

Evidence Based Medicine: Use of Probiotics in Pediatric Population for Diarrhoea.

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ABSTRACT

Submitted: 18/1/2012

Accepted: 12/2/2012

Diarrhoea is the most common problem in pediatric population. Different causes and types of diarrhoea has been identified, i.e., diarrhoea during antibiotic treatment, non rota virus diarrhoea, or based on severity of diarrhoea like mild, moderate and severe form of diarrhoea. Several drugs like loperamide can be used but due to its side effects like stomach ache and bloating, drowsiness, constipation, etc use of these drugs has been limited. Probiotics- live microorganisms has also shown effective results in treatment of diarrhoea in pediatric population. Several types of probiotics are available that showed effective results. Evidence Based Medicine is the proof for drugs that can be used safely and for it several research works have been performed. Probiotics, in the same way, has been tested in different forms (Eg: *Lactobacillus rhamnosus*, *Saccharomyces boulardii*; *Bacillus clausii*, etc.) and has shown evidently that they can be safely administered at several doses for the treatment of different types or forms of diarrhoea in pediatrics.

Keywords: EBM, Diarrhoea, Pediatric, Probiotics.

INTRODUCTION

The World Health Organization defines **Probiotics** as "live microorganisms which when administered in adequate amounts confer a health benefit on the host."¹

The "live microorganisms" that the WHO refers to are the good bacteria in your yogurt or the Brand X supplement you bought, and "the host" is you. And the two of you are going to get along just fine because the human body is not only designed to perform whilst carrying a cargo of these little critters, but Probiotics are essential for your good health.

When scientists deliberate the definition of Probiotics they like to add a few more riders for a bacteria to qualify.

- Probiotics must be identified at the genus, species and strain level, using appropriate molecular and physiological techniques.
- The strain should be deposited in an internationally recognized culture collection so that scientists are able to replicate published research on the strain.
- Appropriate in vitro and animal assessments must be conducted to better understand the physiological attributes of the strain. However, the choice of what assessments are used should be based on assessments that are relevant to the probiotic function in the target host. Care must be taken to not overextend conclusions from in

vitro and animal tests that have not been validated and shown to have relevance in the target host.

- Before use, the safety of the microbe must be fully considered.
- Properly controlled studies must be conducted which document a health benefit in the target host.
- Ability to keep the Probiotics alive at required levels in the final product through to the end of shelf life.

There are other requirements that could be asked of our Probiotics - things like its ability to adhere to intestinal cells and resistance to bile and gastric juices - but these other requirements need only be met by *some* Probiotics. If your task is to confer a health benefit in the mouth or throat, it really doesn't matter whether you enjoy the hurricane winds that might whistle through the bowel!

Probiotics^{2,3}

Probiotics are live, nonpathogenic microbial preparations that colonize the intestine and have a beneficial effect on the health of the host. Probiotic micro-organisms commonly used are strains of lactobacillus and bifido-bacterium. Enteral administration of probiotics has been shown to significantly decrease the risk of NEC (Necrotizing Enterocolitis) and death and shorten the time to full feedings in VLBW (very low birth weight) infants. One major concern is that exposing immunologically immature VLBW infants to probiotics may potentially increase the risk for infections. However, in a recent meta-analysis, no significant risk of sepsis was noted in infants treated with probiotics. Currently, there is no strong evidence to recommend a specific type of probiotics (species, strains, single or combined, live or killed), the timing, dosage,

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or duration of therapy. In addition, the long-term effects of probiotics for the prevention of NEC in VLBW infants are unknown.

Pathogenesis and Presentation of Diarrhoea⁴

Diarrhoea refers to an increase in frequency, volume, or liquidity of stool when compared with normal bowel movements. In developing countries, diarrhoea is a common cause of death. In the United States, approximately 38 million cases of diarrhoea will occur annually, resulting in approximately 2 to 4 million physician visits, 220,000 hospitalizations, and about 400 deaths.

Acute diarrhoea in infants and children generally is abrupt in onset, lasts a few days, and usually is caused by viruses. Diarrhea is considered chronic if it is longer than 2 weeks in duration and can be caused by malabsorption, inflammatory disease, alteration of intestinal flora, milk or protein intolerance, and drugs. Infants and children are at high risk for morbidity and mortality secondary to diarrhea for several reasons. Dehydration can occur easily as acute net intestinal fluid losses are relatively much greater in young children than in adults. This may result from inefficient transport systems in the developing intestine. In addition, the percent of total body water in children is higher than in adults; thus, they are more susceptible to body fluid shifts. Total body water changes from 80% of total body weight in premature infants to 70% in term infants and 60% in adults. Finally, the renal capacity to compensate for fluid and electrolyte imbalances in the infant is limited compared with an adult's.

Probiotics, live microbial foods containing species of lactobacillus, bifido-bacterium, saccharomyces, and streptococcus, can improve the balance of intestinal flora and diminish the effect of enteric pathogens. These microbes are thought to exert their beneficial effects through various mechanisms (e.g., producing antibacterial chemicals, competing with enteric pathogens, inhibiting the adhesive capabilities of pathogens, altering toxins or toxin receptors). Probiotics are most useful in infectious viral gastroenteritis (but not in bacterial infections) when used early in the course of disease. Lactobacillus GG (GG-Named after discovery by scientists, Sherwood Gorbach and Barry Goldin), in doses of at least 10^6 to 10^9 colony-forming units per day, has been the most consistently beneficial in clinical trials. The manufacture of Probiotics is not regulated; therefore, the organism count per dose might be based on the number present at the time of production and not at time of expiration, and the labeling might incorrectly identify the species of organism. As a result, the efficacy of Probiotics is difficult to ascertain reliably. Probiotics are not recommended for use in

immuno-compromised individuals because systemic infections after use have been reported. Zinc supplementation holds promise for the treatment and prevention of diarrheal disease; however, its mechanism of action, best method of administration, and its efficacy in different populations are unclear.⁵

Evidence Based Medicine:⁶

It requires the integration of best research evidence with our clinical expertise and our patient's unique value and circumstances.

- By *best research evidence*-Means valid and clinically relevant research.
- By *clinical expertise*-Means the ability to use our clinical skills and past experience to rapidly identify each patient's unique health state and diagnosis.
- By *Patient value*-Means the unique preference, concerns and expectations each patient brings to clinical encounter and which must be integrated into clinical decision if they are to serve the patient.
- By *Patient circumstances*-Means their individual clinical state and clinical setting.

How do we Practice EBM?⁶

The full blown practice of EBM comprises five steps:

Step 1) Converting the need for information (about prevention, diagnosis, prognosis, therapy, causation, etc.) into answerable question

Step 2) Tracking down the best evidence with which to answer that question.

Step 3) Critically appraising the evidence for its validity, impact and applicability.

Step 4) Integrating the critical appraisal with our clinical expertise and with our patient's unique biology, values, and circumstances.

Step 5) Evaluating our effectiveness and efficiency in executing steps 1-4 and seeking ways to improve them

Limitations of EBM:⁶

Discussion about the practice of EBM naturally endangers negative and positive reactions from clinicians. Some of the criticisms focus on misunderstanding and misinterpretations of EBM, such as EBM will be hijacked by managers to promote cost-cutting tool, since providing evidence-based care directed towards maximizing patients' quality of life often increases the cost of their care and raises the ire of health economist. In addition, the self-reported employment of the

“searching” mode by a great majority of front line GPs dispel that the contention that EBM is an ivory tower concept (another common criticism). EBM actually leads to therapeutic nihilism in the absence of randomized trial evidence.

Use of Probiotic in Pediatric Population for Diarrhoea:^{7,8,9}

Aims and basic rules:

1) Make a diagnosis

- Find the type of diarrhea (Viral Gastroenteritis, Infantile, etc.)
- Find out the cause of diarrhea (Antibiotics induced, bacterial infection, etc.)

2) Assess the degree of dehydration in percent and grams

- Mild 4%, Moderate 8%, Severe 12%
- In children below 1 year 5%, 10%, 15%, in adults 3%, 6%, 9% respectively.
- Dry mucus membrane, decrease in tears and oliguria suggests mild dehydration.
- Above-listed signs combined with cool periphery, loss of skin elasticity and prolonged (>2 sec) capillary refill time on the palmar surface of the distal fingertip suggests moderate dehydration.
- Above listed signs and deep, gasping breathing, ice cold periphery and poor general condition suggests severe dehydration.
- Observed or estimated pace loss should also be used to estimate dehydration in grams (in acute disease dehydration almost equals weight loss).

3) Choose the place of care

- Usually the child's home.

4) Plan and instruct how to give treatment

5) Give a prognosis

- Viral gastroenteritis usually continues for 4-7 days, rotavirus disease sometimes even longer.

TREATMENT:

Use of Probiotics:

- Oral rehydration solution (control group); *Lactobacillus rhamnosus* strain GG; *Saccharomyces boulardii*; *Bacillus clausii*; mix of *L delbrueckii* var *bulgaricus*, *Streptococcus thermophilus*, *L acidophilus*, and *Bifidobacterium bifidum*; or *Enterococcus faecium* SF68; Not all commercially available probiotic preparations are effective in children with acute diarrhoea.^{10,11,12}

- Nonrotavirus diarrhea can be cured using *Lactobacillus*.^{13,14}
- Diarrhoea during antibiotic treatment can be cured using Probiotics (10^9 *Lactobacillus* GG, *L. sporogens* or *Saccharomyces boulardii* at 5–40 x 10^9 CFUs daily).¹⁵ But does not show effective outcome.¹⁶
- Administration of *L. rhamnosus*(573L/1; 573L/2; 573L/3) strains shortens the duration of Rota viral diarrhoea in children but not of diarrhoea of any aetiology.^{17,18}
- *S. boulardii* therapy in otherwise healthy infants and children with acute gastroenteritis, mainly a shorter duration of diarrhoea.¹⁹
- Drug: Lacidophil can be given in emergency treatment of diarrhea in pediatric population but should be administered with caution.²⁰
- Probiotic agent (Lacidophil) is effective in reducing the severity of acute infectious gastroenteritis among children.²¹
- Dietary Supplement: probiotics (antibiophilus, bio-three) probiotics (antibiophilus, bio-three) 10^9 cfu/40kg/day can be given in diarrhea for the age group of 3 months to 12 years.²²

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