ON SERUM REACTIONS.

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This record of the reactions seen in my patients consequent on the therapeutic use of sera is the result of reflection after reading Dr. J. A. Ryle's book "The Natural History of Disease."

The quality of the serum used falls into two periods, easily divided.

(a) England, Egypt and the Near East during the period 1923-1933.
(b) India during the period 1934-1938.

In the first period two of my patients developed anaphylaxis; serum sickness was not a common sequel. In the second period one developed anaphylaxis and very few patients have escaped a delayed serum reaction. I have not seen a death that could be attributed as directly due to serum administration.

The quantity of serum injected varied from 1 cubic centimetre to 380 cubic centimetres. The larger quantities have usually been given in the treatment of bacillary dysentery. The total quantity of serum given in doses of 100 cubic centimetres, usually intramuscular, being spaced over two or three days. In the delayed serum reactions seen in India, the intensity of the serum sickness was increased on each succeeding day after the incubation period. That is each succeeding injection produced its own reaction after the same incubation delay. The result was that the patient appeared to have a further attack of serum sickness on two or three succeeding days.

As a good deal of confusion exists as to the type of serum reactions that develop the tabulated list that follows is the division that I would make as a result of my personal experience. Other types of reaction outside that limited experience, must of course occur.

REATIONS.

A. Immediate.—(One half to twelve hours after injection): (1) Anaphylaxis. (2) Protein shock (consequent on intravenous administration of serum). (3) Cardiovascular distress, generalized urticaria and urticaria gigantea of the eyelids and lips. (4) Local edema at the site of injection (this edema may be extreme); delay of twenty-four hours. (5) Local erythema and edema around the site of the injection with lymphadenitis.
of the glands draining the area. (6) Irritation of the meninges consequent on intrathecal injection of serum. (7) A case combining the following features: (a) Anaphylaxis; (b) protein shock; (c) haematoporphyrinuria.

B. Delayed.—(Six to fourteen days; average eight to ten days): (1) Serum sickness in its various grades with cutaneous rashes: (a) Consequent on a single small prophylactic injection; (b) recurrent attacks of sickness consequent on repeated injections of serum over a short period. (2) Malaise, adenitis. (3) Malaise, hydrarthrosis. (4) Malaise, fever, itching, sense of constriction of the throat, urticaria and great swelling of the eyelids and lips. (5) Fever, arthralgia, generalized lymphadenitis; spleen palpable in two cases.

The collective symptoms and signs of serum sickness are malaise, pruritus, vomiting, fever, skin rashes and œdema, abdominal pain, diarrhoea, arthralgia, adenitis and albuminuria. Any combination of these symptoms may exist, and so the clinical picture may vary to a considerable degree in case to case. For instance, the skin signs may be intense itching without a rash, erythema, discrete papular urticaria to confluent urticaria, the colour of the papules ranging from pink to an intense red, or urticaria gigantea.

A reaction encountered consequent on the intramuscular injection of 40 cubic centimetres of antistreptococcal serum merits detailed consideration as the benefit consequent on the injection caused great discomfort to the patient. The benefit that resulted was from an unforeseen upset in the balance of the body fluids. An officer was admitted to my care three days after he had received a sword wound above his left wrist joint. His left arm was septic and very swollen. An operation involving free incision of the forearm was considered necessary. Antistreptococcal serum 40 cubic centimetres was given into the right vastus lateralis muscle. Half an hour later his right thigh commenced to swell and by next morning he was unable to move in bed. His right thigh was then swollen to three times the circumference of the left, and there was an effusion into his right knee-joint. The œdema of his left hand and forearm had completely disappeared. The septic sword cut remained unchanged and healed slowly. The effusion into the thigh muscles took about a week to subside. The effusion into the right knee took two weeks to absorb.

An analysis of the clinical syndromes detailed suggests that the following systems may be involved in serum reactions: (1) Cardio-vascular; (2) respiratory; (3) cutaneous; (4) alimentary; (5), lymphatic; (6) articular; (7) reticulo-endothelial.

The symptom of involvement of the cardio-vascular system that causes most discomfort to the patient is because he is aware that his heart action is embarrassed. The clinical signs vary from being unable to distinguish the pulse beat at the wrist, to the more usual rapid pulse
rate of over 100 beats per minute; in both instances there is a fall in blood-pressure.

The involvement of the respiratory system may be mechanical if oedema of the soft palate or larynx develops. The patients had a sense of constriction of the throat that had caused them great alarm. The shallow breathing and pale colour in cases of anaphylaxis is accepted as a sign of shock.

The cutaneous signs are considered to be due to damage to the walls of the capillary vessels in the skin permitting transudation of serum; this corresponds to the response seen after an injection of histamine into the skin.

Abdominal pain, vomiting or diarrhoea indicates that the alimentary canal has been upset in its normal functioning.

The disturbance in the lymphatic system is more complicated. When oedema occurs as an immediate response after the injection of serum, especially when the injection has been made into muscle tissue, it is probable that the lymph spaces and smaller lymphatic vessels are involved with the capillary blood-vessels in the transudation of fluid that takes place into the tissue spaces. In the delayed reaction the main response is seen in the lymph glands.

Arthralgia is fairly common in serum sickness. Effusion has several times taken place into the knee-joint in association with large injections of serum into the vastus lateralis muscle on the same side. In serum sickness the following joints have been involved, with or without effusion, in the following order of frequency, knee-joint, temporo-mandibular, shoulder and ankle.

On two occasions serum sickness, after the usual delay of a week, took the following form. There was no rash in either case. There was malaise, fever, general enlargement of the lymph glands all over the body and the spleen became palpable. Enlargement of the liver was not detected. These two cases are submitted as evidence of irritation of the reticulo-endothelial system.

As to prophylaxis against serum sickness, calcium lactate had been given as a routine after serum injections. It does not appear to prevent the reaction developing. Expense has prevented the use of proprietary calcium preparations. If conditions permitted "Tabloid" calcium gluconate with calciferol (Burroughs Wellcome and Co.), or salpern (Boots), are worth trial as I am satisfied that they may be absorbed from the alimentary canal in the cramps associated with pregnancy.

Liquor adrenalinæ hydrochloridi by subcutaneous injection gives great relief to the subjective symptom of embarrassed cardiac action. The adrenalin usually requires to be repeated in small doses, as advised by Sir Arthur Hurst in the treatment of asthma, to obtain anything more than
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temporary relief. I have on two occasions seen extensive urticaria completely clear up in less than a quarter of an hour after an injection of adrenalin. This is, however, an exceptional response to treatment. Calcium is of value during the attack. It has to be given by intramuscular injection as either calcium chloride 1 grain in distilled water 100 minims, or calcium-levulin (Glaxo), 10 cubic centimetres, or colloidal calcium with ostolin (Glaxo), 1 cubic centimetre. As to a local application for the irritation in the skin, lotio acidi carbolici (1-40) or calamine lotion made up with 1 per cent carbolic acid is used. So far I have not encountered toxic signs as a result of carbolic acid so employed.

REFERENCES.

SHORT WAVE THERAPY.

BY THE STAFF OF THE MASSAGE AND ELECTRO-THERAPY DEPARTMENT, ROYAL VICTORIA HOSPITAL, NETLEY.

(Continued from p. 52).

THERAPEUTICAL CONSIDERATIONS.

At this early stage a clearly defined field for short wave therapy cannot be expected. Every user is, in effect, doing research work. As more cases are treated by the individual and as additional knowledge from other sources becomes available, consolidation of results will enable empirical evidence to be discarded to an increasing degree and will set limits to the scope of this therapy.

Treatment with short wave therapy was introduced into the Royal Victoria Hospital, Netley, in May, 1938. It is perhaps as well to point out that there was no false enthusiasm; the apparatus had to justify its use on its merits, i.e., the ability to deal with conditions which did not react favourably to other forms of treatment. The medical personnel were, on the whole, definitely sceptical.

At the outset dramatic responses to treatment were obtained in some cases and this stimulated interest to such an extent that in a short time almost 50 per cent of cases sent for treatment by physical means were being treated with short wave therapy.

All writers on this subject are agreed that short wave therapy can be applied in acute inflammatory conditions, either specific or non-specific. This is possibly the greatest boon conferred by this form of treatment as the rapid subsidence of inflammatory changes which follows does not