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no collecting station has been established, the railway commandant must carry out the evacuation.

As the sick and wounded can seldom be removed at once to the home country, hospital detachments allotted to General Headquarters of the Army organize in back areas general hospitals for serious cases and convalescent depots for slight cases. Sick and wounded who have recovered in the zone of operations, but are not fit to rejoin their units, are handed over to convalescent companies in back areas to be hardened for service by graduated exercises.

Replenishments of Medical Supplies.

R.M.O.’s indent, on the nearest medical company, field hospital or the A.D.M.S. as may be most convenient. Medical troops indent on the A.D.M.S. who has at his disposal medical store wagons and medical store depots. A medical store wagon can be sent to any required spot, such as a re-filling point, the site of which has been made known. In back areas medical store depots are organized for a group of higher formations.

During a Lull in Operations.

Regimental aid-post dugouts must be established as quickly as possible; large medical dugouts in which specialists can perform operations may be required when enemy fire prevents the evacuation of wounded. Routine measures for the evacuation of wounded must be elaborated; on field train-ways special trucks for the carriage of wounded are to be got ready. Premises for field hospitals are to be prepared. Sanitary measures, such as the supply of drinking water, the management of latrines, the destruction of vermin, the establishment of bathing places are to receive immediate attention.

Neutrality Sign.

All members of the medical units of the field army and all other medical personnel, regimental stretcher-bearers, leaders of the medical pack horses, drivers of regimental ambulance wagons, drivers and attendants of motor ambulances, grooms of regimental medical officers and the personnel of voluntary aid societies, wear on their left arm a white armblet stamped with the neutral sign of the Geneva Cross, that is a red cross on a white ground.

Current Literature.—Pathology.

Memorandum prepared by Dr. Copeman on recent work in connection with the Bacteriology of Scarlet Fever, and Immunization Methods for Treatment or Prevention (Ministry of Health).—During my recent official visit to New York I was afforded opportunity of investigating work in progress on the bacteriology of scarlet fever, on methods of immunization, and on the specific treatment of individuals who have already contracted the disease. Work in these directions is now being
carried out at the Willard Parker Hospital on a considerable scale by Dr. Abraham Zingher, Assistant Director of the Public Health Department.

This work is largely based on what is known as the "Dick Test," so-called from its introducers, Drs. G. F. Dick and Gladys H. Dick, of Chicago—a test which exhibits analogies to the "Schick Test" for diphtheria.

Bacteriology.—In a series of recent papers the Dicks have set out the results of a lengthy study of the bacteriology of scarlet fever, in the course of which they confirm the earlier results of Klein, Tunnicliff, Bliss and Mervyn Gordon, that a hæmolytic streptococcus, long recognized as a micro-organism constantly present in the naso-pharyngeal cavities of all patients with scarlet fever, constitutes the probable etiological agent of the disease.

But considerable difficulty has been experienced in connexion with the work owing to the fact that it is impossible by the inoculation of guineapigs, rabbits, mice, or other laboratory animals to produce a disease bearing any definite resemblance to scarlet fever; consequently all recent experimental work on the subject has had necessarily to be carried out on human volunteers.

Examination of blood cultures also has failed to reveal any organism present constantly enough to indicate a causal relation, and the results of the subcutaneous inoculation of the volunteers with fresh blood serum and fresh whole blood from early cases of scarlet fever have been completely negative. This has also been the case as a result of experiments in the inoculation of volunteers in the throat, and subcutaneously with filtered throat mucus obtained from early cases of scarlet fever. As, however, these experiments might possibly have been invalidated owing to the individuals inoculated having previously suffered from an attack of scarlet fever, a further series of volunteers was obtained who had lived practically all their lives in the country, and concerning whom no history of attack by scarlet fever could be obtained. In this second series of human inoculations a typical case of scarlet fever was produced by swabbing on the tonsils and pharynx a pure culture of hæmolytic streptococcus isolated from a lesion on the finger of a nurse who acquired the disease while caring for a convalescent scarlet fever patient.

As, however, recent opinion has tended to the suggestion that a filterable virus might be concerned in the production of the disease, another group of volunteers was inoculated with the same culture after it had been passed through a Berkefeld V filter. These all remained well. After an interval of two weeks they were once more inoculated, this time with the unfiltered culture; forty-eight hours later one of them developed scarlet fever. As bearing on this point it may be mentioned that I learnt from Dr. Krumwiede, bacteriologist to the Public Health Bureau, that one of his assistants at the Research Laboratory recently contracted scarlet fever following the accidental swallowing of a culture of the hæmolytic streptococcus. From cultures of this streptococcus; of which there would appear to be two types, one of which is capable of fermenting mannite in culture, while the other does
not do so, the Dicks obtained a toxic filtrate from the condensation fluid of cultures of the organism on blood agar slants, the fluid being subsequently passed through a Berkefeld filter in order to obtain it free from organisms.

The "Dick Test."—This toxin, when suitably diluted, is now used for the purpose of the Dick test for determination as to the susceptibility of individuals to scarlet fever or the reverse; the test fluid being inoculated intradermally in precisely the same manner as the solution of diphtheria toxin in performance of the Schick test. The results following on the use of this test are also very similar to those observed in the case of the Schick test, except that the reactions appear more rapidly and subsequently fade more quickly. Dr. Zingher, who had kindly inoculated a number of children on the day previous to my visit to the Willard Parker Hospital, in order that I might see the results obtained, laid great stress on the fact that pseudo reactions are even more frequent than in the case of the Schick test, and that consequently a control inoculation on the opposite arm is of very special importance. The control test is carried out with a solution of the toxin which has been heated in a water-bath to boiling temperature for an hour, the toxin being less easily destroyed than in the case of the Schick toxin. A similar dose (0.2 cubic centimetre) of the toxin is employed as in the Schick test, and the results following on this use will be either (1) positive, (2) positive and pseudo, (3) negative, (4) negative and pseudo; the reddened area representing the positive result being of about the same area as is observed in a positive Schick test.

As bearing further on the specific effect of the toxin, it is found that when a patient, who has been inoculated intradermally, subsequently contracts scarlet fever, the area occupied by the previous positive reaction is marked as a pale area surrounded by the scarlet fever rash, which latter is specially intense in a narrow area immediately surrounding that previously occupied by the positive reaction.

The effect of the toxin can be completely neutralized by mixing with it blood serum obtained from a convalescent scarlet fever patient, or the serum of a horse which has been immunized with the toxin; furthermore, if serum from either of these sources be injected intradermally into the skin of a patient suffering from an early scarlet fever rash, a blanching of the rash over the area of the injection is at once produced. This is known as the Schultz-Charlton phenomenon.

Information afforded by the "Dick Test."—All patients coming into the Willard Parker Hospital, whether supposed to be suffering from scarlet fever or not, are now, as a regular matter of routine, inoculated with streptococcus toxin. Of the cases which definitely turn out to be scarlet fever, it is found that in the very early stage a positive Dick test may be obtained, whereas if the test be repeated about ten days later the result is usually negative. In a certain number of cases of mistaken diagnosis also a positive result will often be obtained, but again if, as not infrequently happens, a patient contracts scarlet fever after a stay of
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some days in hospital, a negative test will be obtained after a corresponding interval of time.

As regards the reaction likely to be obtained following on the Dick test among children not suffering at the time from scarlet fever, very similar results have been obtained to those well known in connection with the Schick test. Thus, in the earliest stage of life a child apparently obtains fleeting immunity from the mother, so that up to the age of three months at any rate the Dick test is likely to afford a negative result. At subsequent ages the relative proportion of positive and negative results, as in the case of the Schick test, will develop according to age, to social status, and as to whether the child is town or country bred. In the case of many hundreds of children from congested slum areas in New York, Dr. Zingher finds that the proportion of positive Dick tests is about 32 per cent., whereas in children from better class areas, or from country districts, the proportion of positive reactions may be as high as 88 per cent.

Treatment of Scarlet Fever.—Like the Dicks and other subsequent observers, Dr. Zingher finds that the course of the disease in those who have already contracted scarlet fever can be modified and curtailed by the inoculation of blood serum from a case convalescent from the disease, or by the simpler procedure of using for this purpose citrated whole blood to the extent of double the amount necessary in the case of convalescent serum. Arrangements have recently been made, however, for the immunization of horses with streptococcus toxin, the anti-toxin serum obtained from which has been found to act as well or better than convalescent serum, and which will have the advantage of being much more readily obtainable.

Immunization.—Some thousands of children in hospitals or at infant welfare centres in New York, who have been found to give a positive reaction to the Dick test, have now been inoculated intramuscularly with scarlatinal hemolytic streptococcus toxin. Again, as in the case of the Schick test, these inoculations have been three in number at weekly intervals. These, in the majority of instances, have not given rise to any serious reaction, locally or constitutionally. The amount employed for the purpose of these immunizing inoculations is based on the quantity of toxin used for the Dick test, children under twelve being injected with 100, 250 and 500 skin-test doses, while for persons over twelve years, 100, 250 and 500 skin-test doses have been employed, the toxin being so diluted that each cubic centimetre represents 500 skin-test doses, the initial dose therefore being 0·2 cubic centimetre.

In a small proportion of the inoculated persons constitutional symptoms, including a scarlatiniform rash, slight sore throat and elevation of temperature have been observed, these symptoms disappearing however in from thirty-six to forty-eight hours. In order to avoid the possibility of such reactions, Dr. Zingher and his colleagues are at present investigating the effects of using a toxin purified with formaldehyde, according to the
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Methods suggested by Glenny and Hopkins for the production of a toxoid from diphtheria toxin. Again, as in the case of the Schick work, it is important that the results of these inoculations, qua immunization, should be tested by the Dick method after an interval of three or four months from the last inoculation. Of 274 children recently retested in three institutions at an interval of from four to five weeks only after the last toxin injection, 167, or 61 per cent, showed they had become immune.

No child giving a negative Dick test on admission to hospital (the Willard Parker) has, thus far, contracted scarlet fever, even though bedded in the scarlet fever wards.


G. F. and G. H. Dick have produced scarlet fever in humans by swabbing the tonsils and pharynx of volunteers with an apparently pure culture of a hæmolytic streptococcus. At the same time, however, they do not conclude that all cases of scarlet fever are caused by the hæmolytic streptococcus. Later they found that filtrates of such cultures, when diluted and injected intracutaneously, caused a reaction similar to the Schick reaction in 41·6 per cent of persons with no history of scarlet fever. Patients convalescent from scarlet fever invariably gave a negative or very slightly positive reaction. If convalescent scarlet fever serum was mixed with the filtrate before injection, or given intramuscularly before the test was made, no reaction occurred.

Evidence is produced to show that scarlet fever may be caused by two types of hæmolytic streptococci—a mannite fermenter and a non-mannite fermenter.

Four cases are reported of persons with positive skin reactions who were injected intramuscularly with a larger dose of the filtrate from the culture of one of the hæmolytic streptococci. Within a few hours of injection all the patients developed a scarlatinâ rash, fever, nausea, etc., these symptoms disappeared after forty-eight hours and later the skin test was found to be negative. The incubation period of experimental scarlet fever was about forty-eight hours and the short interval between the injection and the onset of the symptoms described above suggests that the effect was produced by a soluble toxin rather than by a filterable virus.

H. J. B.

The Dick Test in Normal Persons and in Acute and Convalescent Scarlet Fever. By Abraham Zingher (Journ. Amer. Med. Assoc., 1924, vol. lxxxiii, p. 432).—This important paper is an account of the Dick test
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with an analysis of results in over 4,500 young people. An account is 
given of the preparation of the pure toxin from hæmolytic streptococcus. 
At present there is not a very satisfactory method of standardizing the 
toxin, the method in use being the comparison of skin reactions with a 
standard diluted toxin. The technique of the test closely follows the 
lines of the Schick test. The toxin, however, being more resistant to heat 
than diphtheric toxin, has to be heated at 100° C. for one hour before it 
can be used as a control. A positive reaction comes on more quickly, 
and fades more quickly than in the Schick.

A positive reaction indicates susceptibility and a negative immunity. So 
far scarlet fever has only developed in positive reactors. A persistent 
positive reaction during a case of clinical scarlet fever to convalescence may 
be explained by a mistaken diagnosis or the existence of other causative 
toxins and bacteria.

The infection is a combined toxic and bacterial one, but immunization 
is antitoxic only.

The age and social status susceptibility for scarlet fever follow fairly 
closely those observed for diphtheria.

Natural active immunity was developed in ninety-three per cent of 
convalescent scarlet fever cases.

Artificial active immunity has been produced satisfactorily by means of 
the ordinary toxin injected subcutaneously, but work is in progress with a 
modified toxin prepared on the lines suggested by Glenny and Hopkins for 
the production of toxoid from diphtheria toxin which promises to give 
better results.

H. J. B.

The Precipitin Diagnosis of Typhoid Fever. S. Costa, L. Boyer and 
L. Jaur (C. R. Soc. Biol., xc, No. 12, April 4, 1924, p. 865).—The precipitin 
reaction is used for medico-legal purposes, but hitherto has found very little 
application in the diagnosis of infectious diseases. The authors have 
undertaken its study from this aspect, commencing with typhoid fever.
The reagents used were:

(1) The patient's serum.

(2) A culture of typhoid bacillus in broth which had been kept at 37° C. 
for three weeks and filtered through a Chamberland L3 candle. The super-
position of layers of the two fluids in a test tube gave satisfactory results 
when undiluted serum was used, but not with diluted serum. The typhoid 
toxin was therefore mixed in equal parts with nutrient gelatine of neutral 
reaction, the mixture being effected by melting. The gelatine was allowed 
to solidify, and on the surface was placed one to two cubic centimetres of 
the serum to be tested. The tubes were kept at a temperature of 18° to 
22° C. for eighteen to twenty-four hours. In the case of a positive reaction, 
a whitish granular film forms at the junction of the serum and the 
gelatine. This film adheres to the gelatine, and the serum can be poured off 
without disturbing it. The sera of twenty cases, proved to be typhoid either
bacteriologically or serologically, were tested by this method, which gave positive results in every case with a dilution up to 1:5 and usually up to 1:10. The reaction attains its maximum about the third week, but is obtainable from the first few days, in one case from the fourth day and in three cases from the sixth day, while the agglutination reaction was still negative.

Further Notes on Modification of Diphtheria Toxin by Formaldehyde. By A. T. Glenny, B. E. Hopkins and C. G. Pope (Journ. of Pathology and Bacteriology, 1924, vol. xxvii, p. 261).—The amount of formaldehyde necessary to produce this modification depends upon the amino-nitrogen content of the toxin. That is, a toxin having a high Van Slyke value requires more formaldehyde to prevent a dermal reaction than a toxin having a low nitrogen content. Temperature and the length of exposure also influence the reaction. At temperatures from 30° to 39°C, the modification progressively increases. A toxin containing 0.4 per cent. formalin took nine days at 30°C before a negative intradermal reaction was obtained from undiluted material.

The addition of varying quantities of formalin to a toxin alters only very slightly its combining power with antitoxin, but the rate of the reaction is definitely reduced. As a result of modification of toxin many of the tests for combining power can no longer be made, and here Ramon's flocculation test becomes invaluable. There is evidence to show that there may be present in a diphtheria toxin much non-specific toxin, and that the larger doses of formalin required to modify such toxins may reduce the affinity of modified toxins for antitoxins. But by a process of precipitation of toxins by one to three per cent glacial acetic acid, toxins and even modified toxins may be purified and concentrated. And this modified concentrated toxin has a much greater antigenic value than toxin-antitoxin mixtures. Further, if an immunizing mixture of modified toxin and antitoxin be used it is found that the amount of antitoxin, within wide limits, does not affect the antigenic power. It has been found possible by means of a single injection of modified concentrated toxin, to produce Schick negative guinea-pigs in eleven days.

H. J. B.

Observations on the Agglutinins in Typhoid Fever. By F. M. Burnet (Brit. Journ. of Exper. Pathology, 1924, vol. v, p. 251).—The author examined a serum from a patient suffering from typhoid fever against an emulsion of B. typhosus grown in ammonium oxalate broth and also against a normal standard emulsion. The first emulsion was agglutinated into small compact granules, whilst the second was agglutinated into large loose flocculi. The author thinks that the oxalate broth produces a type of bacillus which corresponds to Arkwright's R-type, and that ordinary broth a type which corresponds to the S-type. These two types, inoculated into animals, resulted in the production of specific agglutinins, spoken of as R and S respectively. S-agglutinogen provokes almost equal
amounts of R and S-agglutinins, but practically only R-agglutinins are produced with an R type.

In nearly every case of typhoid fever both agglutinins may be demonstrated. Usually the R-agglutinins are in excess of the S. In the case of active immunization produced by means of prophylactic use of vaccines, however, the S-agglutinins predominate and only a trace of R-agglutinins can be found. This phenomenon may have some importance in the diagnosis of typhoid fever in inoculated subjects.

H. J. B.

Reviews.


This book is a comprehensive treatise on goitre by Professor F. de Quervain, of the University of Berne. It is not a large volume, containing only 247 pages, but its seventeen chapters deal with every aspect of the subject. It is a notable addition to the literature of the thyroid gland and its diseases.

The surgical anatomy and the physiology of the thyroid are first discussed, followed by causes of goitre, pathological anatomy of goitre, and the pathological physiology of the thyroid. Diagnosis, prophylaxis, and non-operative treatment each form separate chapters, and the operative treatment of goitre is then entered upon.

Post-operative treatment, prognosis, operation in relapse and in inflammatory conditions, are discussed, followed by chapters on malignant goitre, thyroid deficiency, hyperthyroidism and exophthalmic goitre, and combination of hypothyroidism with hyperthyroidism.

The volume is well translated and contains a bibliography. It is profusely illustrated. The elementary aspects of the subject are omitted, and Professor de Quervain's work, summarizing as it does the teaching of the Berne school, is a co-ordinated and compact treatise which deals thoroughly with the whole subject of goitre, as far as this subject is understood at the present day.

M. B. H. R.


In this handy little book there are nine chapters dealing respectively with the pineal, pituitary, suprarenal, thyroid, parathyroid, thymus and sexual glands; the pancreas and the hormones of the intestinal tract.