

EPICOR[®]

EpiCor[®] and its Immune Effects on Gut Health

Larry E. Robinson, Ph.D. and Stuart Reeves, Ph.D., ARCS, Scientific Affairs



Summary: The gut is extremely important for proper immune health. Gut-Associated Lymphoid Tissue (GALT) comprises a large part of the immune system. An *in vitro* study, using a multistage simulator of the human digestive system, was conducted to understand EpiCor's affect on the immune and digestive systems. EpiCor appears to support gut health through a variety of mechanisms:

- EpiCor acts as a prebiotic, which helps explain part of its mode of action as an immune modulator.
- The model used an established human gut flora inoculum and showed that EpiCor significantly increased the levels of butyrate, a short chain fatty acid (SCFA) that has been shown to be beneficial for gut immune health.
- EpiCor significantly increased the levels of beneficial bacteria (bifidobacteria and lactobacilli) over the control.
- Levels of secretory IgA have been shown to significantly increase with EpiCor vs. placebo in human clinical trials. This important immunoglobulin present in mucosal membranes is vital in our body's first line of defense against pathogens.
- EpiCor contains mannan-oligosaccharides (MOS) and β -glucans. Research has repeatedly demonstrated the beneficial effects of these oligosaccharides for gut immune health.
- Results show that the immune and prebiotic effects of EpiCor are complementary and help to improve gut health.



EMBRIA[®]
Health Sciences

Embria Health Sciences
2105 SE Creekview Dr.
Ankeny, IA 50021

embriahealth.com

Sales Contact:

Doug Reyes
North American Sales &
Marketing Manager
(877) 362-7421
dreyes@embriahealth.com

Naz Kalantari
Regional Sales Rep. East
(877) 362-7421
nkalantari@embriahealth.com

EpiCor has been shown in multiple published studies to support both the innate and adaptive parts of the immune system. However, due to the complex interactions between the immune system and the digestive system (GALT), it seemed very likely that EpiCor would positively affect gut health. As a first step, EpiCor was studied in an *in vitro* prebiotic screening model developed by the University of Ghent and conducted by its related research company, ProDigest in Belgium.

The model studied was a multistage simulator of the human digestive system (Figure 1), using an established human gut flora inoculum. The system is designed to screen products for prebiotic and probiotic activity. To test for prebiotic effects, the relative amounts of SCFA levels and changes in populations of bifidobacteria and lactobacilli were measured. During this trial, cellulose was used as a negative control, and fructooligosaccharide (FOS) and inulin were used as positive controls.

Figure 1. Simulator of the Human Intestinal Microbial Ecosystem (SHIME)



The first vessel represents the stomach/duodenum, the second the jejunum/ileum and the third through fifth the colon (ascending, transverse and descending respectively). Photo courtesy of ProDigest.

Definitions

Probiotic: A product containing viable, defined microorganisms in sufficient numbers to alter the microflora in a compartment of the digestive system, and thereby exert beneficial health effects in the host.

Prebiotic: A non-digestible food ingredient that beneficially affects the digestive system by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon.

Synbiotic: A mixture of a probiotic and a prebiotic.

Effect of EpiCor on Short Chain Fatty Acids in the Model System

EpiCor caused a similar increase in total SCFA as inulin and FOS, but it shifted the pattern of SCFA to produce more butyrate (significant in the comparison of EpiCor to FOS, $p < 0.05$), as shown in the table below. This is very interesting; since butyrate is thought to positively interact with the immune system in a variety of ways (see discussion section below for more information on the benefits of butyrate).

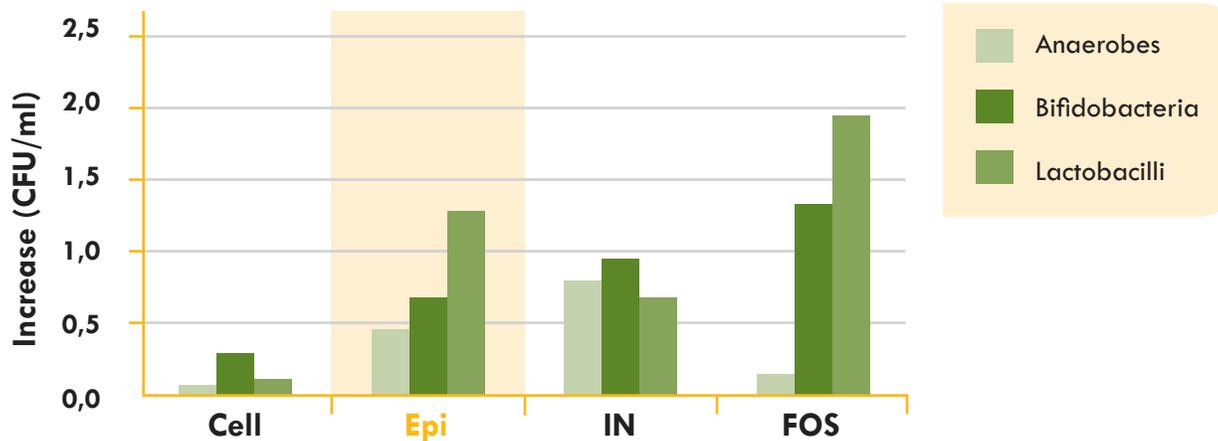
Table 1. The effect of EpiCor on SCFA

	EpiCor	Inulin	FOS
Acetate (%)	48	57	64
Propionate (%)	30	30	26
Butyrate (%)	21	14	9

Effect of EpiCor on Bacterial Populations in the Model System

The study results are reflected in the following graph (Figure 2), which shows the ability of EpiCor to increase the levels of these beneficial bacterial groups, bifidobacteria and lactobacilli, as compared to the cellulose control. These results suggest EpiCor acts as a prebiotic, with effects similar to inulin and FOS. These additional gut health benefits, combined with data from other studies performed with EpiCor, may further explain why EpiCor helps the body achieve immune balance.

Figure 2. The Effect of EpiCor on Bacterial Populations in the Model System



Discussion

SCFAs produced by bacteria during digestion have been recognized for many years as sources of energy for the host, which are mainly derived from fermentation reactions in the distal sections of the digestive system. Recently, there has been considerable interest in the effect of SCFAs on immune health, in particular butyrate. Apart from butyrate's association with energy, it is thought to interact directly with parts of the immune and digestive systems. Research has shown butyrate's beneficial effects on the structure of the gut wall and on its ability to alter cytokine profiles in such a way that the immune response is modulated. The effects include increasing levels of IL 10, an anti-inflammatory cytokine (Saemann et al, 2000).

Lactobacilli and bifidobacteria are both considered beneficial bacteria in digestion, and indeed, many probiotics contain these species. These species have been shown to help “exclude” pathogenic bacteria, thus reducing the possibility of disease, especially traveler's diarrhea, and help balance the overall flora of the gut, leading to better and more regular digestion (Williams et al, 2001). Having the appropriate levels of the right bacterial species in the gut is also important for overall immune health. The combination of the potential prebiotic effects shown here and the increase in secretory IgA shown in human clinical studies, strongly suggest that daily consumption of EpiCor may help balance the gut flora and modulate immune health in a beneficial manner (Jensen et al, 2008 and Moyad et al, 2009). Furthermore, the presence of MOS in EpiCor, which is known to bind to and exclude pathogenic bacteria, could also aid in this endeavor. The polyphenols and β -glucans along with the other components present in EpiCor provide additional benefits for immune function.

These demonstrated prebiotic effects of EpiCor help explain the beneficial immune effects of EpiCor.

The study shows daily consumption of EpiCor may help balance the gut flora and modulate immune health in a beneficial manner.

References:

- Jensen, G.S., Patterson, K.M., Barnes, J., Schauss, A.E., Beaman, R., Reeves, S.G. and Robinson, L.E., (2008), A double-blind placebo-controlled, randomized pilot study: Consumption of a high-metabolite immunogen from yeast culture has beneficial effects on erythrocyte health and mucosal immune protection in healthy subjects, *Open Nutrition Journal*, v. 2, p. 68-75.
- Moyad, M.A., Robinson, L.E., Kittelsrud, J.M., Reeves, S.G., Weaver, S.E., Guzman, A.I. and Bubak, M.E., (2009), Immunogenic yeast-based fermentation product reduces allergic rhinitis-induced nasal congestion: a randomized, double-blind, placebo-controlled trial, *Advances in Therapy*, v. 26, p. 795-804.
- Saemann, M.D., Böhmig, G.A., Österreicher, C.H., Burtscher, H., Parolini, O., Diakos, C., Stöckl, J., Hörl, W.H., Zlabinger, G.J., (2000), Anti-inflammatory effects of sodium butyrate on human monocytes: potent inhibition of IL-12 and up-regulation of IL-10 production, *FASEB Journal*, v. 14, p. 2380-2382.
- Williams, B.A., Martin, W.A., Verstegen, and Tamminga, S., (2001), Fermentation in the large intestine of single-stomached animals and its relationship to animal health, *Nutrition Research Reviews*, v. 14, p. 207–227.





EpiCor[®] and its Immune Effects on Gut Health



EMBRIA[®]
Health Sciences

Embria Health Sciences | 2105 SE Creekview Dr. | Ankeny, IA 50021
embriahealth.com