THE MANAGEMENT OF EPIDEMIC SUMMER DIARRHOEA AND VOMITING, INCLUDING THE USE OF SALINE INJECTIONS.

BY

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THE outbreak of the epidemic summer diarrhoea and vomiting in the district surrounding this hospital shows signs of being more widespread and severe in character than usual. As the end of the epidemic is probably still distant, any figures of the numbers treated are inconclusive. But it may be said that at least one-third of the children seen in the out-patient department are sufferers, and amongst the casualty patients seen at night the occasional dog bite or swallowed halfpenny forms a welcome digression from the monotonous stream of diarrhoea and vomiting.

Between July 1st and August 18th 125 cases were admitted to the medical wards; this does not include those which at the time of writing occupied 54 of 80 medical cots in the hospital. Of the 125 admissions 50 have died and 75 have been discharged as cured—that is, with a cessation of symptoms and able to take a normal diet. A small proportion has been readmitted with recurrence of the illness; while of the 50 that died, 12 were moribund when brought to hospital, 3 dying within half an hour of their admission.

In a large proportion of cases the children were marasmic, and were bottle-fed; severe attacks in breast-fed babies have been wholly exceptional. In most condensed milk has been the staple article of diet since the early weeks of infancy; in a smaller proportion cow's milk and barley water. The reason given for bottle-feeding in nearly every case is that the mother's milk failed at the third or fourth week of lactation. The necessity to go out to work seems to offer an explanation of this, coupled in certain cases with real disinclination to suckle their infants. In several women who gave a history of mammary abscesses, together with an account of removal to hospital for operation, examination has failed to discover traces of any such procedure.

It is difficult not to believe that the barley water in itself is a sufficiently dangerous ingredient of the bottles to be responsible for a good deal of the trouble. It is made at infrequent intervals and according to strange recipes—"a couple of pints at a time"; "a handful of barley to a tumbler of water." Such a fluid, if allowed to stand through a hot day in dirty jugs, will effectually lower to zero the value of the cow's or condensed milk to which it may be added. The majority of cases have occurred in babies from 4 to 12 months old, and as a rule their weights are about half those of normal healthy breast-fed children.

Those recommended for admission are selected by the out-patient physicians and casualty officers from amongst the worst seen. A rough classification may be made into three groups:

1. Those in whom the attack has started a few hours previously, and in whom the frequency of the vomiting has alarmed the parents. There may or may not be a history of diarrhoea as well.
2. Those in whom the attack has lasted several days, with sometimes a remission and then a return with increased severity. In these milk in one form or another has been continued throughout, and both diarrhoea and vomiting are frequent.
3. Those who have still got worse though treated in the out-patient department where orders were given for a cessation of milk. In these diarrhoea is the most marked symptom.

In nearly all the condition is accompanied by pyrexia. Several have been seen in a condition strongly suggesting overdosage with opium—difficult to rouse, with slow, shallow breathing, faint irregular heart's action, and contracted pupils. A history of soothing powders has been obtained in a few.

For the most part the patients are undersized and wretchedly thin, rickets being common in the elder

children. The eyes are sunk in the orbit, have a staring expression when awake and remain only half closed in sleep. The fontanelle is depressed, the skin is dry, loose, and wrinkled, the abdomen is usually sunken, distension being very uncommon. There is a great loss of subcutaneous fat everywhere. In cases of recent and sudden onset there is marked restlessness, with frequent jerky movements of the head and arms. Head retraction has not been a common symptom. The tongue is very dry, and, with the palate, often covered with thrush. In those in whom the condition has lasted several days the babies are apathetic and hard to rouse for more than a few moments.

There is a tendency on the mother's part to exaggerate the frequency of the vomiting and diarrhoea. A reliable history is much easier to obtain when once admission has been secured and the parent's anxiety allayed, or, in many cases, when they have found relief from further responsibility.

The high mortality amongst the cases admitted does not at first sight suggest that any very satisfactory line of treatment has been adopted. In many, however, the attack has supervened upon a course of such gross misfeeding that it was almost bound, *ipso facto*, to prove fatal. Nothing has been found which will counteract the toxæmia once it has got more than a certain hold over the child. On the other hand, success has attended the treatment of most of those in the first category quoted above, and in many of the others recovery has eventually been obtained.

Treatment.

The methods of treatment adopted vary, as a general rule, only as regards sequence and the amount of time that elapses between the various steps.

On admission the stomach is washed out with saline (0.9 per cent. solution) at a temperature of 110° F. The gastric contents are often exceedingly foul smelling and copious. With very few exceptions vomiting ceases absolutely and does not recur. The rectum is next washed out with saline at a similar temperature, the irrigation continuing until the return flow is clear. If done in this order time is saved, as the bowels usually move freely during the gastric lavage, and the subsequent rectal irrigation is a shorter proceeding. If any great degree of collapse or shock is present a mustard bath, or in extreme cases a mustard pack, is given, and is one of the most useful remedies that can be employed. The child will, as a rule, then sleep quietly for an hour or so, during which time a subcutaneous infusion of normal saline, or of a 5 per cent. solution of glucose in normal saline, is started.

The method of introducing the fluid under the skin is a point of some importance. It has been found that the usual way of conducting the fluid along india-rubber

To illustrate method of infusion with vacuum flask.

tubing from a supply situated some distance from the child is open to distinct objections. The fluid seldom reaches its destination with more than the chill off, and the child may experience no small degree of shock rather than any benefit. This fact may be easily tested by fitting up a flask containing fluid at a temperature of 180° F., and leading it through tubing 3 ft. long into a wad of cotton-wool in which a thermometer is placed. The conditions nearly represent those of the real procedure, and the thermometer will register about 80° F. At this temperature the fluid is absorbed very slowly; in cases of rapid

emaciation this is an additional disadvantage. A method which obviates both difficulties is to use one of the inexpensive forms of vacuum flasks now on the market. An india-rubber cork with two holes is fitted to it, and through these two glass tubes are introduced; one, drawn out to a fine point, allows air to enter the flask; the other, which may conveniently be of the "two-way" kind, leads the fluid. Not more than 8 in. of narrow india-rubber tubing are attached to either limb of the two-way tube, and into the ends of each a small silver infusion needle is inserted. A wooden board laid across the sides of the cot, with a hole bored through the centre, acts as a support for the neck of the inverted flask.

This simple apparatus has proved so valuable in the wards, that it may be worth while to mention a few points about its use. The cork, tubes, and needles are sterilized by boiling; the flask is disinfected and scalded out with hot water; and though there is a theoretical objection in that it cannot be boiled also, no untoward results have followed in the large number of cases in which it has been employed. In order to warm the vessel, it is allowed to stand for a few minutes before use filled with sterile water at 120° F. This is then emptied and the amount of saline prescribed, *plus* about an ounce to allow for waste, is put in at a temperature of 120° F. This allows for a drop of 15° F. in transit through the tubing, and at 105° F. the fluid has been found to be absorbed most readily.

The child is laid flat on its back, and the limbs secured by bandages tied to the sides of the cot. The abdomen or thighs are prepared as for surgical operation, and when the needles have been inserted they are covered by a piece of sterile gauze or wool. The temperature of the fluid in the flask has been proved not to drop more than 2° or 3° F. in four hours. The amount usually ordered is about 7 oz., and takes two hours to run in. On one occasion where absorption was very rapid, 30 oz. were given continuously during the night to a baby 9 months old with excellent results. The rate of flow can be controlled if necessary by screw clamps or artery forceps on the tubing. A very few minutes is enough to start the working of the apparatus, and when once the fluid is running the nurse is free to attend to other duties. An occasional inspection to watch the rate of absorption is all that is necessary.

The feeding is perhaps the greatest difficulty. Water, preferably hot, is all that is allowed for twenty-four hours. It is best to feed the child at first with a spoon, as the great thirst induces the baby to take the bottle too greedily, and vomiting results. Whey has been extensively tried as the first food. It answers well, but has the disadvantage of producing a dirty condition of the mouth, even when made freshly every three or four hours. Frequent cleaning of the babies' mouths is undesirable, as it again causes a tendency to vomit. For this reason a 5 per cent. solution of glucose, to which albulactin may be added, is useful. Any real return of vomiting calls for a repetition of gastric lavage, but unless milk is started too early this is unlikely to occur.

Frequent repetition of the subcutaneous infusion is the only way to replace the enormous loss of water from the tissues caused by the frequent stools, and opium has proved very useful in checking diarrhoea at certain stages and in controlling the restlessness that is often an accompaniment. The weight was observed in one case to drop from 21 lb. to 14 lb. in eight days. There were frequent evacuations of large watery stools, which measured in some instances over three-quarters of a pint and were passed as often as twelve times in twenty-four hours. Seven ounces of saline were injected at twelve-hourly intervals under the skin for nine days, and the child began slowly to make up lost ground when diarrhoea ceased.

Milk, freely diluted with water and with the addition of sodium citrate, is tried only when the diarrhoea has shown signs of subsiding. The strength of the feeds is very gradually increased, but if the attack has been severe and has occurred in a marasmic child, the digestive functions often seem to be entirely suspended for a long while. Open air treatment has proved of the greatest possible value during convalescence. Of drugs, calomel in repeated small doses ($\frac{1}{10}$ grain every hour), castor oil $\frac{1}{2}$ to $\frac{1}{4}$ v, and opium seem perhaps the best; bismuth in anything but quite the late stages, the most deadly. Brandy is useful if its administration is not unduly prolonged.

Though the wards have contained so many cases it is interesting to record that in no instance has the complaint been contracted by children suffering from other diseases. The surgical ward is free from it, nor has it spread to the surgical cases in a ward which contains an equal number of surgical and medical beds. No case of intussusception has been met with. Two patients developed acute tetany, which subsided in three or four days, and was followed by recovery. Haematemesis and melaena have been uncommon but grave occurrences. Bronchopneumonia is a very fatal complication, and has been the cause of death in eight of our cases. It is preceded, probably in every instance, by collapse of the lung. That it has not occurred more often may be attributed to the excellent nursing the children have received, without which few of the recoveries could have been recorded.

REMARKS ON

A CASE OF PLEURAL TUBERCULOSIS WITH LARGE EFFUSION.

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THE following case furnishes a "record," as far as I am able to find, for the amount of fluid withdrawn at a single tapping from one pleural cavity. It is also interesting as showing a connexion between large exudations and a definite variety of thoracic tuberculosis.

A. C. M., aged 30, a drayman, tall and powerfully built, was admitted on January 5th, 1911, to the Cheltenham General Hospital, complaining of shortness of breath during the previous four weeks, intermittent stabbing pain in the right side, and a troublesome cough with little expectoration. He had suffered from dysentery and enteric fever about ten years previously in the course of the South African war. The family history was unimportant.

The usual signs of a full pleural cavity were found on the right side with slight generalized catarrh of the left lung. The day after admission 9 pints and 8 oz. (188 oz.) of clear yellow fluid were withdrawn from the right side through a small cannula in twenty minutes. At the end of the time the fluid was still running, but as the patient began to cough and his pulse showed irregularity, it was considered advisable to withdraw the instrument.

In spite of the relief this afforded the temperature and pulse-rate were not appreciably reduced, the general level of the one being 101° F., and of the other 100 to 120 per minute. Von Pirquet's test, tried on the fourth day after admission, gave a negative result. Tapping was soon needed again, and 90 oz. and 100 oz. were removed on separate occasions from the right side, while the left side, which was also found dull, yielded 60 oz. once. The fluid removed presented the characters of an exudate rather than a transudate. Fraenkel's pneumococcus was recovered from it, but no tubercle bacilli. The latter were also absent from the scanty sputum.

The temperature, after becoming intermittent in character, was practically normal from February 26th till April 6th, and during that time the patient was allowed up, and managed to walk about slowly. At the end of this remission the breathlessness increased, and 125 oz. were removed from the right chest with some temporary improvement; but the temperature began to be unsteady, and a repetition of the von Pirquet test gave a positive reaction.

Injections of Koch's tuberculin (1000000 mg.) at weekly intervals seemed to cause a slight retardation of the unfavourable course of the disease, the temperature becoming practically normal for three weeks; but the fatigue of going out in a wheeled chair on Coronation Day, intended to act as an auto-inoculation, was followed by a last stage of increasing weakness, laboured respiration, and cyanosis. Tapping the pleura towards the end yielded very small amounts of fluid (2 oz. on July 6th) and gave no relief, and on July 15th the patient died cyanosed and insensible.

Post-mortem Examination (July 17th).

Body somewhat emaciated. The right pleural cavity contained about three pints of turbid fluid with flakes of opaque lymph. The whole of the pleura, both parietal and visceral, was converted into a stiff membrane of almost cartilaginous consistence, varying in thickness from $\frac{1}{8}$ to $\frac{1}{4}$ in., being densest on the parietes near the root of the lung and thinnest on the lung itself; it was so closely beset with fibro-caseous deposit as to be uniform in consistence over its greater extent. The lung was bound down and retracted to about the size of a large fist. The left lung was generally but not uniformly adherent and contained some fluid between the adhesions. The pleura was in a similar condition to that of the right side but in a less advanced stage. Barring collapse the parenchyma of