A New Generation of Prebiotics

From concept to commercialization, we add value at every step.
A New Generation of Prebiotics

I. Probiotics
   I. Benefits and Popularity
   II. Good and Bad Bacteria
   III. Hurdles to Overcome

II. Overcoming the Hurdles

III. Prebiotics
   I. Benefits
   II. Examples
   III. Drawbacks

IV. Introduction of a Novel Prebiotic
   I. Testing and Results
Can be Ingested as Food
Reaches the Intestines Alive
Aids in Digestion
Supports Normal Bowel Function
Supports Health Through Immune Function and Inflammatory Response
The Microbiome

100 trillion microorganisms...
10x amount of human cells!

Prevotella
Streptococcus
Veillonella
Helicobacter
Enterococcus
Lactobacillus
Bacteroides
Bifidobacteria
Clostridia
Enterobacteria
Enterococcus
Escherichia
eubacteria
Klebsiella
Lactobacillus
Peptococcus
Peptostreptococcus
Proteus
Ruminococcus
Staphylococcus
Streptococcus
A Constant Battle for Food & Space
Shared vs. Unique Components of the Gut

Bacteria interact with many different things in their environment.

SHARED

BAD Bacteria

GOOD Bacteria

UNIQUE

Glucose

Raffinose
Examples of Unique Components

**Sugars**
- Raffinose

**Lipids**
- Almond Lipid

**Proteins/Peptides**
- Lactoferrin

Chemical structures and molecular representations are shown for each category.
“non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon, and thus improves host health.”

- Food and Drug Administration
Prebiotics contained in foods or supplements are consumed.

Prebiotics are not digested in the stomach or small bowel.

Prebiotics selectively promote growth of “good” bacteria over “bad” bacteria.

Prebiotics positively increase good bacteria flora in the GI tract.

Increased beneficial bacteria in the small & large bowel support a variety of health effects.
Common Polysaccharides as Prebiotics

- Inulin
- Lactulose
- Xyloooligosaccharides
- Raffinose
- Galactooligosaccharides
Drawbacks of Current Prebiotics

- Gas, bloating, discomfort
- Action depends on environmental composition
- Efficacy requires large doses
- Effect requires prolonged period of time
- Activity localized to large intestine
- Can increase growth of unwanted bacteria in the GI tract
Introducing PreforPro®

A PROBIOTIC-ENHANCING PREBIOTIC
Finding Sources
In-vitro Testing
Experimental Setup

- Physiological Conditions of the Intestine:
  - Low $O_2$, pH7.0, 37°C
  - Beneficial Bacteria + Undesirable Bacteria + PreforPro
- Bacterial Counts
*Competing with *E.coli*

After 5 hours

**L. lactis***

- **L. lactis**
- **L. lactis + PreforPro**

Bacterial Counts

- 0
- 100
- 200
- 300
- 400
- 500
- 600
- 700
- 800
- 900
- 1000

**L. lactis**

**L. lactis + PreforPro**

10

1,000
B. longum*

*Competing with E.coli

After 5 hours

Bacterial Counts

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Bacterial Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. longum</td>
<td>30</td>
</tr>
<tr>
<td>B. longum + PreforPro&lt;sup&gt;ro&lt;/sup&gt;</td>
<td>7,000</td>
</tr>
</tbody>
</table>
B. subtilis*

After 5 hours

*Competing with E.coli
PreforPro vs. Inulin

*Competing with *E.coli* After 48 hours

**B. longum**

- **PreforPro**: 9 million CFU/g
- **Inulin**: 18,000 CFU/g
In-vivo Testing - PreforPro

The probiotic *B. longum*, competing with *E. coli*, after 24 hours

*B. longum*
PreforPro Benefits

- Supports the proliferation of beneficial bacteria that comprise a healthy colon
- Does not promote the growth of unhealthy bacteria
- Promotes a healthy digestive tract and immune system
Research Conclusions

PREFORPRO

From concept to commercialization, we add value at every step.
Advantages Over Typical Prebiotics

- Fermentation does not produce discomfort
- Independent of environmental conditions
- Effective in small doses
- Efficacious within hours
- Active in small and large intestine
Characteristics of PreforPro

- Common Component in Foods
- Works with a Broad Spectrum of Probiotics
- Works in Different GI Compartments
- Non-GMO Project Verified
- Vegetarian

- GRAS
- Efficacious in Small Quantities
- No Allergen Labeling Required
- No Preservatives Labeling Required
- Does Not Cause Flatulence