

Banatrol[®] *plus*

White Paper Summary

The #1 natural antidiarrheal used in healthcare facilities.



Diarrhea is an important problem in critically ill patients [1] [2]. Enteral feeding and medications are common causes of diarrhea in the hospital setting. Fiber-free enteral nutrition can induce diarrhea through abnormal colonic responses and disruption of the colonic microbiota [3] [4] [5] [6]. Antibiotics can also disrupt the gut microbiota resulting in dysbiosis and diarrhea [7] [8] [9].

Dietary fiber has been shown to have a positive impact on diarrhea in acute care patients [2] [10] [11]. In 2016, the Society of Critical Care Medicine (SCCM) and the American Society for Parenteral and Enteral Nutrition (JPEN) published clinical guidelines which included expert consensus that a fermentable soluble fiber additive (module) be considered for routine use in all hemodynamically stable medical and surgical intensive care unit patients placed on a standard enteral formulation [12]. In addition, a dose of 10 – 20 g divided over 24 hours was recommended as adjunctive therapy when there was evidence of diarrhea while the routine use of a soluble fiber additive (module) was suggested for all ICU patients as a prophylactic measure to help maintain commensal (colonic) microbiota and promote bowel health through the delivery of short chain fatty acids (SCFA).

Soluble, fermentable dietary fiber plays a key role in the management of diarrhea in acute care through the restoration/modulation of the colonic microbiota and serving as a substrate to produce SCFAs. The colonic microbiota is a complex and diverse microbial ecosystem [13]. Beneficial colonic microbiota suppress enteropathogenic organisms through a process called colonization resistance [14] [15]. Mechanisms for colonization resistance include : 1) competition for niches and nutrients, 2) metabolic exclusion by SCFA production, O₂ consumption and bacteriocins, and 3) modulation of the host immune system [15]. Disruption of the gut microbiota via antibiotics [8] [16] or enteral tube feeding [17] [18] can reduce colonization resistance and increase the risk of infection by organisms such as *Clostridium difficile*.

Anaerobic fermentation of dietary fiber by the resident microbiota in the large bowel leads to the production of SCFAs, primarily acetate, propionate and butyrate [19] [20]. SCFAs play an important role in colonization resistance [15] [21] and are a source of energy for the host [22] with butyrate being a preferential energy source for the colon [23]. Another key benefit, as it relates to diarrhea, is the effect of SCFAs on water absorption in the colon [24]. SCFAs are absorbed by colonic epithelial cells and stimulate Na-dependent water absorption via a cyclic AMP-independent process involving apical membrane Na-H, SCFA-HCO₃, and Cl-SCFA exchanges [24]. Nasogastric tube feeding of fiber-free formulas induce abnormal secretion of fluid and electrolytes in the ascending colon [25]. However, this effect is reversed when SCFAs are infused into the ascending colon [26]. A reduction in SCFA production during antibiotic use may be the primary reason for antibiotic-associated diarrhea [27] as the mechanism by which the colon absorbs water is compromised. Fermentable dietary fiber, by serving as an indirect source of SCFAs, helps restore the level of these important organic acids in the colon through the fermentative activity of the resident microbiota.

Banatrol Plus is a unique combination of banana flakes, that provide dietary fibers such as pectin and resistant starch [28] [29], and Bimuno GOS (B-GOS). Bananas have a long history of use in the management of diarrhea. In 1950, Fries [30] published a paper on the effect of dehydrated banana flakes on infant diarrhea. Infants treated with dehydrated banana flakes recovered more quickly than did the infants in the control group. Banana flakes have also been shown to control diarrhea in enterally fed patients [31]. Results from treatment with banana flakes were comparable to the control group receiving routine care (ie., antidiarrhea medication and tube feeding rate adjustment). Bimuno GOS is a novel galactooligosaccharide produced by a strain of *Bifidobacterium bifidum* NCIMB 41171 [32]. B-GOS is highly fermentable and bifidogenic [32]. Clinical studies in healthy elderly volunteers demonstrated a significant increase in the number of beneficial bacteria, especially bifidobacteria, as well as a positive effect on immune response [33] [34]. Also, B-GOS has been shown to reduce diarrhea episodes in healthy subjects at risk of travelers' diarrhea [35].

Bimuno GOS and the dietary fiber in banana flakes are highly fermentable serving as an energy source for the microbiota in the large bowel [36] [37] [38]. Bimuno GOS is a highly effective prebiotic serving as preferential energy source for bifidobacteria. These ingredients help maintain/restore the colonic microbiota and subsequently colonization resistance during enteral feeding and following antibiotic therapy. In addition, the SCFAs produced through fermentation drive water and electrolyte absorption in the colon and represents a key mechanism by which

soluble, fermentable fiber helps manage diarrhea in hospitalized patients. There is expert consensus for the routine use of a soluble, fermentable fiber module in all hemodynamically stable medical and surgical intensive care unit patients placed on a standard enteral formula to help maintain commensal microbiota and promote bowel health through the delivery of SCFA. Also, the literature confirms that dietary fiber has a positive impact on diarrhea in acute care patients. The use of a module to deliver dietary fiber represents an approach that allows for a more controlled and consistent dose of dietary fiber to meet the unique needs of the individual patient. Banatrol Plus, a unique combination of banana flakes and B-GOS, represents the ideal soluble dietary fiber module for use in hospitalized patients at risk of or experiencing diarrhea.

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