

combination approach where culture specimens that have yielded a positive result by culture-independent testing are then submitted to public health laboratories for subtyping and sensitivity analysis. A second specimen may need to be submitted if specimens are incompatible with cultures such as dry fecal swab specimens (52–54).

Despite an increasing number of reports worldwide of resistance to various antibiotics among bacterial enteropathogens, the clinical impact of this has yet to be manifest in a significant enough way to warrant anti-microbial susceptibility testing across the board, especially in the individual patient. In general, there appears to be a low failure rate with the use of empiric anti-microbial therapy, especially with the fluoroquinolones and macrolides (55–62). Anti-microbial susceptibility testing will continue to have a role in the outbreak setting and for ongoing surveillance of local trends in resistance patterns and mechanisms (63–65).

TREATMENT OF ACUTE DISEASE

Oral rehydration

Recommendation

5. The usage of balanced electrolyte rehydration over other oral rehydration options in the elderly with severe diarrhea or any traveler with cholera-like watery diarrhea is recommended. Most individuals with acute diarrhea or gastroenteritis can keep up with fluids and salt by consumption of water, juices, sports drinks, soups, and saltine crackers. (Strong recommendation, moderate level of evidence)

Summary of the evidence. One of the most significant advances in the past century was development of a balanced sodium-glucose solution that allows optimal absorption of electrolytes and water. Availability of oral rehydration solution (ORS) has reduced infant mortality in developing countries by at least 50% (66). The major value of ORS is treatment of dehydrating forms of diarrhea in infants and young children in developing countries. ORS may not reduce diarrhea and the objective of ORS therapy is not to shorten illness. In TD dehydration is not common and mortality occurs only very rarely. Among otherwise healthy people, the risk of fatality during a bout of diarrhea is most common for the elderly whether traveling or remaining in a nursing home. More than 80% of deaths in the United States associated with diarrhea occur in the elderly (67). For infants and the elderly with severe TD and in anyone who develops profuse cholera-like watery diarrhea, balanced ORS and medical evaluation are advised. In non-elderly adult travelers with diarrhea, the objectives are generally improving symptoms and getting the people back to scheduled activities. A previous study of TD management in young adults failed to identify clinical or laboratory benefit of balanced ORS therapy in patients treated with loperamide (68). For most otherwise healthy adults with TD, formal ORS is not needed as they can keep up with fluid losses by taking in salty soups, fruit juices, and carbohydrates to provide the glucose-sodium cotransport (69). Popular carbonated soft drinks provide fluids and almost no sodium or potassium, while fruit juices (e.g., apple juice)

provide high levels of potassium and carbohydrate, but low levels of sodium and chicken broth is heavy in sodium (70,71). Travelers with diarrhea should keep up with fluids and electrolytes through diet to be certain they are regularly passing urine and have moist mucous membranes.

In severe diarrhea, a balanced ORS can usually be purchased at a local pharmacy with sodium of 60–75 mEq/l and glucose of 75–90 mmol/l (72) with value in replacing fluids and salt in dehydrating forms of diarrhea as studied in infants and children. Sports drinks while not adequate alone to treat severe diarrhea can provide partial sodium and potassium replacement. More research is needed to determine the optimal composition of available fluid-salt replacement beverages for travelers (73). New developments in oral rehydration are underway, and if convenient without increasing diarrhea and without complications, they may offer advantages in the treatment of more severe forms of TD by preventing symptoms associated with mild forms of dehydration or frank dehydration in cholera-like forms of diarrhea (74).

Probiotics and prebiotics

Recommendation

6. The use of probiotics or prebiotics for treatment of acute diarrhea in adults is not recommended, except in cases of postantibiotic-associated illness. (Strong recommendation, moderate level of evidence)

Summary of the evidence. As our understanding of the importance of the human microbiome in health and disease has advanced, interest in the use of nonpathogenic bacteria and yeast, as well as nutrients that enhance the growth of favorable microbes in our bodies producing enhanced colonization resistance has also expanded (75). Probiotics are defined as live microorganisms, which, when administered in adequate amounts, confer health benefits on the host. For a microorganism to be considered a probiotic, it must exhibit non-pathogenic properties, be viable in delivery vehicles, be stable in acid and bile, adhere to target epithelial tissue, persist within the gastrointestinal tract, produce anti-microbial substances, modulate the immune system, and influence metabolic activities (76). Postulated mechanisms of action of probiotics include “colonization resistance” a barrier effect that prevents attachment or colonization of microorganisms. Probiotics supposedly act by prohibiting pathogen attachment, enhancing the immune response and by assisting in re-establishing the microflora (77). Prebiotics are non-digestible food ingredients that are fermentable in the colon and stimulate potentially health-promoting bacteria, chiefly bifidobacteria and/or lactobacilli, conferring a beneficial shift in the microbial equilibrium of the host gut flora (78). Bifidobacteria as well as lactobacilli appear to have important functions in the ecophysiology of the colonic microbiota. These organisms have been associated with an increased resistance to infection and diarrheal disease (79,80). Prebiotics when combined with probiotics form synbiotics. Synbiotic formulations have been tested in animal models with beneficial effects on reducing adherence of pathogenic bacteria to the jejunum and colonic mucosa (81).