

TREATMENT OF CHOLERA WITH PYROGEN-FREE SALINE

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THE word 'pyrogen' literally means a substance that gives rise to pyrexia or fever when parenterally introduced into the body.

Pyrogens are filterable thermostable products of the growth of certain strains of bacteria falling within the group X described by Jordan. The organisms are ubiquitous and infect any water that is not kept absolutely sterile. They grow rapidly in distilled water; large quantities of pyrogens can be formed in a day at room temperature, and ordinary autoclaving does not destroy them. Water can be freed from them by distillation, but droplets should not pass over during the process. Pyrogens are readily destroyed by the addition of an acid or alkali to the water and the subsequent application of heat. They are particulate, the size being between 1 and 50 millimicrons and they contain nitrogen. Carter (1930) has described a test for pyrogens in water by boiling in dilute sulphuric acid and potassium permanganate solution, and has thereby indicated a method of preparation of pyrogen-free distilled water. Others have given a method of freeing water from pyrogens by shaking with charcoal.

The reaction produced by the injection of pyrogens is essentially characterized by rigor, and by feeling of chill. These may occur within 15 minutes or may be delayed up to 18 hours. The reaction is followed by profuse sweating and fall of temperature. There may be nausea, vomiting, headache and albuminuria. Death has sometimes occurred.

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(ii) in diagnosing pituitary and ovarian hypofunction, and

(iii) in the treatment of sterility.

No satisfactory explanation is possible as to why it is so.

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 and Co., Bombay.

The use of saline made with pyrogen-free water for therapeutic purposes can be dated from 1937-38. Thomas and Ting (1938) used freshly distilled water for making saline for cholera cases and obtained no reaction. Knott and Leibel (1941), in their article 'Prevention of pyrexial reactions in intravenous therapy', indicated foreign protein as being the commonest cause of pyrexia. They found albuminoid ammonia present (from 0.005 to 0.025 per 100,000) in pyrogen-containing waters, and suggested 0.0002 per 100,000 as the safe limit.

Our experiments were done not to determine the nature of pyrogens but to see the effect of pyrogen-free hypertonic saline in cholera cases, as we found that in the Campbell Hospital, Calcutta, many cases treated with the hospital saline were getting severe rigor and pyrexia.

Preparation of pyrogen-free distilled water.—Distilled water was redistilled in an all-glass still in the presence of a few drops of strong sulphuric acid to make it faintly acid to litmus paper, and a few crystals of potassium permanganate were added to give it a faint pink colour during the whole process of distillation. The distillate was led through an adapter so that no drops could pass over into the receiver. The preparation of the receiver was important. It was made of Jena glass, 'Pyrex' or neutral, cleaned thoroughly with hot 10 per cent solution of potassium dichromate in 10 per cent sulphuric acid, washed with pyrogen-free distilled water and then autoclaved. The mouth of the receiver was covered with a clean wooden or cardboard disc with a central hole for the adapter to pass through. When sufficient pyrogen-free water was collected, it was measured in a clean sterilized cylinder and the required quantity of pure sodium chloride was added. The mouth of the receiver was either glass-stoppered or covered with a piece of clean, thick paper tied with a string round the neck, and the whole was immediately autoclaved. No rubber corks were used.

Administration of the saline.—Our apparatus consisted of a bottle in which two pieces of glass tubing were fitted through the rubber cork—one leading to the bottom of the bottle and attached by rubbing tubing to an intravenous needle or cannula at the distal end and the other fitted with a cotton plug for the entry of air only. The whole apparatus was sterilized in the autoclave. When it was used, a measured quantity of saline was poured into the bottle and a little was then blown out through the cannula. To ensure that the saline was running into the vein, a small U-tube, partly filled with a little sterile water, was fitted to the air entry tube. Bubbles of air aspirated through the U-tube indicated the rate of flow of the intravenous saline, which was regulated by raising or lowering the bottle. This device proved highly satisfactory for ready detection of the passage of saline. Rogers' flask can also be used after sterilization and washing with pyrogen-free water.

Pyrogen-free saline was used in 30 cases of clinically and bacteriologically proven cholera; freshly prepared distilled-water saline was used in 18 similar cases; and the hospital saline prepared in sterilized tap or distilled water was also used in 18 similar cases.

The results are given below :—

	Number of cases treated with pyrogen-free saline	Number of cases treated with freshly distilled water saline	Number of cases treated with hospital saline ordinarily prepared
1. Rigor only	3 (10%)	1 (5.5%)	5 (27.8%)
2. Both rigor and high temperature.	1 (3.3%)	3 (16.6%)	12 (66.6%)
3. No rigor, no rise of temperature.	14	10	0
4. Rise of rectal temperature only 1°F., highest limit being 104.4°F.	6	3	1
5. Fall of temperature more than 1°F., lowest limit being 98.2°F. and no rigor.	6	1, rigor +	0
	30	18	18

The above table shows that with pyrogen-free saline in only one case were there both rigor and high temperature and that (14 + 6), i.e., 20 cases out of 30, had neither rigor nor rise of rectal temperature. On the other hand, out of 18 cases treated with hospital saline, 12 had both rigor and high temperature and all had either rigor or temperature. Pyrogens had been largely eliminated in the saline prepared in freshly distilled water and hence only 3 cases had both rigor and temperature and 10 cases out of 18 had neither.

As a rule the hospital saline is not used in cases showing rectal temperature above 100°F. Iced rectal saline is used first to bring down the temperature and then intravenous saline is administered so as to minimize the risk of complications. Pyrogen-free saline, however, was used by us in 11 cases with a high rectal temperature, without any untoward effects.

The results are given in the following table :—

	Pyrogen-free saline
1. Rise of rectal temperature ..	0
2. No rise or fall of temperature and no rigor	6
3. Fall of temperature and no rigor	5
TOTAL ..	11 cases

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NYLON

By F. V. STONHAM

MAJOR, I.M.S.

NYLON is a synthetic textile produced by a process of polymerization from such unromantic raw materials as coal, water and air. It is a substance of remarkable strength, elasticity, and flexibility. It is almost completely waterproof, resistant to heat and unaffected by a large number of chemical substances. Various fine fabrics, stockings, etc., made from this substance were found to be extremely resistant to wear and rough treatment in the laundry, and fishing lines made from it were found to be capable of being stored in a wet condition for long periods without deterioration. Its properties suggested that it might be of value in surgery as a suture material, and it has now been placed on the market by the American firms, Davis and Geck, A. J. Deknatel and Son, Bauer and Black, and more recently I. C. I. (Plastics), Ltd., have manufactured it in England for surgical purposes.

Nylon has the following advantages :—

1. It is of great strength.
2. It is insoluble and able to take up minute quantities of moisture only.

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It will be seen that there was no rise of rectal temperature in any case. On the contrary, in about half the cases, the high rectal temperature came down giving comfort to the patients. Rigor was absent in all the eleven cases.

Summary

1. Pyrogen-free water is prepared by mixing water with a little sulphuric acid and potassium permanganate and then distilling the mixture in an all-glass still. Water is collected in a specially prepared receiver. The saline is prepared with this water and immediately sterilized, and can be stored.

2. The saline is given in cholera cases, with a suitable outfit, indicating its regular inflow.

3. The pyrogen-free saline gave rise to rigor or hyperpyrexia in only a small proportion (13.3 per cent) of cases, whereas the pyrogen-containing saline prepared with sterilized water produced the pyrogenic reactions in 94.4 per cent of cases.

4. Pyrogen-free saline can safely be administered in cases with a high rectal temperature.

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