# Novel Probiotic Compositions for Improving Metabolism and Immunity

**Innovative probiotic formulation to prevent and treat metabolic and immune disorders**

## Technology

The Blaser Lab, formerly at NYU, has developed probiotic compositions utilizing two novel bacterial species, *Ileibacterium valens* and *Dubosiella newyorkensis*, derived from murine intestinal samples, for modulating weight and intestinal immune gene expression in the context of different diseases. As described in published work (*Cox et al. Int J Syst Evol Microbiol 2017)*, these new isolates are Gram-positive, strictly anaerobic, non-spore forming rods, and have been found to possess biochemical and chemotaxonomic traits consistent with organisms belonging to the poorly characterized genera *Erysipelotrichaceae*. As detailed in the NYU patent, germ-free mice colonized with exogenous microbiota deficient in *Ileibacterium valens* and *Dubosiella newyorkensis* gained more fat and weight over time and also had decreased intestinal defenses, demonstrating the protective metabolic role of these strains. The scientists have also demonstrated that microbiota disruption leads to decreased expression of intestinal antimicrobial peptides and immune-defense signals from Th17 cells. In rodent experiments, mice administered high levels of these two bacteria strains showed changes in immune gene expression linked to greater intestinal immunity (e.g., higher expression of RORγT, IL-17A, IL-17F, RegIIIγ, Relmβ, and/or Defβ). Taken together, these novel bacteria isolates are promising early-stage therapeutic candidates for the treatment of metabolic and inflammatory disorders.

## Background

Approximately 70% of U.S. adults are overweight, and over 40% are obese. Obesity-related conditions such as heart disease and Type II diabetes are among the leading causes of preventable, premature death in both the U.S. and worldwide. Although factors such as more sedentary lifestyles and an increased consumption of high-calorie foods have contributed to the obesity crisis, they do not sufficiently explain the rapid rise in obesity and subsequent obesity-related disorders. As described in prior work (*Cox et al. Cell 2014*), the Blaser Lab has demonstrated that early-life disruption of the microbiota from low-dose antibiotic exposure directly results in weight gain and higher adiposity. While intestinal microbiota play a critical role in shaping metabolism and immunity throughout life, only a small subset of bacteria and fungi have been used for microbiota-based therapies due to a limited characterization of the gut flora. Therefore, innovative probiotic compositions that modulate intestinal immune gene expression and stimulate gut bacteria growth are desperately needed as alternative therapeutic strategies to combat obesity, boost immunity, and treat allergic and autoimmune diseases.

## Development Status

Experiments are on-going.

## Applications

**Category**

Life Sciences/Biologics
Life Sciences/Therapeutics/Inflammat Disease
Life Sciences/Therapeutics/Metabolic Diseases
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- Weight management
- Prevention and treatment of diseases associated with altered metabolism and immunity, including:
  - Obesity
  - Metabolic syndrome
  - Diabetes mellitus
  - Asthma
  - Rheumatoid arthritis
  - Inflammatory bowel disease
  - Crohn's disease
  - Celiac disease
  - Other autoimmune and allergic diseases

### Advantages

- **Innovative therapeutic approach:** Microbiota modulation with probiotics is an underexplored therapeutic avenue
- **Disease-modifying activity:** Probiotics would modulate intestinal metabolic and inflammatory programs underlying disease
- **Numerous methods of administration:** Could be delivered orally, topically, sublingually, nasally, rectally, and via mucosal methods
- **Generalizable therapeutic:** Applicable to a wide range of disparate indications
- **Customizability:** Different bacterial strains could be included based on the targeted indication

### Intellectual Property

NYU holds an issued U.S. non-provisional patent covering the probiotic compositions and their methods of use (US10653728B2).

### References

1. Cox LM, Sohn J, Tyrrell KL, Citron DM, Lawson PA, Patel NB, Iizumi T, Perez-Perez GI, Goldstein EJC, Blaser MJ , https://pubmed.ncbi.nlm.nih.gov/28100298/