## Microbiome-Based Prediction, Diagnosis, and Treatment of Relapsing Obesity

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# Overview

A novel method for analyzing the likelihood of weight regain following a weight loss program and maintaining target body weight, based on gut microbiome analysis.

# Background and Unmet Need

The past century has seen an overwhelming increase in the prevalence of overweight and obese individuals, effecting over a third of the worldâ€™s population today. Obesity is strongly associated with conditions such as stroke, diabetes, high blood pressure, musculoskeletal disorders, and ischemic heart disease, the latter being considered a leading cause of overall mortality.

Despite continuous efforts to find a solution for the obesity epidemic, no dietary approach has been able to maintain prolonged weight reduction after the initial weight loss. Moreover, the recurrent weight gain usually exceeds that of the pre-weight loss intervention, irrespective of fitness level or genetic background. The health risks are further increased with each weight gain-loss cycle.

Consequently, there is a strong need for the development of novel methods for weight loss and more importantly, for stopping relapsing obesity post-weight loss intervention.

# The Solution

The teams of Profs. Elinav and Segal have developed a method for analyzing the gut microbiome and inferring the likelihood of weight regain from the presence/absence of specific microbes.

# Technology Essence

The Elinav-Segal research teams discovered that the amount and composition of certain microbes in the gut contribute to accelerated post-dieting weight regain. Therefore, down regulating certain microbes that are associated with weight gain while simultaneously upregulating microbes associated with weight loss can help

achieve and maintain the target weight. The developed method consists of:

Treating the individual with a dieting aid.

Monitoring the amounts of different gut microbes indicative of weight gain/loss.

Administering an agent that alters the gut microbiome signature to that it will resemble the microbiome signature of non-obese individuals.

The researchers have developed a personalized machine-learning algorithm, which based on the gut microbiome population, can predict the likelihood of recurrent weight gain (Fig 1.). Additionally, the researchers have tested different agents such as antibiotics, flavanoids, and fecal transplants in mouse models, to directly modulate the gut microbiome to avoid relapsing obesity.

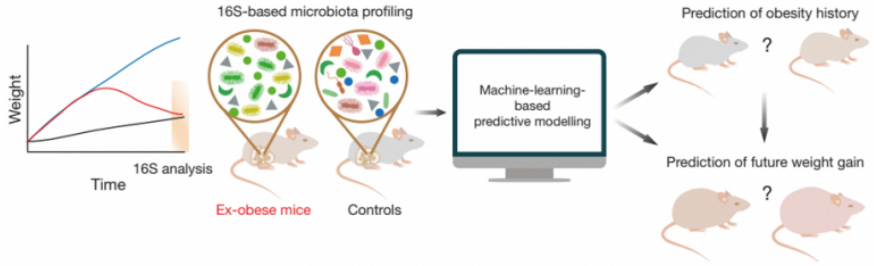


Figure 1: *Schematic of microbiota-based prediction ofweight-gain history and weight regain upon HFD feeding. (Thaiss CA et al. Nature. 2016)*

## Applications and Advantages

Diagnostic test for populations more susceptible to relapsed obesity

A potential method to reduce relapsed obesity by altering gut microbiome composition

## Development Status

The teams of Profs. Elinav and Segal have developed a personalized machine-learning algorithm enabling microbiome based prediction of relapsing weight gain and have demonstrated in mice that fecal transplantation and post-biotic intervention may prevent excessive secondary weight gain. This research has been published in the prestigious scientific journal of Nature1.

Relevant Publications: Thaiss CA et al. Nature. 2016 [1][1]

### Patent Status

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