

gravest problems at present in infant welfare work. This shortage makes an increase in the number of public health nurses for preventive infant welfare work all the more an urgent necessity.

The National Organization for Public Health Nursing and the Committee on Nursing of the Council of National Defense are working in close cooperation with the Children's Year Campaign. The first named organization was appealed to by a conference of state child welfare chairmen to devise means of increasing the supply of nurses, and it has approved a plan for cooperating with states in which funds have been raised to employ a state supervisor of nurses either by the state department of health or by the state child welfare committee. The organization will help states to find suitable candidates for these positions, and through a traveling secretary will aid the state supervisor in developing emergency plans for training graduate nurses to do public health and infant welfare work. Already the child welfare committee of one state—Connecticut—has raised funds for this purpose; and others are making plans to do so.

In many of the states and in many cities much work for children as a war measure was being planned or carried on before the opening of the Children's Year Campaign. I wish there were space to tell of the splendid work that has been done. We hope that the general interest aroused by the campaign has aided the work already begun in those states and cities.

All these lines of endeavor in our country and abroad, this whole movement for the conservation of children in war time which we are discussing today, will grow as the years go on. Some day, when the war is over, this movement for the protection of children, like that for the control of venereal diseases, will, I think, be considered among the important lines of progress that have developed from the great war.

This article and those by Drs. L. R. DeBuys and Paul Armand-Delille are part of a symposium on "Child Welfare." The remaining papers, by Drs. J. P. Sedgwick and N. O. Pearce, and by Dr. W. P. Lucas, with the discussion, will appear next week.

Progress in Child Labor Legislation.—The *Child Labor Bulletin* for May has as a special feature the tentative draft of a bill to create a federal Department of Education, to provide for a Secretary of Education and to secure the appropriation of \$100,000,000 for federal aid to the states. Drafted by the National Education Association and the National Child Labor Committee in cooperation with educators throughout the country, the measure has for its aims the abolition of illiteracy, the improvement of rural schools, the Americanization of immigrants, and the promotion of physical education in the schools. The *Bulletin* also reviews the gains of child labor legislation during the past year, naming New York, Massachusetts, Wisconsin and Missouri as the banner states for progressive law-making. Within that period, Virginia and Mississippi have raised their educational standards, the former extending her law to apply to the whole state and the latter passing a local option educational bill applying to children between the ages of 7 and 16 years. In addition to the state survey made in Oklahoma by the National Child Labor Committee, three more state surveys are now under way in Michigan, North Carolina and Alabama, for the purpose of studying and reporting on all the conditions affecting child life. The *Bulletin* declares that these surveys have become a part of the campaign of education which accompanies the drafting of children's codes in the various states. The survey in Alabama is especially designed to furnish information for the legislature.

POTENCY OF ANTIMENINGOCOCCIC SERUM

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During the past year there has been much discussion of the therapeutic value of the antimeningococcic serum available in the American market, and of its potency as determined by laboratory tests. While the question of the potency of this agent is still under investigation and is far from being settled, it appears desirable to present this brief review of the situation as it exists at present.

Epidemics of cerebrospinal meningitis occurring in 1915 and 1916, in England and continental Europe, with the mobilization of troops, afforded an opportunity to extend the therapeutic use of antimeningococcic serum, and to analyze the results of treatment with better controls than is usual.

The conclusions reached as to the efficacy of the serum treatment were conflicting. Some workers had most unsatisfactory results, while others working with serum of similar origin were apparently enabled to reduce, to a conspicuous degree, the mortality of the disease.

The failures were in part attributed to the presence in the epidemic of strains of the infecting organisms that were resistant to the serum, or, in other words, that the different serologic responses of the meningococcus were to be considered in serum therapy.

It is pertinent, therefore, to present briefly a few facts in relation to the classification of the organisms isolated from the cerebrospinal fluids of persons suffering from epidemic meningitis.

GROUPS OF MENINGOCOCCI

The first definite separation in groups of the organisms under discussion was made by Dopter, who found that by serologic methods it was possible to differentiate two groups, the true meningococci and a group which he designated parameningococci.

It has been very generally accepted that this separation is valid, but certain workers consider this grouping not sufficiently specific. Further investigation along these lines has led to the recognition by one set of workers of the "irregular" group, which includes organisms that vary from the serologic types which form the basis of the two groups mentioned. Others, working with the cultures secured from cases of meningitis that occurred among troops in England, established four types designated I, II, III and IV, I and III corresponding in general to the regular meningococci and II and IV to the parameningococci.

The group classification of a particular organism is made either by means of agglutination or by means of agglutinin absorption, but the results of the two tests do not necessarily run parallel. The separation of cultures into groups probably is a matter of the greatest importance in connection with the testing of the therapeutic potency of the serum. It should be said that ordinarily there is some "cross immunity" shown

by members of the several groups; that is, while a culture falls into a certain group as indicated by reacting with high dilutions of the group type serum, it will react with relatively low dilutions of the antiserum prepared from type strains of other groups.

Unfortunately we are not yet in position to accept finally any grouping that has been proposed, but tentatively, and for the purpose of testing the serum, it seems wise to recognize the largest number of groups which seem to have a reasonably substantial basis.

Some workers, having accepted the classification of four groups, have produced therapeutic serums spe-

cially for the agglutination method, the determination of the opsonins or bacteriotropins, or the animal protection test. The English workers have used chiefly the agglutination method, the French prefer the complement fixation method, while according to the latest available literature, the Germans use both the complement fixation test and the determination of the bacteriotropin content of the serum.

Unfortunately there is no satisfactory evidence as to the correlation of the results of any of these methods of testing with the results of the therapeutic application of the serum to the disease in man.

PROTOCOL 1.—AGGLUTINATION TEST*

Strains	H. L. 98					H. L. 55					H. L. 56					H. L. 57					H. L. 106					H. L. 60				
	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800
Serum A	4	4	4	3	2	4	4	4	3	2	4	4	4	3	2	4	4	4	4	2	4	4	3	1	0	4	4	3	2	1
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	4	4	3	1	0	4	3	2	1	0	3	3	2	1	0	4	4	4	2	0	4	4	2	0	0	3	3	2	1	0
D	4	4	4	2	0	4	3	2	2	1	3	3	1	0	0	4	4	4	2	0	4	4	3	2	1	4	4	2	1	0
E	4	4	3	2	0	4	3	2	2	0	4	3	1	0	0	4	4	4	2	0	4	4	3	2	1	4	3	1	0	0
F	4	4	3	1	0	3	3	2	1	0	3	2	1	1	0	4	4	4	2	0	4	4	3	1	0	3	3	2	0	0
1	4	4	4	3	2	4	4	3	3	2	4	4	3	2	0	4	4	4	3	2	4	4	3	2	0	4	4	2	1	0
2	4	4	4	2	0	4	4	3	2	1	4	3	3	2	1	4	4	2	1	0	4	3	2	1	0	4	4	2	1	0
3	4	4	4	3	2	4	4	4	3	2	4	4	4	3	3	4	4	4	3	2	4	4	4	2	1	4	4	4	3	2

* In the protocols:

4 = complete agglutination with sedimentation and clear supernatant fluid.

3 = strong agglutination with sedimentation and faint clouding of the supernatant fluid.

2 = partial agglutination with slight sedimentation and cloudy supernatant fluid.

1 = slight agglutination with occasional flocculent clumps suspended or precipitated.

0 = no agglutination with homogeneous cloudy supernatant fluid and no flocculent precipitation.

Strong agglutination is credited as satisfactory.

4 = complete fixation or no hemolysis.

3 = strong fixation or a faint tinge to the supernatant fluid.

2 = definite fixation or slight hemolysis with a precipitate of blood cells.

1 = slight fixation or hemolysis with a slight residue of blood cells.

0 = no fixation or complete hemolysis.

Definite fixation is credited as satisfactory.

Lettered serums A, C, D, E, F represent those of producers not engaged in the interstate sale of this product. Numbered serums 1, 2, 3 represent different lots of the several producers who are engaged in the interstate sale of the product. The letter A uniformly refers to the check serum, the letter B to normal horse serum. The numbers refer to different serums in each protocol.

PROTOCOL 2.—AGGLUTINATION AND COMPLEMENT FIXATION TESTS

Agglutination Test

Strains	H. L. 98					H. L. 55					H. L. 56					H. L. 57					H. L. 106					H. L. 60				
	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800	1:50	1:100	1:200	1:400	1:800
Serum A	4	4	4	3	2	4	4	3	3	2	4	4	3	3	2	4	4	4	3	2	4	4	3	2	1	4	3	3	2	1
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	4	4	4	4	4	4	4	4	4	3	4	4	4	4	3	4	4	4	4	4	4	4	4	4	3	4	4	4	4	3

Complement Fixation Test

Groups	I					II					III					IV				
	H. L. 98					H. L. 55 and 56					H. L. 57 and 106					H. L. 60				
Dilutions	1:250	:500	:1000	:2000	:5000	1:250	:500	:1000	:2000	:5000	1:250	:500	:1000	:2000	:5000	1:250	:500	:1000	:2000	:5000
Serum A	4	4	3	2	0	4	4	3	3	1	4	4	3	1	0	4	4	3	1	0
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	4	4	4	3	3	4	4	4	3	3	4	4	4	3	1	4	4	4	4	3

cific against a single group of the organisms. In view of the delay attending the group classification of the organism that may be cultivated from a case, under ordinary conditions, and the uncertainty as to the validity of such classification, it is questionable whether the use of such narrowly specific serums is desirable. Probably it is better for the present to follow the generally adopted procedure of furnishing a polyvalent serum representative of all recognized groups of the organism.

METHODS OF TESTING

A number of methods of testing antimeningococcic serum have been employed, but none has won general acceptance. Thus American manufacturers have been accustomed to use the complement fixation method,

The animal protection test is rather attractive because it seems to produce conditions that are analogous to those under which the serum is used in the treatment of the disease; but our lack of knowledge of the mechanism of infection and protection in man, and of the virulence of cultures for laboratory animals, does not permit the adoption of this test without further study. In other words, it may be quite possible that the protective action of the serum in animals and the curative action in man do not run parallel. Therefore it seemed wise, tentatively, to adopt test tube experiments to determine the activity of the serum used in the United States. •

With the application of these serologic tests to the commercial serums, such wide variations in results were found that it seemed clear that the various

methods of applying these tests might with profit be replaced by those which would lead to the production of a more uniform preparation. Even with the use of the same test, the readings made by different persons on a given specimen varied considerably. It is scarcely an exaggeration to say that the various reagents used in the tests may be varied in concentration and quantity so as to show almost any result; thus we have a serum sent out for test purposes by a state department of health, which was stated to agglutinate in a dilution of at least 1:800 a given culture, but in our hands showed strong agglutination in but 1:100 with the same strain (Serum C, Protocol 1). These facts made it necessary to have all serums offered for

strains lend themselves to cultivation, and to the above mentioned reactions. After some experimentation it was finally decided that the tests should be made with one or more representative organisms of American origin of each of four groups determined by agglutinin absorption methods. It was found that these embraced representative cultures which would be classified in the three groups: the regular or normal meningococci, the parameningococci, and the irregular organisms.

The antigens for both agglutination and complement fixation tests were prepared essentially by the methods employed by Lieutenant-Colonel Gordon of the English Royal Army Medical Corps, and his associates. These were distributed to commercial manufacturers,

PROTOCOL 3.—AGGLUTINATION AND COMPLEMENT FIXATION TESTS

Agglutination Test

Strains	H. L. 98					H. L. 55					H. L. 56					H. L. 57					H. L. 106					H. L. 60				
Dilutions	1:50	100	200	400	800	1:50	100	200	400	800	1:50	100	200	400	800	1:50	100	200	400	800	1:50	100	200	400	800	1:50	100	200	400	800
Serum A	4	4	4	2	0	4	4	3	2	1	4	4	3	1	0	4	4	4	3	0	4	4	4	1	0	4	4	3	2	0
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	4	4	4	3	3	4	4	4	3	2	4	4	4	3	2	4	4	4	3	2	4	4	4	3	2	4	4	3	3	2
2	4	4	4	3	3	4	4	4	3	3	4	4	4	3	2	4	4	4	4	1	4	4	4	2	1	4	4	4	4	1

Complement Fixation Test

Groups	I					II					III					IV				
Strains	H. L. 98					H. L. 55 and 56					H. L. 57 and 106					H. L. 60				
Dilutions	1:250	500	1000	2000	5000	1:250	500	1000	2000	5000	1:250	500	1000	2000	5000	1:250	500	1000	2000	5000
Serum A	4	4	4	3	1	4	4	4	4	3	4	4	4	3	0	4	4	4	3	2
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	4	4	4	3	0	4	4	4	4	3	4	4	4	3	0	4	4	4	4	3
2	4	4	4	3	1	4	4	4	4	4	4	4	4	3	0	4	4	4	4	3

PROTOCOL 4.—LACK OF CORRELATION BETWEEN AGGLUTINATION AND COMPLEMENT FIXATION TESTS

Agglutination Test

Strains	H. L. 98					H. L. 55					H. L. 56					H. L. 57					H. L. 106					H. L. 60				
Dilutions	1:50	100	200	400	800	1:50	100	200	400	800	1:50	100	200	400	800	1:50	100	200	400	800	1:50	100	200	400	800	1:50	100	200	400	800
Serum A	4	4	4	3	2	4	4	3	2	2	4	4	3	3	2	4	4	4	4	3	4	4	3	2	1	4	4	3	3	2
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	4	4	3	3	2	4	4	3	3	2	4	4	4	3	2	4	4	4	2	1	4	4	3	2	1	4	3	3	2	1
2	4	4	4	4	3	4	4	3	2	1	4	4	3	3	1	4	4	4	3	1	4	4	3	2	0	4	4	3	2	0

Complement Fixation Test

Groups	I					II					III					IV				
Strains	H. L. 98					H. L. 55 and 56					H. L. 57 and 106					H. L. 60				
Dilutions	1:250	500	1000	2000	5000	1:250	500	1000	2000	5000	1:250	500	1000	2000	5000	1:250	500	1000	2000	5000
Serum A	4	4	3	0	0	4	4	3	2	0	4	3	2	0	0	4	3	2	0	0
B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	3	1	0	0	0	4	3	2	0	0	1	0	0	0	0	4	3	1	0	0
2	4	0	0	0	0	4	3	2	0	0	1	0	0	0	0	4	3	1	0	0

sale in interstate traffic tested in a central laboratory, and a recommendation to this effect was approved by the proper administrative authorities.

It was determined at the outset that it probably would be wise to accept as suitable for therapeutic purposes any serum which passed satisfactorily either by an agglutination or a complement fixation test. This seemed desirable as certain American and English workers favored the former, believing that it was an index of the value of the serum, while the latter was preferred by other Americans and by French workers.

The choice of the strains for the preparation of antigens to be used in these methods is complicated by the differences of opinion on the grouping of meningococci, as well as by the readiness with which the

together with detailed descriptions of the use of these reagents and the method of reading the results obtained. It was required that the manufacturers should test this serum using these or similarly prepared antigens, but that the serum should not be released until samples had been tested and passed at the Hygienic Laboratory.

All lots of serums have been tested in comparison with one (Serum A in the protocols) which gave moderately high titer, by the above-mentioned methods, and were regarded as satisfactory if they showed an agglutination or complement fixation titer slightly less than, equal to or greater than the check serum used (Protocols 2 and 3).

There have been examined since Dec. 1, 1917, 101 lots of serum, representing in each lot from four to

more than 100 liters. Of these, twenty-five failed to meet the requirements. Of the twenty-five, nine were produced in the early months of 1917 before the application of the present methods by the Hygienic Laboratory, and six were produced by an institution which does not have a license to engage in interstate traffic, but submitted samples for check testing. Hence, of the lots produced subsequent to this date, 12 per cent. of those submitted by producers offering serum for interstate sale failed to pass.

Comparisons made on eighty or more tests have shown that complement fixation titer usually has a correlation with agglutination titer. However, in individual lots there are distinct deviations from this correlation, as are shown in Protocol 4.

All American serums now on the market are polyvalent serums, and are made by immunizing the horses with from thirty to eighty different strains of meningococci, most of which have been isolated from individuals in this country.

Different lots of serums even from the same manufacturer may vary in titer on different strains of the same and different serologic groups, both in agglutination and complement fixation reactions.

Further, the same lot of serum may show different titers on different antigens made from the same strains, and even on the same antigen. The latter variation is, however, within a comparatively short range.

It has been determined that producers can obtain results comparable with those of the Hygienic Laboratory, when using the methods of testing specified by this institution.

CONCLUSIONS

By the tests, thus far devised, it is possible only to determine definitely that the serum examined is derived from a horse which has been immunized with strains of meningococci representative of the various serologic groups occurring in this country.

All antimeningococcic serums now offered for sale in interstate traffic are required to show this property before release from the plant of the manufacturer.

Feeble-mindedness Discussed at National Conference.—At the meeting of the National Conference on Social Work at Kansas City, May 16, George A. Hastings, executive secretary of the Committee on Mental Hygiene of the New York State Charities Aid Association, in discussing the pressing problem of feeble-mindedness said that while no census of these defectives had ever been taken in this country, there are probably 400,000 of them, or one for every 250 of the population. In New York State alone there are about 35,000, of whom only about one-sixth are in proper institutions. About 15,000 men have been rejected from the new National Army on account of nervous and mental disorders, and of these, one-third, or about 4,000, were rejected on account of feeble-mindedness. The proper place to detect feeble-mindedness, he said, is in the schools, and in dealing with the problem, five definite steps are necessary—identification, registration, instruction, supervision and segregation. A practical working program should include an awakened public knowledge and conscience concerning feeble-mindedness, a realization of state responsibility and a definite policy, on the part of the state, facilities in the community for the earlier discovery of cases, central registration, the establishment of institutions and schools for segregation and training, facilities in the courts for determining the mental condition of prisoners, establishment of more ungraded classes in public schools, a system of community supervision, and continued scientific study of the whole problem.

RATIONALE OF TREATMENT OF TOXIC AND INFECTION PSYCHOSES *

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The clinical interpretation of toxic and exhaustion psychoses rests, primarily, on psychobiologic principles. Of these principles, the modern physiologic concept that living things are transformers, rather than generators of matter and energy, gives us understanding of the term "mechanism" when applied in conservation of energy, on which concept treatment must be founded. The neural mechanisms with their baffling complexities, their problems of functioning, their clinical interpretations, etc., all require familiarity with the physiology of nervous reactions and afford the most inviting field for the research worker today, especially when in this great world's war, the clinical problems in this special field are overwhelming both in intricacy and in numbers.

We must, in our approach to the understanding of these problems, keep in mind the three essential points of Sherrington,¹ as regards nervous reactions, namely, first, the natural history of cell life; second, the conduction of the nervous impulse more recently studied by Lucas,² and third, the integrative nervous reactions, in virtue of which the nervous system unifies functional activities. It is not necessary to dwell on these fundamentals as essentials in the biologic foundation for a psychologic doctrine of the mental life of an individual.

As practitioners, we all recognize the essential value of these principles on which mental mechanisms have their foundation. It is said by Dunlap³ of Johns Hopkins University that psychologists who have recognized the value of physiology have confined their attention almost exclusively to neurology. This neurology has been of little use to the psychologist, except as a terminologic scheme. The pressing need in psychophysiology is the study of muscle and gland, and only through the study of these tissues in their structural and functional relation to nervous tissue, can neurology be made psychologically valuable. Sherrington,¹ concluding his valuable epoch-marking work, strongly emphasizes the biologic point of view, for the research student, the clinician and all others concerned, in giving explanation of neural mechanisms, as a whole, the purposes of which are dominance and advantage over the environment of the individual. He says:

The dominance over environment is a necessity and each individual must be adequately adjusted for this purpose.

To a certain extent, this adequacy is a native endowment, transmitted, but with each advancing conflict with evolution of environment, readjustments are necessary. Only by continual modification of its ancestral powers to suit the present, can it fulfill that which its destiny, if it is to succeed, requires

* Read before the Section on Nervous and Mental Diseases at the Sixty-Ninth Annual Session of the American Medical Association, Chicago, June, 1918.

1. Sherrington, Charles G.: *The Integrative Action of the Nervous System*, New Haven, Yale University Press, 1911.

2. Lucas, Keith: *The Conduction of the Nervous Impulse*, London, 1917.

3. Dunlap, Knight: *An Outline of Psychobiology*, Baltimore, Johns Hopkins University Press, 1914.