these cases: (a) a defective "health conscience," and (b) a desire to be the centre of attention and to obtain more appreciation from the community than is earned by actual social and personal value. A past history of neurotic traits in childhood and difficulties in adjusting to school life, as well as an unsatisfactory work record with many changes of job and much time off for minor ailments, is commonly found among hysterical psychopaths. A large number of those who broke down had never, on account of ill-health, inefficiency, or distaste, held a job for long in civilian life.

Case 7.—A Newfoundlander enlisted with most of the eligible men in his village in January, 1940. His application was a half-hearted gesture which both he and his mother and, as he said, the whole village were astonished and dismayed to find successful. He had been known for years as a semi-invalid, taking after his father, who had twice been a patient in a mental hospital. He had given up one job after another because it was too strenuous, and his work record consisted of short periods in labouring and farming jobs, long-shore fishing, and fish-packing, interspersed by considerable intervals for rest and recuperation. On arrival in this country his humble position, the disappointing pay, and the lack of interest in his hypochondriacal complaints shown by his messmates and superiors in the training depot provoked an intense resentment against the authorities who passed him as physically fit to join up. After a few weeks he reported at the sick bay complaining of pain in the back, which he alleged had been brought on by rifle drill, and frequency of micturition. Full urinary investigation was carried out, including even an intravenous pyelogram and a radiograph of the spine and renal areas; no physical abnormality whatever was discovered. On admission to the Royal Naval Auxiliary Hospital his mental state can be briefly described as disgruntled petulance. He was completely taken up with his own symptoms and disappointments; he showed no interest in the war news or the other patients, worked mechanically in the occupational department, and went through the movements in the physical-training class in feeble apathy. He made no improvement at all until the decision to invalid and repatriate him was made.

Case 8.—An ordinary seaman aged 25 volunteered after a minor quarrel with his wife in April, 1940. In July he got his first draft, to a small submarine-chaser. For the whole of the two months he was with her she was in harbour fitting out, and only twice went to sea on trials. He was terrified by heavy air raids on the harbour, and one night, returning from leave, he collapsed in the street and was taken to hospital by the police. Shortly afterwards he was given sick leave; he went home, and overstayed his leave because he "could not face it again." He could not explain to his relatives his remaining at home, so he spent three days wandering round the city without food and then reported at the local naval depot. He was sent from there to our hospital. He looked and played the part of a hopeless and beaten man; his voice was rather ungeniously tremulous and tears were "not far away." He said he would rather go to gaol than return to duty and that he had been foolish not to plead conscientious objection. He showed none of the physical signs of anxiety, and slept well without drugs. He made no complaint of illness: "Just funk, I suppose; it's a rotten way to be, but whenever I think of going back my stomach turns over and over." He was of average intelligence and his work record in civil life had been fairly good, although he had always looked for jobs near his home, as he was very dependent upon the sympathy of his family. His personality was immature and egocentric, and his freedom from "symptoms" appeared to spring from a complete absence of struggle against his fears. He showed no sense of social responsibility and spent much of his time in hospital spreading discontent and resentment among the patients. In such a case as this the role of the doctor can only be to report his findings and to advise the executive authorities, with whom the final decision as to disposal must lie.

Case 7 is an example of defective "health conscience"; Case 8, of defective morale. A description of the latter case is given although it cannot be classified as hysterical, because here, as with the typical hysterical psychopath,

failure in the Service was an expression of the inadequacy of the total personality. Both cases illustrate a very serious problem of disposal. No medical treatment is of any use, and if these men were sent back to duty further psychopathic developments would be certain to occur and the lives of others might be endangered. Discharged to civilian life, they are a living invitation to seek escape through "neurosis" and a burden on the community. No satisfactory disposal is available; rejection at the recruiting station, or as early as possible during training, and direct drafting to a labour camp or rehabilitation centre, where suitable manual work is done under modified Service discipline, is urgently called for. Such centres would be valuable for many types of case besides those described here. Cases of deficient morale are uncommon, but the hysterical psychopath has often been met with among new recruits. Work and discipline are the best treatment for both, and when similar cases in the other Services are taken into account the problem is already large enough to justify prompt action. The enlistment, training, and hospital treatment of such men are an extravagance which, if it could be afforded in the past, must eventually be terminated by increasing financial stringency and demands for labour.

Summary

A brief description is given of some hysterical reactions and one case of defective morale which have been seen in the naval psychiatric service. An attempt is made to classify such reactions by means of an assessment of the symptoms in the setting in which they occur. This has been found to facilitate prognosis and appropriate disposal. The more general question is raised of the most useful and economical disposal of the psychopath in wartime.

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THE STABILITY OF TETANUS ANTITOXIN UNDER SUBOPTIMAL STORAGE CONDITIONS

BY

C. RUSSELL AMIES, M.D., D.T.M.&H.

(From the Serum Department, Lister Institute, Elstree)

Under normal conditions it is the usual practice to store sera and other immunological products at a temperature slightly above 0° C. At present, however, stocks of tetanus antitoxin and other sera have to be maintained at civilian first-aid posts and dispensaries where refrigerators are not available. Moreover, under war conditions it is not always possible to obtain cold-storage on ships carrying supplies of serum over-seas. It is therefore a matter of importance to know the rate at which antisera deteriorate under suboptimal storage conditions. Some information on this subject is already available, but the results obtained by earlier workers were derived from the study of sera of low titre, and it cannot be assumed that these apply to sera of high potency obtained by improved methods of immunization. It may therefore serve a useful purpose to record the results of some recent investigations of this problem.

The effect of temperature has been studied more completely on diphtheria antitoxin than on other antisera. Anderson (1910) and MacConkey (1913, 1917) reported that diphtheria antitoxin lost about 6% of its activity after being stored for a year in the refrigerator and about 10% per annum at 15° C. MacConkey (1913) also found that this antitoxin when stored at 36° C. lost half of its activity

in a year; while Glenny (1913) reported that antitoxin stored at 37° C. for four and a half years had lost 82% of its activity, and over 90% after seven years. Results with tetanus antitoxin concentrated by the Banzhaf-Gibson method, still employed in a modified form in some serum laboratories, indicate that this antitoxin has a similar heat-inactivation rate.

The material for the present study consisted of samples of unconcentrated antitoxin from individual horses or from large pools representing several bleedings from a group of twelve to twenty animals. All the samples contained 0.35% of cresol as a preservative. Some were kept in the laboratory under known conditions of temperature, while others were samples returned from first-aid posts and dispensaries. The conditions to which these latter had been subjected were not precisely known, but it was considered that the analysis of such random samples should give a fair indication of the effect of storage under the actual conditions of distribution. All the assays were carried out on guinea-pigs at the L + 1/5 level, the same test-toxin being used throughout.

Control Series: Storage in the Cold, at Room Temperature, and at 37° C.

Two horses, "Equa" and "Calidus," received the same course of immunization with tetanus toxoid and alum. Samples of the serum from each horse were stored (in rubber-capped 50-ml. bottles) in the cold room at 2° to 4° C., in a glass-fronted cupboard in one of the laboratories where the seasonal variation in temperature is between 10° and 25° C., and in an incubator maintained at 37° C. The samples remained under these conditions for one year, the potency of each being tested at frequent intervals during this period. For the sake of brevity, however, only the initial and final titres are given.

Potency of Serum in International Units

	Serum "Equa" stored at			Serum "Calidus" stored at		
	2°-4° C.	Room Temperature	37° C.	2°-4° C.	Room Temperature	37° C.
At start of experiment	8,000	8,000	8,000	1,350	1,350	1,350
After 1 year	8,000	7,250	4,200	1,300	1,250	750
Loss	Nil	9%	47%	4%	7%	44%

Tests on Returned Samples

A batch of unconcentrated tetanus antitoxin designated No. 423 was issued to various centres acting as medical stores for the A.R.P. services. From time to time bottles of this antitoxin were returned, and these were tested to determine the fall in potency which had occurred. Samples of this same batch of antitoxin were kept in the laboratory at room temperature (10° to 25° C.) and in the cold room, and these were also tested at intervals. The results may be summarized as follows:

		Percentage Loss
1. Batch No. 423, original test	1,300 I.U. ml.	—
2. Retested after 2 years at 2-4° C.	1,200	8
3. Retested after 2 years at room temperature	950	27
4. Samples returned after 2 years:		
9 samples from different centres	1,200	8
4	1,100	15
2	1,000	23

The greater loss found in the sample that was maintained in the laboratory at room temperature was probably due to the fact that the room was furnished with skylights and consequently became very warm during the summer.

The Effect of Freezing

It is commonly believed that the freezing of an antiserum results in a considerable fall in antibody titre. This is said to arise from the denaturation of the antibody

globulin by the phenol or cresol preservative, the effective concentration of which is considerably increased when the water separates out in the form of ice. Glenny, Pope, Waddington, and Wallace (1925) have shown that this phenomenon is responsible for the increased toxicity observed in toxin-antitoxin mixtures used for diphtheria prophylaxis. This, however, must be regarded as a special case, because carefully controlled experiments with a number of different antitoxins and anti-bacterial sera have failed to show any appreciable diminution of potency as the result of repeated freezing and thawing. Sealed glass ampoules very rarely break when their contents become frozen, since the air space in the neck of the ampoule allows the fluid to expand before it freezes. The rubber caps employed to seal multiple-dose containers may, however, be forced off if insufficient air space is provided. If these mechanical risks are avoided the contents of a bottle or ampoule which has been frozen may be used, with full confidence that no appreciable deterioration of the antibody has occurred.

Conclusion

Tetanus antitoxin in the form of natural horse serum loses less than 10% of its potency per annum when kept at room temperature under reasonably good conditions. Samples maintained at 37° C. for a year lost less than 50% of their activity. These results are in agreement with those obtained by other investigators. The freezing of serum containing 0.35% cresol has no appreciable effect upon the antibody.

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Clinical Memoranda

Peripheral Neuritis and Acute Rheumatism

The interest of the following case lies in the rarity of polyneuritis as a complication of acute rheumatism.

CASE HISTORY

A pale stout boy aged 10 was admitted to the rheumatism unit of Queen Mary's Hospital, Carshalton, on August 3, 1939. His former history was that he had been operated on at the end of May, 1939, for acute appendicitis. Shortly afterwards he complained of pain in one wrist. Joint pains spread and persisted, and he was transferred to Carshalton. There was no previous history of rheumatism.

On admission the child looked ill. The skin was unusually dry, and he had a malar flush. He was apyrexial; no signs of chorea and no rheumatic nodules were present. There was a collapsing pulse and clear evidence of mitral and aortic incompetence. It is of interest to note that no evidence of aortic disease was observed on July 20. During the next few days he became dyspnoeic, was very difficult with his food, and vomited occasionally. There was no cyanosis or oedema of the legs. On October 16 he began to be incontinent of faeces. Control was regained about a week later. On October 26 bilateral drop-foot was noted. All the muscles below the knees were wasted, and the tendon and plantar reflexes were absent. There was diminished sensibility below the knees, and the muscles were tender on pressure. At this time the boy became very awkward in the use of his hands. This suggested chorea, but marked muscular wasting was observed here also. The cerebrospinal fluid was examined on two occasions and was not abnormal.

The patient was treated with vitamin B₁ in the form of betaxan: 450 mg. was given over a period of seven weeks, and during that time he also received bemax. Salicylates