

# CHOLERA

David R. Nalin, M. D.\*

## Introduction

Much money has been spent on cholera vaccine, but from the practical standpoint the vaccine appears to be of little value. Treatment saves 99% of patients, whereas vaccine saves only 50% and that only for 2½ month after it is given. Out of 10,000 persons in East Nepal, only 25 get cholera ( 0. 26% ). A vaccination program, on the other hand, requires that *every* person receive vaccine. Therefore, a vaccination program ends up being more expensive than a treatment program, even though it is less effective. In addition, patients who get cholera after vaccination do *not* have milder disease. In fact, they may have more severe disease. For the moment, therefore, emphasis must be placed on therapy.

## Principles of Therapy

Replacement of water and electrolytes lost in stool and vomitus is the basis of cholera therapy. The following method has been used in our hospitals with a mortality of less than 1%. The care of all cholera patients is greatly facilitated by the use of a canvas wooden frame cot with a hole in the center, through which diarrial stool can flow directly into a calibrated bucket placed under the cot. Each patient's records should be kept on a simple bedside chart; diarrhea volume, vomitus and I. V. and oral fluids must be measured and recorded.

## Rehydration and Correction of Acidosis

Intravenous rehydration is the treatment of choice. Our standard solution, known as 5:4:1, contains 5 grams of NaCl, 4 grams of NaHCO<sub>3</sub> and 1 gram of KCl per liter. This solution has the electrolyte pattern of the average adult cholera stool, i.e., 133 mEq. of Na, 48 mEq of HCO<sub>3</sub>, 98 mEq of Cl and 13mEq. of K. This solution may be used for infants and children if water is given orally.

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\* Johns Hopkins University CMRT and Cholera Research Laboratory, Dacca, Bangladesh

Severely dehydrated patients are given a quantity of this solution equal to 10 per cent of their body weight rapidly by vein. For example a pulseless patient weighing 50 kg. would receive 5 kg., equal to 5 liters, of intravenous fluid. In the most severe cases rehydration is often begun into the femoral vein with an 18 gauge needle. As soon as peripheral veins become apparent, a second infusion is started.

The severity of dehydration is assessed by observation of clinical and vital signs, and the adequacy of replacement is indicated by the reappearance of radial pulses, skin turgor and a moist tongue. Some of the patients are drowsy or even comatose on admission. Unless initial therapy restores the patients to an alert mental state within one hour, some complication is present.

Patient with moderate to mild dehydration but who are not hypotensive are given an amount equal to 5 to 2.5 per cent of their body weight on admission, or they can be treated with an oral 5: 4: 1 replacement solution, described later.

The majority of admissions to our cholera ward are pediatric patients. Scalp vein needles, 21 to 23 gauge, are invaluable for starting intravenous therapy in young patients. The external jugular, femoral and scalp veins as well as arm and leg veins should be used, particularly in severe cases.

### Maintenance Therapy

The basis for maintenance hydration is the replacement, volume for volume, of fluid lost in stool, vomitus, urine and sweat. The careful collection, measurement and recording of stool volume is essential. Vital signs and stool volume should be checked every hour in patients with a stooling rate of more than 700 ml. per hour so that the rate of intravenous replacement can be adjusted to match stool losses. Patients with lower stooling rate can be checked every 4 hours for a balance of intake and output. After initial I. V. injections restore pulse, or if pulse is present on admission, oral therapy is used.

### Oral Therapy

Only within the past two years has oral therapy been feasible. Hundreds of patients have been treated with oral therapy in conjunction with intravenous fluids. The oral solution contains 110 millimole of glucose, 120 mEq. of Na, 48 mEq. of  $\text{HCO}_3^-$ , 25 mEq. of K and 98 mEq. of Cl per liter of drinking water. In village areas the formula can be measured using tablespoons (see Table 1). It is desirable that it be warmed to 40° to 45° C. before oral administration. The solution can be given, however, by thin plastic nasogastric tubes connected to an infusion bottle. The use of this oral solution for maintenance therapy of severely ill patients after initial I. V. therapy has reduced the requirements for intravenous fluids by 70 to 80 per cent. This is important in isolated areas where sterile solutions are scarce and expensive.

After I. V. fluid equivalent to 10% of the body weight is rapidly given, the pulse returns; then oral maintenance therapy is used; 750 to 1500 ml. per hour is given to adults

for 4-6 hours, depending upon the degree of initial dehydration and stooling rate. Thereafter the volume of stool and vomitus collected during the preceding 4-hour period indicates the volume of oral solution to be given during the current 4-hour period. If, however, losses exceed the intake, the negative balance must be corrected with intravenous fluids. Additional intravenous fluids is also required if hypotension or oliguria develops. Oral therapy has been successful in children as well as adults. For children, with severe cholera, 250-500 ml. oral solution per hour is given by mouth during the first 4-6 hours after intravenous dehydration. Then the amount of oral therapy given during each 4 hours matches the stool output of the previous 4-hour period. If the pulse is normal on admission oral therapy is used alone, without prior I. V. therapy, in both children and adults.

### Alternate Intravenous Solutions

It is advantageous during an epidemic to use a single standard solution for all patients, but several other solutions may be used. If only isotonic sodium chloride and isotonic sodium bicarbonate or lactate solutions are available, 1 liter of the bicarbonate or lactate solution be given first, followed by 2 liters of isotonic sodium chloride. An intravenous solution containing sodium acetate instead of bicarbonate or lactate is highly effective. If oral therapy will be used for maintenance, then initial I. V. therapy with normal saline or Ringer's lactate is adequate.

### Antibiotic & Chemotherapy

Tetracycline eliminates the vibrio from the intestine, reduces the stool volume and shortens the average period of diarrhea from 5 to 2 days. Adults should be given 250 mg. every 6 hours; children should receive 5 to 10 mg. per kg. of body weight on the same schedule. Medication should be continued for 5 days. Shorter courses of therapy may not eradicate the vibrio, and the patient may thus be discharged and become a factor in the spread of the disease.

Furazolidone, 100 mg. every 6 hours for 5 days in the adult or 50 mg. every 6 hours for 5 days in children is effective but eliminates the vibrio from the stool more slowly.

### Other Drugs

Drugs other than replacement fluids and antibiotics have no known therapeutic value in cholera and may be harmful.

### Complication

Vomiting. Volumes of vomitus are small compared to stool volumes, but they must be measured, recorded and replaced. Most patients have vomited before admission, but vomiting rarely persists beyond the first 8 hours of therapy. The use of antiemetic drugs in cholera has been studied because adequate rehydration and maintenance eliminate vomiting.

**Hypoglycemia:** Hypoglycemia is associated with cholera, especially in children. One per cent glucose concentration in the intravenous solution will prevent this complication, but if lethargy or convulsion occurs, 25 to 50 ml. of a 50 per cent solution of glucose should be infused intravenously after obtaining a blood specimen for glucose analysis.

**Hypokalemia.** Rapid infusions of sodium bicarbonate to correct acidosis or of glucose to correct hypoglycemia may depress plasma potassium levels and increase the need for potassium therapy. Potassium can be administered by mouth or by vein.

**Hypocalcemia.** Tetany is seen during the intensive fluid and electrolyte treatment of cholera but is easily controlled by the slow intravenous administration of calcium gluconate.

**Muscle Cramps.** Cramps in the rectus abdominus or in the calf of the leg are common during the acute phase of cholera but disappear with rehydration.

**Aspiration Pneumonia.** Pneumonia has been seen principally in a few pediatric cholera patients who have vomited. Suitable antibiotic therapy is added to the basic cholera therapy.

### Diet

After dehydration and acidosis are corrected, appetite returns promptly and a soft or regular diet is well tolerated. This is especially helpful in administering extra potassium.

Table 1. The Formula for Oral Therapy is :

To make 10 liters	To make 1 liter
10 liters drinking water	1 liter drinking water
8 oz. Glucose	10 teaspoons glucose
3½ tablespoon salt	1 teaspoon salt
3½ tablespoons sodium bicarbonate ( baking soda )	½ teaspoon sodium bicarbonate ( baking soda )
2 tablespoons potassium chloride	½ teaspoon potassium citrate or chloride

### N. B. Do NOT boil or sterilize

Solution can be made with warm water which is more pleasant for patients to drink.

Without Glucose, oral solution will not work.

Use ruler to make level the teaspoonfuls or tablespoons of the oral therapy ingredients.

If potassium citrate is used instead of potassium chloride, only 1 tablespoons sodium bicarbonate are needed to make 10 liters.