right base, and breath signs were very faint. The temperature ranged from 97° to 99°, the pulse rate was 90, and the respiration rate 20. On April 9th pus was aspirated from the right chest and a portion of rib was resected for an empyema. On the 12th and following days the empyema wound drained freely, and on the 15th the temperature was normal. On May 1st the temperature was still down, the wound was draining slightly, and the patient's general condition was good. Altogether she had 2 drachms of preparation X subcutaneously and 3½ by mouth. Of preparation Y she had approximately 24 minims daily for seventeen days.

CASE V.

The patient, a primipara aged 23, had a normal labour at her own home on March 4th, 1929. She was well until the third day, when her temperature rose to 104° F., after which it ranged from 99° to 103° F. until March 22nd, when she was admitted to hospital. On the 23rd her temperature was 103.6° F., and her pulse rate 128; preparation X, given by mouth, was vomited. On the 24th a swab from the cervix showed the presence of *Streptococcus haemolyticus* in pure culture, and *Streptococcus haemolyticus* was grown in a blood culture in twenty-four hours. Two minims of preparation Y were given hourly by mouth for twelve hours, and an arsenobillon course was started; she was very drowsy. On the 26th her condition was brighter; her temperature was 102°, and the pulse rate 100. On April 3rd a blood culture was sterile, but the temperature was still swinging from 98° to 103° F., and the pulse rate was 100; on the 11th the temperature ranged from 98° to 102° F., but on the 14th it came down to normal and administration of Y was discontinued. On the 24th the temperature and pulse were still normal, and the patient was discharged on the 27th. Preparation Y was given in 2-minim doses for twelve hours during twenty-nine days; the total amount being 1 oz. Arsenobillon was given intramuscularly in doses of 0.3 gram, three being given on the first day, two on the second, and one each on the third, fifth, and seventh days. The total quantity was 2.4 grams.

It is clear that, impressive as are the results described, they are too few in number to allow the deduction that this form of treatment is specific in its nature for septicæmia. They do, however, warrant the belief that the animal experiments pointed correctly to the hypothesis that vitamin A plays a part as an anti-infective agent to bacterial infection, and has the property of raising the resistance of the body to such infection. The fact, observed above, that the administration of these preparations does not produce an immediate beneficial effect, and that this only becomes obvious after a week to a fortnight, according to the severity of the case, from the beginning of treatment, suggests that the fulminating type of septicæmia, which proves fatal in a few days, may not benefit by this treatment in its present form. This view can only be tested, however, by further investigation. If vitamin A should ultimately prove, as the result of further tests, even to approach in efficacy the standard obtained in the present work, it is obviously of great value as a therapeutic agent. Nor is there reason to believe that this anti-infective action, if established clinically, would only be of importance in streptococcal infections, and it is most probable that the same increase in bodily resistance would be found in many other types of infection. We think it desirable that clinical trials should be made in other bacterial infections. It is probable that the dosage of vitamin A and the mode of administration we have used can be improved upon by further trial.

Finally, if vitamin A should prove to have anti-infective qualities of a curative nature, as this work suggests, it must also be of inestimable value in its prophylactic effect. Indeed, it is possibly essential for the natural defence of the body against infective agencies, and, if so, it is incumbent to see that the body under all conditions, but especially in times of special stress, as in pregnancy, should receive an adequate and large supply of this substance by the inclusion in the diet of natural foods which contain it. Such foods include egg-yolk, green vegetables, milk, butter, and cheese. Cod-liver oil also contains vitamin A in abundance.

Summary.

On the basis of animal experiments which indicated that vitamin A is an anti-infective agent, we have treated five cases of puerperal septicæmia from whose blood haemolytic streptococci were grown, with preparations rich in vitamin A. All made complete recoveries, thus indicating that vitamin A, when given therapeutically, can raise the

resistance of the human body against septic and infective micro-organisms.

The cases described were under the care of Mr. King, Mr. Chisholm, and Mr. Stacey, members of the honorary staff of the Jessop Hospital, Sheffield, and to them we wish to express our indebtedness. We wish also to thank Professor Miles Phillips for his interest in the work, and Miss Moore, the resident house-surgeon.

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APPARENT RECURRENCES OF SCARLET FEVER.

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THE difficulties which attend the diagnosis of mild types of scarlet fever can best be appreciated by those whose experience in this disease is greatest and who have been impressed with the need of maintaining very careful observation before arriving at a decision. The Dick test and the Schultz-Charlton reaction, though valuable, have not removed all diagnostic difficulties. A negative Dick reaction does not always exclude scarlet fever, nor when during the course of a disease the patient develops an immunity, as evidenced by failure to react to the Dick toxin, may it necessarily be assumed that he is convalescing from scarlet fever.

It is a well-established fact that a susceptible individual placed in a community which contains carriers of the diphtheria bacillus, or in which fairly frequent outbreaks of diphtheria occur, will develop immunity in a comparatively short time. May not, then, a susceptible person in an environment of scarlet fever acquire, through subinfective doses, a similar immunity? It is incorrect to assume that a person with a scarlatiniform erythema and a Dick-positive reaction who, in the course of two or three weeks among scarlet fever patients, fail to react to the Dick toxin is necessarily suffering from erythema due to the toxin of the scarlet fever streptococcus. Furthermore, it is usually in those cases where its help is most needed—cases, for example, with transient rashes—that the Schultz-Charlton reaction fails, though other signs present at the time and later developments may serve to indicate that the case was actually one of scarlet fever.

There are bound, therefore, to be many erythemata the nature of which cannot be established by the Schultz-Charlton reaction or a Dick test, and whose diagnosis must depend on an observation of the course of the disease over a fairly lengthy period. Valuable diagnostic aids are the occurrence of complications, such as albuminuria, cervical adenitis, arthritis, or otitis media, and a study of the appearance, order, and nature of the desquamative process. Even here, however, there are pitfalls. Many mild but undoubted attacks of scarlet fever, generally recognized only by their occurrence during an epidemic, are followed by little or no desquamation. On the other hand, there are many scarlatiniform erythemata which produce skin changes practically indistinguishable from those of true scarlatinal peeling.

DIAGNOSIS OF SCARLATINIFORM ERYTHEMATA.

The diagnosis of scarlatiniform erythemata prodromal to certain of the exanthemata will generally not cause difficulty for more than a day or two. These erythemata are generally followed by some other sign or symptom which helps to establish their nature. Similarly in the case of drug rashes the history, the disproportionate constitutional

disturbance, and the absence of enlarged tongue papillae, help to establish the diagnosis; moreover, these rashes are generally followed only by slight desquamation. The same points are of value in the investigation of erythematous suspected to be due to the action of certain food substances, additional help being sometimes afforded by the appearance of urticarial patches. The majority of enema and serum rashes may be diagnosed without difficulty. Perplexity is sometimes caused by the scarlatiniform rash, which may be seen on the second day of the rubella eruption, though the rubella which is marked enough to be mistaken for scarlet fever can, in the absence of other signs, usually be distinguished from it by the mild or absent throat signs and the appearance of the tongue. Later on the appearance of desquamation, which in rubella is never present on the palms and soles, and on the trunk is almost invariably of a branny or powdery nature, would usually clear up any difficulty.

The cases whose diagnosis may cause the greatest difficulty are those of recurrent scarlatiniform erythema. Associated with the erythema there may be slight pyrexia and a reddened throat; desquamation is usual, but is frequently of a branny type, beginning earlier and not lasting so long as the desquamation of scarlet fever. There may be a history of several similar attacks, and it is possible, therefore, that some of the cases of alleged recurrent scarlet fever recorded in the literature may have been of this type. Acute exfoliative dermatitis is similar, but the rapidity with which desquamation appears, and its coarse nature, are usually sufficient to differentiate this affection.

RECURRENT SCARLET FEVER.

Clinicians differ very much in their views as to the possibility of recurrence in scarlet fever. Goodall,¹ who has never seen more than two attacks in one person, doubts whether three or four infections ever occur. Foord Caiger has personally observed three genuine attacks. Rolleston² believes that recurrences may occur, and gives instances where competent observers have recorded third and fourth attacks. Everard³ cites the case of a woman in whom he observed what was supposed to have been her fifth attack of the disease; in this woman the first attack occurred when she was 3 years old, and Everard mentions that it was complicated by chicken-pox and measles, all three rashes being present at the same time. As, however, measles may be associated with a papillated tongue, and chicken-pox and measles with prodromal scarlatiniform rashes, it must, in the circumstances, have been difficult to establish the diagnosis of scarlet fever. In this patient the second infection occurred when she was 7 years old, and the third and fourth, which appeared after an interval of nine and ten years respectively, were complicated by rheumatism. The fifth attack was observed by Everard personally and appears to have been genuine scarlet fever, as the patient and her niece developed the disease on the same day, a week after they had been in contact with an established case. Fielding⁴ records a case of a blacksmith said to have had five attacks in twelve years, the first occurring during an epidemic. On each occasion the syndrome comprised sore throat, strawberry tongue, intense rash, fever, and complete desquamation.

In view of the above observations it is interesting to record the case of a young woman who, in February of this year, was admitted to the South-Western Fever Hospital with what was alleged to be a fifth attack of scarlet fever.

This patient was first admitted in October, 1913, when she was 13 years old. She had a very bright rash, severe throat symptoms, and submaxillary adenitis. Desquamation, which was profuse, began at the tips of the fingers. Three weeks after admission she developed faucial diptheria. She was in hospital for nine weeks, and I find from the case register that her case was diagnosed as one of scarlet fever.

In December, 1922, she was readmitted to a scarlet fever ward, and her case sheet records a general punctate erythema which appeared on the day of admission and was preceded by a sore throat, inflamed but clear fauces, and a furred tongue. The next day the rash was very intense, but confined principally to the trunk. The throat, though clear, was very congested, and the tongue was peeling at the tip and edge. There was no adenitis. Twenty-four hours later the erythema was unchanged, but the

tongue had almost finished peeling. Ten days after admission there was peeling of the chest, and, at the beginning of the fourth week, of the legs and feet. Desquamation appears to have finished at the end of the fourth week, when the patient was transferred to the convalescent home from which she was discharged as recovered two weeks later. The diagnosis was scarlet fever.

In August, 1926, the patient was admitted to the Grove Fever Hospital with an erythema confined to the trunk and legs. The Schultz-Charlton reaction was negative. The temperature was 100° F.; she had a sore throat, slight faucial injection, a furred tongue, and circumoral pallor. The next day the temperature was 102° F., but two days later the rash had faded, the tongue was clean, and the papillae were enlarged. Desquamation began at the end of a fortnight, and was general by the middle of the fourth week. There were no complications, and the patient was discharged at the end of seven weeks. The diagnosis was again scarlet fever.

The next attack, which appears to have been a mild one, occurred in December, 1927, and the patient was admitted to the Joyce Green Hospital. On the previous day she had suffered from headache and general pains, but made no complaint of sore throat. The rash appeared first on the neck, and when the patient was seen on admission she had a general punctate erythema, a coated tongue, a clean but injected throat, and a temperature of 99° F.; there was no adenitis. By the next day the rash had faded, and nothing else occurred worthy of note until about three weeks after admission, when desquamation appeared on the hands and feet. The patient was then transferred to the Southern Hospital. There were no complications, and she was discharged at the end of the fifth week—her case diagnosed as one of scarlet fever.

On February 23rd of this year she was again admitted to the South-Western Hospital. Two days previously she had had a slight rigor, followed on February 22nd by backache. On the morning of the 23rd she complained of headache and nausea, and a rash appeared on the neck which, on admission that evening, had developed into a general punctation, with a more discrete appearance on the face. The limbs were unaffected; glands in the posterior cervical fossa were palpable, but nits were present on the scalp. There was no sore throat, but the fauces were slightly injected; the temperature was only 99° F. On the following day the circumoral region was invaded; also the limbs. Here the rash appears to have been paler, though still of a punctate character. The tongue was coated, and the papillae at the tip were enlarged. The Schultz-Charlton reaction was negative. Five days later desquamation was noted on the neck, and twelve days after the patient's admission desquamation of the pinhole type was seen on the legs, with a coalescence into larger patches, and was followed the next day by peeling of the fingers. Desquamation rapidly assumed the character typical of scarlet fever, involving every part, with the exception of the terminal phalanges and the backs of the hands. The peeling on the hands was profuse and lasted for about three weeks; the toes and soles of the feet were not involved. There were no complications, and the patient was discharged after five weeks in hospital.

CONCLUSIONS.

There would appear to be no doubt as to the genuineness of the first attack, and in the second also the signs and symptoms present warranted the diagnosis of scarlet fever. There seems to be some slight doubt about the nature of the rash in the third attack, but the subsequent peeling conformed more to the scarlet fever type than to that of recurrent scarlatiniform erythema. The fourth attack was very mild, but though the rash was fleeting there was no doubt about its character. Most practitioners have seen cases of undoubted scarlet fever in which the rash, accompanied by a few symptoms and signs, has shown itself for just as brief a period. As for the final attack, few observers, seeing it for the first time after desquamation had started and watching its progress, would have failed to arrive at a diagnosis of scarlet fever.

The patient's history gives no reason to implicate thrugs or nemata in the causation of her attacks. In the intervals she never suffers from rashes of any description, nor does her skin ever show signs of dryness or of definite peeling. Her work is very light and insufficient to give rise to desquamation from the hands during prolonged periods of rest. Her previous illnesses include measles, chicken-pox, and whooping-cough. There are several young persons in the family who, it appears, have not suffered from scarlet fever.

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