

METHOD TO EVALUATE FUNCTION OF MEMBERS OF A GUT MICROBIOTA

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Technology Description

Researchers at Washington University in St. Louis have developed a bead-based method to understand the functional states and metabolic capabilities of individual members of the human gut microbiota. The gut microbiota is increasingly linked to multiple aspects of human health and there is evidence suggesting that the host diet affects the composition of the microbiome. As such there are efforts to develop microbiota-directed interventions to improve health. There is also an increased interest in understanding how therapeutics alter the gut microbial community. It is difficult, however, to study the interplay between diet or drugs and the microbiome as it is difficult to culture many of the bacterial species. Thus, new methods are needed to understand how gut microbial community members interact with microbiota-directed interventions.

To help meet this need the inventors have developed this bead-based method. The method uses biotinylated polysaccharides attached to streptavidin-coated paramagnetic beads. The beads can be retrieved from intestinal contents using a magnetic field. Additionally, the beads are also labeled with fluorophores so that several types of polysaccharide-coated beads can be pooled, administered, recovered and then sorted. The bead-based assay enables *in vivo* study of the interactions between polysaccharide digestion and the microbiome. This technology provides a method to characterize the functional properties of a microbial community.



Schematic depiction of the bead-based *in vivo* glycan degradation assay.

Stage of Research

The inventors used the technology to measure glycan degradation in a gnotobiotic mouse colonized with a defined, 14-member bacterial community. Further development is ongoing.

Publications

Patnode ML, Beller ZW, Han ND, Cheng J, Peters SL, Terrapon N, Henrissat B, Le Gall S, Saulnier L, Hayashi DK, Meynier A, Vinoy S, Giannone RJ, Hettich RL, Gordon JI. [Interspecies Competition Impacts Targeted Manipulation of Human Gut Bacteria by Fiber-Derived Glycans](#). Cell. 2019 Sep 19;179(1):59-73.e13. doi: 10.1016/j.cell.2019.08.011.

Applications

- Tool to:
 - Determine/classify the functional state of a human individual's microbiota
 - Measure glycan degradation in a host
 - Identify molecules and microbes that bind to the polysaccharides on the beads
 - Assess the effects of interventions designed to prevent or treat disease
- Discovery/development of probiotics and/or synbiotics for next generation microbiota-directed therapeutics

Advantages

- Enables measurement of bacteria composition *in vivo*
- Structurally similar dietary, host or microbial polysaccharides do not interfere with measurement of polysaccharides coupled to the beads
- Permits simultaneous testing of multiple glycans in the same animal- allows for direct comparison of the degradative capabilities of different gut microbes *in vivo*
- Can be used to quantify functional differences between gut microbiota as a function of host health or nutritional interventions
- Could facilitate development of more personalized nutritional recommendations
- May advance food science- may be used to develop and test food prototypes optimized for processing by microbiota of different targeted human populations
- Method can be extended to other nutrients
- May be used by microbial communities associated with diverse host and environmental habitats

Patents

- Provisional patent application has been filed.

Related Web Links

- [Dr. Gordon profile](#)