

What is St Mark's Electrolyte Mix (solution)?

Prepared by UK Medicines Information ([UKMi](https://www.ukmi.nhs.uk)) pharmacists for NHS healthcare professionals
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Summary

- St Mark's Electrolyte Mix is an unique glucose-electrolyte mix oral rehydration solution (ORS)
- It is used in the management of short bowel syndrome, to maintain an adequate fluid balance and minimise stool output
- Patients should make the solution up fresh every day using the following measurements:
 - 20g (six level 5mL spoonfuls) of glucose powder or glucose powder with vitamin C
 - 2.5g (one heaped 2.5mL spoonful) of sodium bicarbonate powder (baking soda) or sodium citrate powder if the sodium bicarbonate is not tolerated due to causing a bitter or salty taste
 - 3.5g (one level 5mL spoonful) of sodium chloride (table salt)
 - This is then to be dissolved in 1 Litre of tap water which provides 90mmol/L of sodium
- The prescribed volume should be drunk slowly throughout the day and not in one go
- Patients should be strongly encouraged to avoid plain water consumption when they are thirsty and to substitute it with the St Mark's Electrolyte Mix
- The solution can be made more palatable if patients find the solution bitter or salty due to the sodium bicarbonate component by:
 - Storing in the refrigerator and drinking chilled
 - Freezing the solution into ice cubes and drinking as a slush
 - Adding a small amount of fruit juice or squash when making up the whole solution rather than adding this to each glass of solution to ensure the sodium content is maintained
 - Sipping the solution through a straw which can also help minimise the bitter taste

Background

St Mark's Electrolyte Mix is a glucose-electrolyte solution, also known as an oral rehydration solution (ORS) which is used in the management of short bowel syndrome (1). Short bowel syndrome occurs as a result of extensive surgical resection or of congenital diseases of the small intestine which is characterised by the inability to maintain protein-energy, fluid, electrolyte or micronutrient balances when on a normal diet. It is a functional definition implying a significant amount of malabsorption of macronutrients and/or micronutrients (2). This can lead to dehydration, weight loss, malabsorption of fluids, and electrolyte imbalance. One of the main aims of management is to increase fluid uptake and improve absorption (3). Most patients will require fluid, electrolyte and nutrient supplementation, and some patients may require parental nutrition or intravenous fluids to maintain health and growth. ORS are important in the maintenance of adequate fluid balance as they help decrease the need for parental nutrition and intravenous fluids (4;5).

Answer

Patients with short bowel have a disrupted fluid and nutrient absorption process leading to excessive fluid losses (6). Hypotonic fluids such as tea, coffee, plain water, and alcohol or hypertonic solutions such as carbonated drinks and fruit juices should be limited. Drinking hypotonic or hypertonic fluids will lead to sodium and fluid moving from the body into the intestine which can lead to increased stool output and result in net fluid and sodium losses (3;7;8). This will result in a high output and sodium depletion. Isotonic fluids are glucose-electrolyte solutions which optimise the ratio of sodium to glucose and allow greater fluid and sodium absorption across the jejunum (5;9). The glucose present in the intestinal mucosa promotes the passive absorption of both salt and water via a solvent drag mechanism (4;9). At least 90mmol/L of sodium are necessary to maximise the water and sodium absorption (5;9).

The original standard World Health Organization (WHO) oral rehydration solution contains a sodium concentration of 90mmol/L, but it also contains potassium which can cause hyperkalaemia in some patients (1). Standard “sport drinks” are not suitable as they contain a high sugar content and low sodium content (8;9). There are many proprietary solutions available, however these are costly and have low sodium content (10). Due to the lack of suitable preparations available, St Mark’s Hospital in London has produced a unique solution called “St Mark’s Electrolyte Mix”. This is a glucose-electrolyte mix which contains 90mmol/L of sodium and no potassium (1;11).

The patient should make the solution up fresh every day using the following measurements (11):

- 20g (six level 5mL spoonfuls) of glucose powder or glucose powder with vitamin C
- 2.5g (one heaped 2.5mL spoonful) of sodium bicarbonate powder (baking soda) / if the patient cannot tolerate Sodium Bicarbonate, use sodium citrate powder
- 3.5g (one level 5mL spoonful) of sodium chloride (table salt)

This is then dissolved in 1 Litre of tap water which provides 90mmol/L of sodium per 1 Litre (11). The patient should drink up to the prescribed volume slowly throughout the day for maximum absorption, and not in one go (3;8;11). Two to three litres per day may be necessary to maintain hydration (5). The solution can be stored at room temperature or in the fridge but it must be discarded 24 hours after mixing and a fresh solution prepared the next day (11).

The individual powders can be purchased from community pharmacies and supermarkets, and will often be cheaper than a single prescription charge. If the solution is prescribed on a NHS prescription, the constituents should be prescribed separately(12). This is preferable to prescribing a ‘special’ product for which costs will be high (13).

Currently there are difficulties in sourcing plain glucose powder and therefore ‘glucose powder with vitamin C’ can be used as an alternative (11;14). Glucose with vitamin C is usually available in a pack size of 450g and contains vitamin C 0.05% (50mg of vitamin C in 100g of Glucose powder). The recommended 20g of glucose powder used to make up the St Mark’s Electrolyte Mix will contain 10mg of vitamin C (14). The recommended daily amount of vitamin C for adults (aged 19 to 64) is 40mg per day which is usually obtained from the daily diet (15). As vitamin C is water soluble any excess amount will be excreted in the urine (14). However large amounts of vitamin C (more than 1,000mg per day) can cause stomach pain, diarrhoea and flatulence. These symptoms should disappear once the vitamin C is stopped (15).

Patients should be strongly encouraged to avoid plain water consumption when they are thirsty and to substitute it with ORS (10). Non-electrolyte drinks should be restricted to one litre a day (2). Often patients may benefit from separating ingestion of fluids and food (no fluids for 30 minutes before and after food), especially in patients who experience a bowel movement immediately after eating (3;5). However there is no published evidence that this reduces stomal output or increases in macro or micronutrient absorption (3).

Patients should be advised that inaccurate measurement of ingredients or enhancing the ORS with additional water, ice, juice or sugar-containing flavourings will alter the sodium to carbohydrate ratio making the solution less effective (8). The solution can be made more palatable as patients may find the solution bitter or salty due to the sodium bicarbonate component by the following (1;3;11):

- Storing in the refrigerator and drinking it chilled
- Freezing the solution into ice cubes and drinking as a slush
- Adding a small amount of fruit juice or squash when making up the whole solution rather than adding to each glass of solution to ensure the sodium content is maintained
- Sipping the solution through a straw which can also help minimise the bitter taste
- If taste continues to be a problem, the sodium bicarbonate can be replaced by the same quantity of sodium citrate

Limitations

There are other similar formulations available which may be referred to as St Mark's mix. These are variations of the basic formula and may have different electrolyte content. Locally prepared formulas should be checked.

Reference List

1. Forbes A. Intestinal failure and short bowel syndrome. *Medicine* 2010; 39(3):178-182.
2. UKCPA study day summary. Management of short bowel syndrome. *The Pharmaceutical Journal* 2001; 267:574-575.
3. Guidelines for management of patients with a short bowel. British Society of Gastroenterology. *Gut* 2006; 55 (suppl IV): iv1-iv12.
4. Nauth J, Chang CW, Mobarhan S et al. A therapeutic approach to wean total parenteral nutrition in the management of short bowel syndrome: three cases using nocturnal enteral rehydration. *Nutr Rev* 2004; 62:221-231.
5. Brown CR, DiBaise JK. Intestinal rehabilitation: a management program for short-bowel syndrome. *Progress in Transplantation* 2004; 14(4):290-296.
6. Jeejeebhoy KN. Short bowel syndrome: a nutritional and medical approach. *Can Med Assoc J* 2002; 166(10):1297-1302.
7. Austin K, Bonnes S, Daniel H. Controversy in Nutrition Recommendations for Short Bowel Syndrome: How Type of SBS Impacts Response. *Current Gastroenterology Reports*. 2019;21(12).
8. Wall E. Ors: The solutions to optimize hydration in short bowel syndrome. *Practical Gastroenterology*. 2020;44(3):24-31.
9. Scolapio JS. Short bowel syndrome. *Journal of Parenteral and Enteral Nutrition* 2002; 26(5):S11-S16.
10. Buchman AL. The medical and surgical management of short bowel syndrome. *Med Gen Med* 2004; 6(2).
11. Patient Information Leaflet: Electrolyte mix (E-mix). St Mark's Hospital. London North West University healthcare Trust. . Reviewed February 2020
12. Personal communication. NHS Prescription Services. 02/01/2018
13. Personal communication. Jacqueline Eastwood. Lead Pharmacist. St Mark's Hospital. 03/12/2015.
14. Personal communication. Internal Shortage Memo: Shortage of Glucose powder used for making electrolyte mix. St Marks Hospital. London North West University healthcare Trust. 24/03/2020.
15. NHS website. Vitamins and minerals - Vitamin C. Published 03/08/2020. Available from: <https://www.nhs.uk/conditions/vitamins-and-minerals/vitamin-c/> [accessed 28/08/2020].

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Search strategy

1. Medline: ("FLUID THERAPY"/ AND ("SHORT BOWEL SYNDROME"/dt OR "MALABSORPTION SYNDROMES"/dt)) [DT 2018-2020]
2. Embase: ("ORAL REHYDRATION THERAPY"/ AND ("SHORT BOWEL SYNDROME"/ OR MALABSORPTION/)) [DT 2018-2020]
3. Pubmed: (((short bowel syndromes[MeSH Terms] OR (malabsorption syndromes[MeSH Terms]))) AND (fluid therapies[MeSH Terms])) AND (("2019/01/01"[Date - Publication] : "2020/08/31"[Date - Publication]))