**Diet and gut microbiota dominate in explaining the human serum metabolome**

Principal Investigator: Prof. Eran Segal

Summary of the technology:

The research group led by Prof. Eran Segal from the Weizmann Institute of Science (WIS) has sampled over 1000 serum metabolites from a cohort of 500 patients and devised a machine learning (ML) algorithm to predict their levels based on a comprehensive profile consisting of gut microbiome, clinical parameters, diet, lifestyle, anthropometric measurements and medication data. The team were able to obtain significant predictions for over 92% of the profiles metabolites with diet and microbiome explaining hundreds of metabolites. Gut microbiome alone explains 64% of the variance of some of the metabolites.

Additionally, the team uncovered a dense network of interactions between diet, gut microbiome, drug intake, and lifestyle, explaining the levels of some metabolites.

Lastly, the team were able to show that some of these interactions are casual, as some metabolites that were predicted to be positively associated with bread increased in level following a randomized clinical trial of bread intervention.

The technology can pave the way towards mechanistic understanding of the alterations in metabolites under different conditions and to designing interventions for manipulating metabolite levels.

Applications:

* Diagnostics - using the database and ML algorithms drug companies could better predict the potential effect of different drugs (e.g. maybe we can use this data to predict the effect of certain drugs before the trial begins)
  + Alternatively, some drugs can be converted to harmful secondary metabolites by the gut microbiome. These metabolites can perhaps also be predicted by
* Treatment - In a similar vein to the previous idea - treatment can be better adjusted based on a subject’s profile (microbiome, diet, etc.) to achieve better efficacy (for example they report in the paper that some patients had low serotonin levels despite taking SSRI’s. A patient’s microbiome population could be taken into account when prescribing the correct SSRI or dosage.
* Service based - health service providers can use this data and algorithms to supply an advisory service to their clients. For example, if a patient has high cholesterol, rather than prescribing statins, a health service provider can use this data to suggest other lifestyle changes that might be just as effective.

Potential Investors (all have invested in microbiome companies):

* Pfizer R&D Innovate
* Genesys Capital
* Innovate U.K.
* Microbiologics
* Gopher Angels
* Johnson & Johnson
* Century Partners
* Lundbeckfond Ventures
* Nestle Health Science
* Omnes Capital
* Mayo Clinic Ventures
* Google Ventures
* Celgene
* Spruce Capital Partners
* Tate & Lyle Ventures
* Horizons Ventures
* Morgan Noble
* Avenir Growth Capital
* Willet Advisors LLC
* Shumway Capital
* Bill Gates
* Polaris Partners
* Lux Capital
* Two Sigma Ventures
* The Column Group
* Essex Woodlands Health Ventures
* Zehnder Communications
* NO/LA Angel Network
* IP Group PLC
* SR One
* Morgenthaler Ventures
* Pfizer Venture Investments
* Advanced Technology Ventures
* Seraph Group
* Digitalis Ventures
* MBL Venture Capital
* Adveq
* Merck & Co., Inc.
* Terra Accelerator
* SOSV
* Indie Bio
* Kairos Venture Investments
* NCI
* Zaluvida
* seventure

Potential Companies That Would Be Interested In The Technology Or Collaboration:

* Enterome - development of gut microbiome based immuno-therapeutics
* Evolve BioSystems -a microbiome-based approach to solving newborn gut dysbiosis.
* Finch Therapeutics - fecal and oral transplant therapeutics
* Adapsyn Bioscience - combines genomic and metabolomic data with artificial intelligence and machine-learning to identify novel, mechanistically diverse evolved small molecules from human and environmental microbiomes.
* CHAIN Biotechnology - CHAIN Biotechnology develops Clostridium-based live biotherapeutic products for chronic gut-related diseases.
* ClostraBio - Discovering and developing new therapeutics that modulate the protective ability of the microbiome.
* CoreBiome - B2B- offers microbiome analysis using genomics and informatics. help customers design studies, collect samples, generate sequencing data, and analyze data using machine learning.
* Kallyope - focus on metabolic and CNS disorders. The platform has relevance for disease areas linked to the gut and gut-brain axis.
* Microbiome Therapeutics -Make microbiome modulators
* Microbiotica - Developing medicines and biomarkers based on microbiota
* Second Genome - focusing on disease causing gut bacteria
* Sugarlogix - make complex sugars with prebiotic functions. These sugars are not energy sources for the human body; instead, they selectively feed the beneficial bacteria living inside the human gut.
* Symbiotix Biotherapies - developing molecular therapeutics based on molecules derived from the human microbiome
* TargEDys - Appetite regulation involving bacterial, hormonal mimetic, proteins that are found naturally in the gut microbiome
* uBiome - Sequencing gut-microbiome to identify pathogenic bacteria
* Vedanta Biosciences - Producing drugs that can modulte gut bacteria in order to achieve a positive effect on the subjects health.