Prebiotic may help patients with intestinal failure grow new and better gut

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Adding the right prebiotic to the diets of pediatric patients with intestinal failure could replace intravenous feeding, says a new University of Illinois study.

"When we fed the carbohydrate fructooligosacharide (FOS) as a prebiotic, the gut grew and increased in function," said Kelly A. Tappenden, a U of I professor of nutrition and gastrointestinal physiology. "The study showed that using the correct pre- and probiotic in combination could enhance these results even more."

When FOS enters the intestines, bacteria convert it into butyrate, a short-chain fatty acid that increases the size of the gut and its ability to digest and absorb nutrients, she said.

But today's IV solutions don't contain butyrate and adding it would entail drug development trials and regulatory red tape. She wanted to see if adding this carbohydrate to the diet while continuing to provide most nutrients intravenously would cause the gut to start producing butyrate on its own. It worked.

According to Tappenden, at least 10,000 U.S. patients are totally reliant on intravenous feeding because their intestines have been surgically shortened.

Many of these patients are premature infants who develop necrotizing enterocolitis, a kind of gangrene of the intestine. In the U.S., one in eight

infants is a preemie, and removing necrotized, or dead, intestine is the most common surgical emergency in these babies.

"Surgery saves their lives, but with so much intestine removed, they're unable to digest or absorb nutrients. These babies are also at risk for long-term complications, such as bone demineralization and liver failure. Our goal is to take kids who've had this resection and cause their gut to grow and adapt," she said.

She tested her hypothesis about butyrate using newborn piglets, an excellent model for the human infant in metabolism and physiology. Piglets with intestinal failure were assigned to one of four groups: a control group; a group whose diet contained FOS, a carbohydrate given as a prebiotic to stimulate the production of butyrate by beneficial bacteria; a probiotic, or actual live bacteria; and a combination of pre- and probiotics.

"We believed that bacteria in the gut would use the prebiotic to make butyrate and support intestinal growth. But we thought that might only happen in the group that received both pre- and probiotics because we didn't know if the newborn gut would have enough bacteria to make this important short-chain fatty acid."

Actually, the neonatal piglets did have enough bacteria in their guts, and the prebiotic alone was effective in increasing intestinal function and structure, she said.

"In fact, the probiotic that we used in one of the groups eliminated the beneficial effect of the prebiotic. That shows us that we need to be exceptionally careful in selecting the probiotic we use, matching it to the specific disease," she noted. Many consumers believe all probiotics are equal, but the effect of specific bacterial strains is different, she said.

"At this point, we can only recommend consumption of the FOS prebiotic alone," she added.

More information: The article appears in the September 2012 issue of the *Journal of Parenteral and Enteral Nutrition* and is available online at http://pen.sagepub.com/content/current. Jennifer L. Barnes of the U of I and Bolette Hartmann and Jens J. Holst of the University of Copenhagen, Copenhagen, Denmark, are co-authors of the study, which was funded by grants from the National Institutes of Health.

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