obviously no need for any addition to the blood, but examinations of many specimens of stored transfusion blood and experiences with horse blood have shown that this is a rare condition; there are usually a very few organisms present which do not reveal themselves until the blood has been in the refrigerator for some days or weeks. Then they begin to multiply, and the blood is lost. It is to guard against this wastage and possible danger that the addition of sulphanilamide is suggested.

Novak, referring to his recommended concentration of 1:5,000 for storing transfusion blood, estimates that on transfusion of 500 c.cm. of blood the amount of sulphanilamide introduced would be 0.1 gramme, which he considers an extremely small dose. He adds: "Since the drug is readily absorbed from the blood by the tissues and since it is likewise rapidly excreted it is doubtful that any detectable elevation of blood sulphanilamide level will result even when multiple transfusions are administered." Colebrook and Purdie (1937) have shown that a 0.8% solution can be administered by intravenous drip without any ill effects. The only question, therefore, would seem to be whether there is any objection to giving small doses of sulphanilamide to patients who need blood only.

The sulphanilamide must be added to the blood in concentrated sterile solution. The powder is not readily

soluble in water, and the most convenient method is to dissolve the requisite weight with heat in fifty times its weight of water and boil in a beaker for twenty minutes. The volume will then be reduced to about one-half the original quantity. This solution must be added to the blood while still warm, before the sulphanilamide begins to crystallize out. Sulphanilamide is stable to heat, and solutions may be autoclaved for five minutes. The simple method of boiling in a beaker as described is, however, quite adequate.

Summary

Sulphanilamide in concentrations of 1:1,000 to 1:5,000 is effective as a preservative in blood stored in the refrigerator at 2° C.

The possibility of using the method to assist in the preservation of stored blood for transfusion purposes is discussed.

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THE WAR AS AN AETIOLOGICAL FACTOR IN PSYCHIATRIC CONDITIONS

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Among many other changes which the war will bring to the medical profession will be an increase of bureaucratic work: war injuries require not only treatment but also administrative measures, and the allotment of the expenses incurred will be based in many instances on the "attributability" to war injury. Many practitioners will be called on to express their expert opinion and to answer questionnaires which will influence decisions regarding this thorny problem. The first condition necessary for the answering of such questions is obviously knowledge of the regulations on which decisions are based. Knowing, for instance, that "war injury" in respect of civilians means physical injury, the practitioner who is asked for advice or a certificate need not waste much time in discussing the prospect of a claim based on damage by fear, anxiety, or mental shock. When official certificates are required the forms to be filled in will usually quote the regulations concerned or will contain them implicitly in the questions.

The main difficulties encountered by medical experts are the incomplete aetiological knowledge in many conditions and the frequent incompatibility of medical and administrative (legal) conceptions. In no other branch of medicine are these difficulties so apparent as they are in psychiatry, where classification of illness is still so ill defined, where hardly any condition is regarded as due to one simple cause, and where prognosis and influence on earning capacity are so uncertain.

As it is to be expected that a great many cases to be judged will have a psychiatric aspect, it seems worth while to review the more common psychiatric conditions from this medico-administrative angle, not presuming to judge the final attributability, which depends on many factors and will ultimately be the province of experts, but to help doctors to answer questions in as useful a way as possible. This survey will mainly be an application of the aetiology as outlined for the various conditions in the chapter on medical psychology by D. Curran and one of us (E. G.) in Conybeare's *Textbook of Medicine*.

The questions put to the practitioner vary in their formulation, but they are bound to contain the following points: (1) What is the cause of the disability? (2) If it originated during service, was the origin determined by the conditions of the service? (3) Was the progress of the disability hastened by service conditions though not determined by them? (4) Has the effect of service conditions passed away, and, if not, when can such effect be expected to have disappeared?

An attempt will be made to answer these questions in reference to various mental illnesses.

Schizophrenia

1. Schizophrenia is a hereditary illness. The way in which it is transmitted is not exactly known; at any rate, one recessive gene—possibly several—takes part in the transmission. For that reason it is often difficult, sometimes impossible, to trace the ancestors in question. This, however, is no argument against the hereditary basis of the individual case.

2. We know, however, that the "penetrative power" of the gene or genes under consideration is not 100%. In other words, additional causative factors take part in the manifestations of the illness. Thus in an outbreak of schizophrenia during the war the question of specific service conditions determining the origin will have to be carefully considered. Severe injury to the head, particularly to the brain, is acceptable as a precipitating factor if the psychosis starts immediately after the injury or if there is a continuity of the symptoms from the injury to the outbreak. Typical, though rare, is the sequence: injury—unconsciousness—delirious state—schizophrenic symptoms in a delirious setting—pure schizophrenia (that is, without clouding of consciousness). In case of doubt whether the delirious features have disappeared, one will obviously regard the case as an organic psychosis solely caused by the injury. Severe bodily illness starting off the same sequence of events will equally be regarded as the determining factor.

The psychological conditions of service in the forces in general can hardly be regarded as determining the origin of a schizophrenic illness. In the extremely rare instances, however, in which an acute psychological shock produces shock psychosis and this merges into a schizophrenic illness the same rules will apply as to physiogenic psychosis followed by schizophrenic pictures.

3. Under-nourishment, exhaustion, general infections—in short, all conditions which lower the bodily resistance—tend to hasten the progress of a schizophrenic illness. Psychological strain may act in the same way.

4. The more acute the schizophrenic illness and the greater the extent to which exogenic factors are operative in the origin, the better its prognosis. There is therefore a fair chance of cases precipitated by service conditions improving or recovering. Any relapse, unless specific precipitating factors can be found, is due to the nature of the disease. If judged in retrospect the end of the effect of service conditions can be assumed at the time of the optimum improvement; in prospect all factors have to be taken into account to determine the progress of a schizophrenic illness—heredity, pre-psychotic personality, type of illness, and weight of exogenous factors. Considering that only cases to which exogenous factors are largely contributory come under this heading, the duration of an acute attack may be estimated as between six and eighteen months.

Manic-depressive States

1. Depressions are generally caused by the co-operation of constitutional (endogenous) and environmental (exogenous) factors. The weight of either causative com-

ponent varies from case to case. For the purpose of discussing question No. 2 endogenous depression (melancholia) and reactive (exogenous) depression may be distinguished. It should, however, be borne in mind that both aspects, and their relative importance, must be considered in each individual case. The discussion of endogenous depressions (melancholia) applies, *mutatis mutandis*, to manic states as well.

2. Melancholia immediately following serious concussion or brain injury can be regarded as determined in its origin by the injury, in spite of evidence of heredity, previous manic-depressive phases, and the typical clinical picture of the "endogenous" type (retardation, self-reproach). The spontaneous recurrence of phases is quite unpredictable; on the other hand, precipitation of manic-depressive phases by apoplectic strokes is so typical and common that statistics used as argument against this assumption do not carry much weight. Some infectious illnesses, particularly epidemic influenza, are apt to precipitate depressive attacks of the endogenous kind: given the temporal connexion, such attacks will be considered as determined by service conditions if and when the infectious illness is so regarded. Psychological causes may precipitate the outbreak of a melancholic state. In such cases the psychological cause is not reflected in the clinical picture. Only experiences of considerable acuity and severity are capable of such precipitating effect, and, assuming they are due to service conditions or circumstances, they will have to be assessed in the light of the patient's personality and background before they can be said to determine the origin of the condition.

3. In cases in which the weight of circumstances seems less one may still consider that they hasten the progress of the disability. Reactive depressions, in contrast to the precipitated melancholic states, are in their symptomatology focused round the causative event. This, however, can be regarded as "determining the origin" only, as constitutional factors are always operative as well. Furthermore, the alleged service conditions or circumstances have to be compared with non-service ones in their significance in determining the origin of the state in question. Wartime conditions do not necessarily affect the soldier in their military aspect: previous and present difficulties in home and business, wrong decisions owing to the man's personal judgment of the war situation, may be conspicuous in determining his mental condition. There is also the paramount diagnostic decision whether and how far the present state is depressive (that is, determined by past or present psychological experiences), and how far it is hysteric (that is, caused and kept up by the subconscious tendency to use neurotic symptoms for individual purposes).

4. In endogenous depression the effect of specific conditions, if any, will have passed away by the end of the attack; in other words, any recurrences cannot be related to the factors operative in a previous attack, but have to be judged on their own merits. The more the precipitating factors are operative the better usually is the prognosis; six months is the normal rough estimate for the duration of a depressive attack. In reactive depressions the same considerations are valid, bearing in mind that on the average the duration is shorter. Reactive depressions lasting longer than a few months should be re-examined with the differential diagnosis from hysteria in mind.

Neuroses

1. The diagnosis "neurosis" involves grave responsibility, as it is of course difficult to exclude all organic conditions. Besides, the conception is badly defined; and many discrepancies of opinion about attributability may

be due to different definitions which different experts have in their minds. In this review functional disturbances—in other words, such as lack an anatomical substratum—are called neurosis only if there is positive evidence of their psychological causation. (Palpitations, breathlessness, diarrhoea, and similar “functional” disorder may be psychological symptoms, but they may also be due to post-infectious exhaustion, constitutional inferiority, or abnormal susceptibility). A neurosis is the expression or the result of a person's incapacity to adjust himself to or overcome a particular situation in life, very often with much mental conflict. The individuality of the person concerned, his mental and physical endowment, his character, his upbringing, his social and moral standards, have to be taken into account if one tries to assess what amount of stress, what particular conflict, can be regarded as responsible for his breakdown; the military factors have to be sifted out from all the factors concerned, and their relative importance estimated, if the causation of the disability is to be judged. “Constitution” as such cannot be regarded satisfactorily as causing a particular reaction, but it will often be possible, and necessary, to demonstrate the patient's predisposition in his previous reactions and to point it out as one causative factor.

2. Many neurotic reactions can be traced back in the man's pre-service life, and this means, *ipso facto*, that the answer to Question 2 is in the negative; particularly in the case of the obsessional, paranoid, and hypochondriacal reactions, a careful anamnesis will often lead to this decision. Anxiety and conversion neurosis will with more frequency actually begin during military service, and are more likely to be determined in their origin by service conditions in that case. It is necessary, however, to search for contributory non-service factors, especially if there is no evidence or not much evidence of the individual's exposure to a particular military stress.

3. To answer Question 3 it is of the utmost importance to make sure, by all available means of psychiatric examination, if and how far the origin is determined by the patient's more or less subconscious wishes, hopes, expectations, or intentions, not specific to the specific service conditions or circumstances, but rooted in his personality and his response to a general situation, such as war, interference with career, home life, etc.

4. It will have to be remembered that the continuation as well as the origin of a neurotic reaction may be due to subconscious tendencies, and also that reactions originally determined by other factors, psychological or physical, may be continued by such mechanisms. Recurrences are particularly suspect of being due to wishful tendencies, so are psychogenic disturbances which start after a considerable latent period.

Organic Reactions Types

This clinical group contains those psychiatric conditions in which the aetiology is known, and these will give the least difficulty. Psychoses after brain injury, of the organic type, are obviously caused by the injury; schizophrenic and emotional pictures have been discussed before. Organic reactions—that is, confusional states, delirium, etc.—with bodily illness, are caused by the latter; all further questions have therefore to be answered as in regard to the physical condition.

General paralysis raises some problems. It is known to be caused by syphilis, but practically nothing is known about factors determining the potential paralytic among syphilitics and those determining the onset of the cerebral disturbances after so long a latent period. It may there-

fore be asked, when paralysis starts during military service, whether these two points were possibly brought about by service conditions. There is no ground for assuming this in general; in the individual case this may be reconsidered when the patient is unusually young (below 30) or the incubation period is unusually short (under six years). In such instances, given conditions which are liable to reduce physical resistance, the assumption of part-determination in origin by military circumstances seems justified.

When the symptoms of general paralysis immediately follow cerebral injury, or the post-traumatic symptoms gradually blend with those of G.P.I., it is likely that the trauma has determined the actual onset at this particular time; if, however, the history reveals that vague or mild symptoms of G.P.I. have previously existed one will assume that military conditions have hastened the progress only and will fix the date when the effects of service conditions have passed away at a time when ordinarily the symptoms of an injury such as the patient has suffered would have disappeared.

Neuroses After Concussion.—The usual complaints following a serious concussion, such as headache, giddiness, intolerance of heat and alcohol, are functional, but not necessarily neurotic in the sense previously defined. They demand careful diagnosis because neurotic reactions after head injury generally show the same symptomatology. If such a neurosis is due to subconscious wishes and expectations rather than to the situation created by the injury it cannot be regarded as caused or determined in its origin by specific service conditions. On the other hand, one may be reluctant to deny any influence of the injury on the patient's condition, particularly in a transitional period, when a conscientious examiner will never be free from doubt as to whether a particular symptom is still a direct sequel of the concussion or is neurotic as defined before. In such instances one may be justified in assuming that the specific military circumstances hastened the development of the neurotic reactions. It will have to be remembered, however, that peacetime experience has shown that, in the absence of subconscious wishes for some gain through the illness, the post-concussional syndrome disappears within six months even after a severe concussion. It need not be emphasized that complications such as laceration of the brain or cerebrovascular disease must be excluded if “concussion” is diagnosed.

Neuroses after structural injury to the brain, laceration, haemorrhage, etc., present mainly a diagnostic problem with regard to reactions that, while appearing to be neurotic, may be caused fundamentally by a brain injury which brings about a change of the personality, rendering the patient unfit to cope with his previous problems. In neurosis after physical injury, other than cerebral, it has to be diagnosed, first, whether the physical damage is transient or permanent. The difficulty, similar to that in cases of concussion, lies in determining the time of recovery from the organic damage if the same or similar symptoms are being kept up by habit or psychological mechanisms; in the case of permanent damage, the importance of the loss as a neurosis-causing factor must be taken into account when reactions due to subconscious wishes, etc., are absent or are not regarded as caused by or as the outcome of specific service conditions.

It is hoped that these notes will help medical men to answer the questions in a more useful and less haphazard manner than seemed at first inevitable when confronted with them.

C. C. Ling, S. S. Taur, P. C. Heuer, and S. Y. Yang (*Chinese med. J.*, 1940, **57**, 11) performed 110 sternal punctures and an equal number of blood cultures on typhoid and paratyphoid patients. As compared with blood culture sternal puncture yields a distinctly higher percentage of positive results and, owing to the heavier infection in the bone marrow than in the blood culture, gives a more rapid and abundant growth.