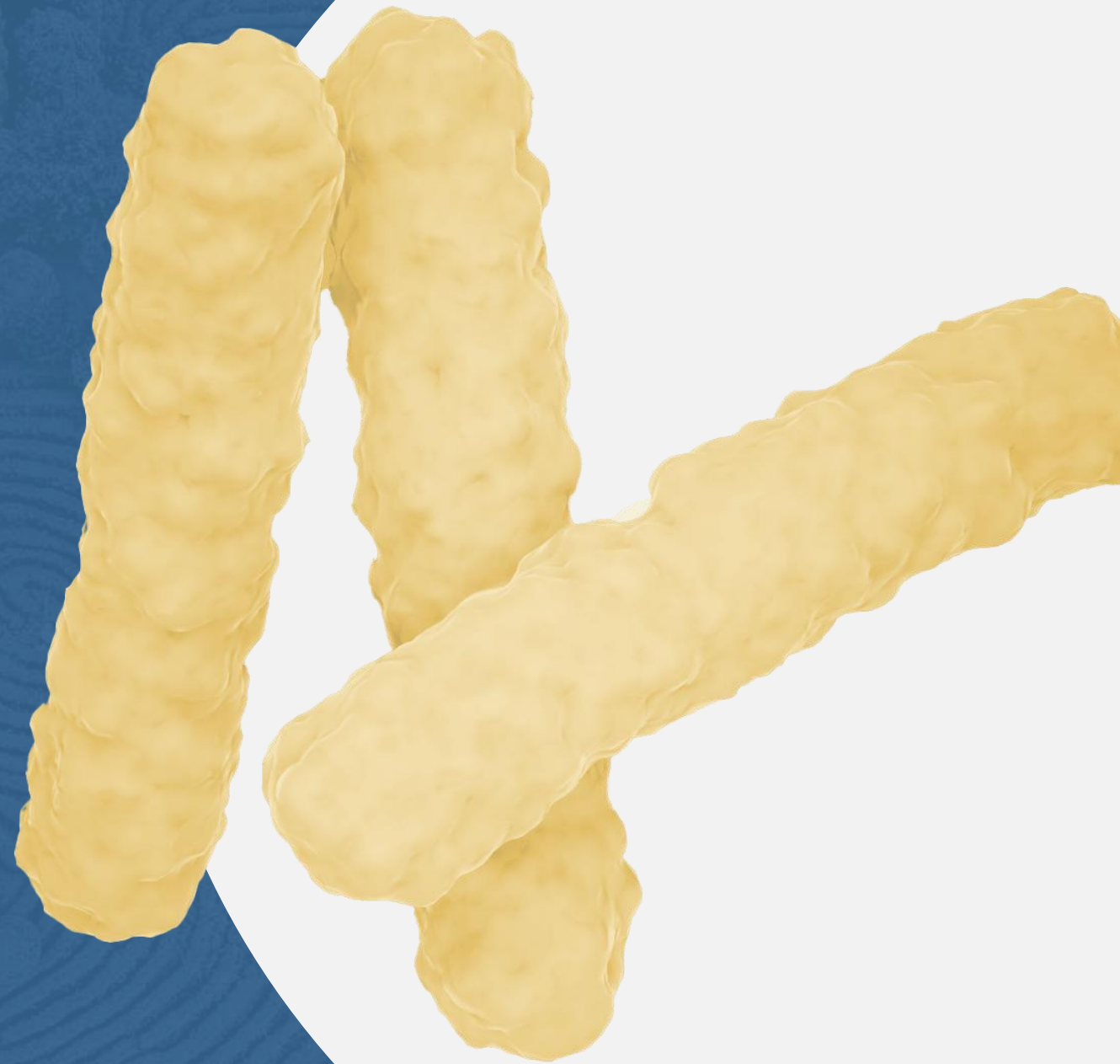




Unlocking Akkermansia: A New Era in Probiotics

Dr. Rishi Raj Trivedi, PhD
Global Commercial Director, Probiotics





Gut Health

- ↑ Gut Barrier
- ↑ Immunity



Liver Health

- ↓ Insulin resistance
- ↓ Blood glucose
- ↓ Diabetes
- ↓ Fatty Liver
- ↓ Liver inflammation



Artery Health

- ↓ Cholesterol
- ↓ Atherosclerosis



Cell Health

- ↓ Fat Mass
- ↓ Inflammation



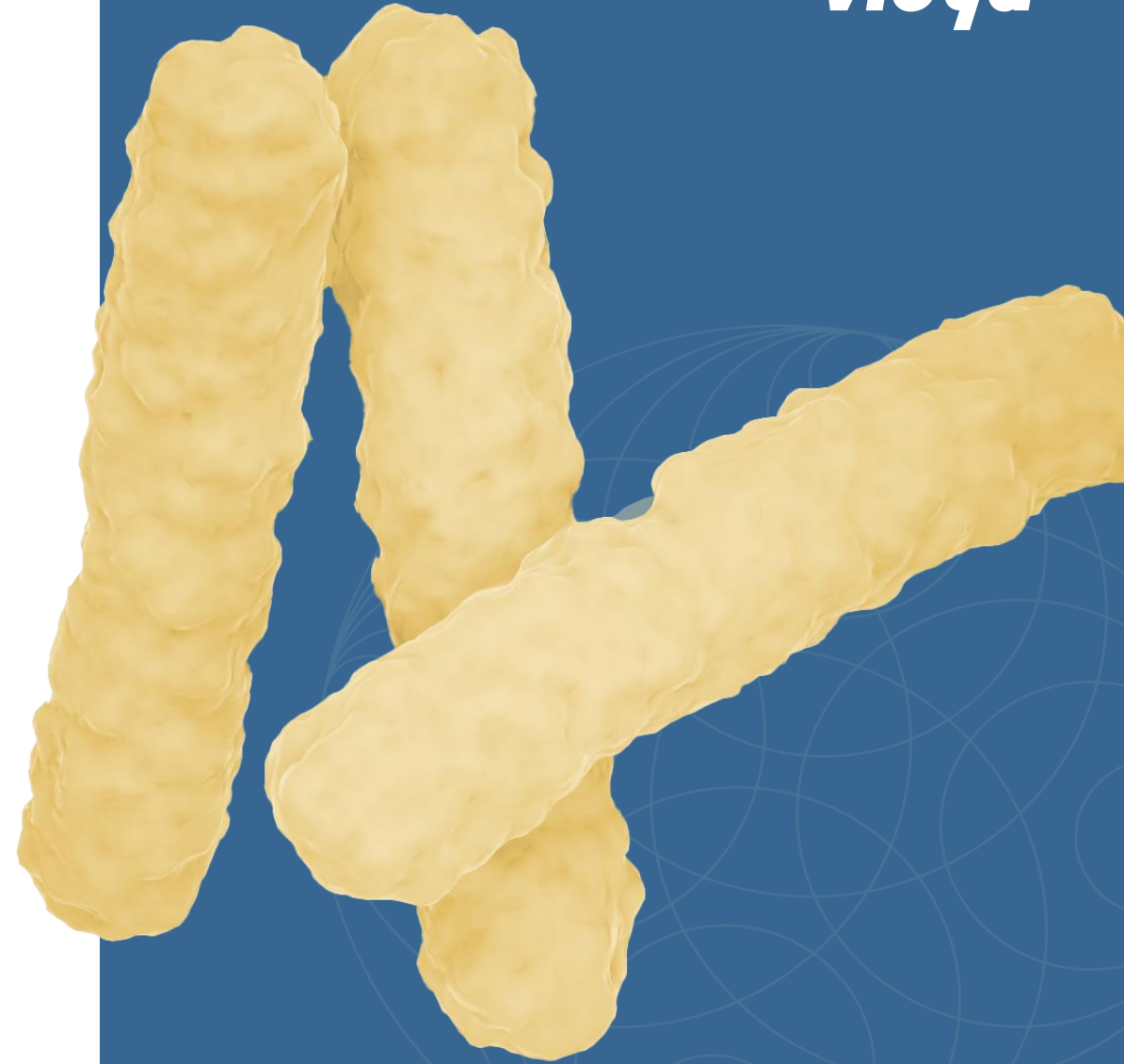
NūGensia™

LIVE STABLE AKKERMANSIA

VHAKM Akkermansia Starting Culture: ATCC BAA-835

- Akkermansia muciniphila strain BAA-835 **was isolated in 2002** from human fecal matter. Since then, there have **been over 350 cited papers reviewing** the safety and effectiveness of this strain.
- Using Vidya's proprietary fermentation process, BAA-835 **can flourish into VHAKM**, a vegetarian-friendly probiotic protected by microencapsulation.
- **97% similarity** between VHAKM and BAA-835

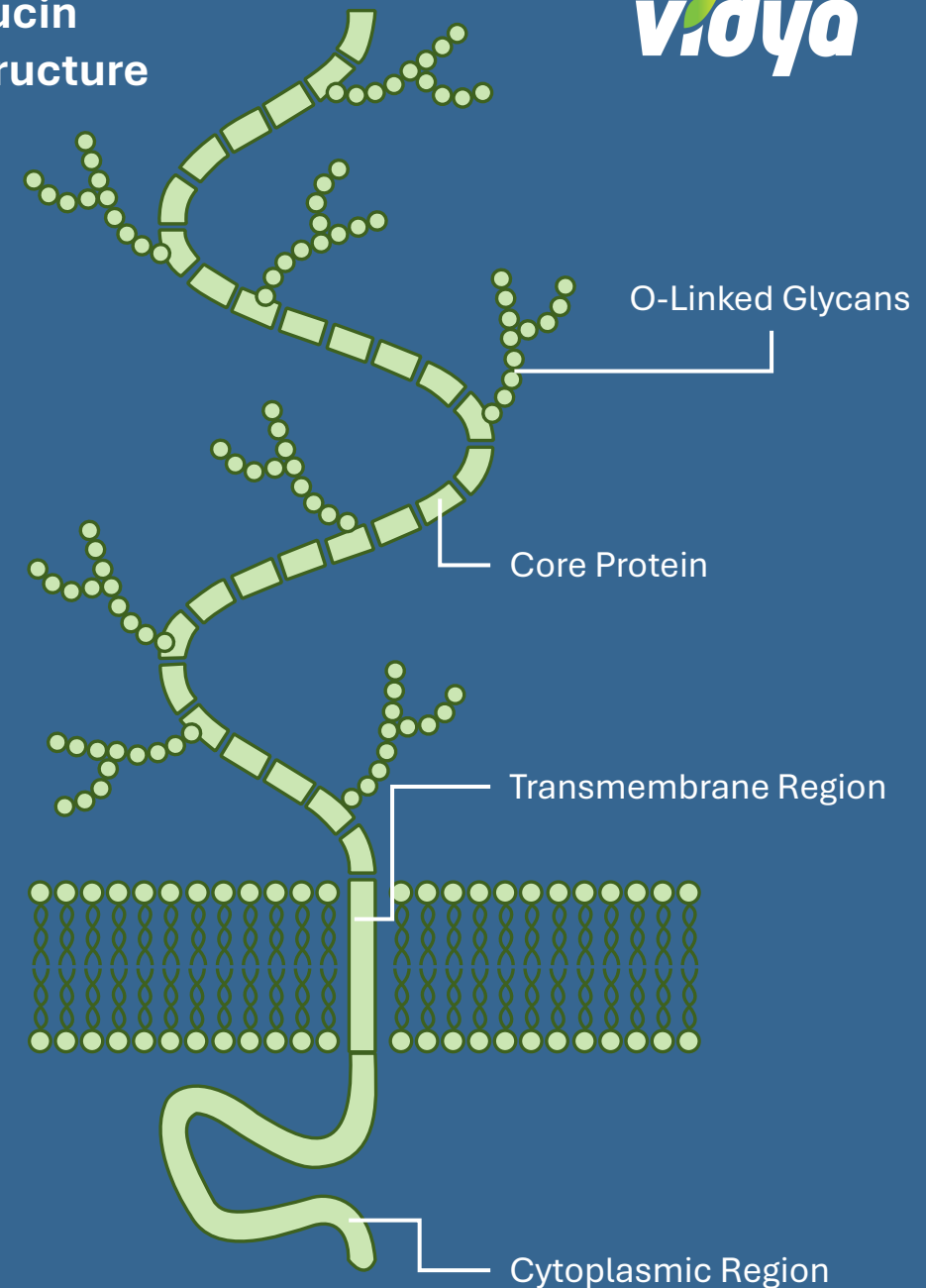
vidya



Akkermansia fermentation required plant-based gum as a food source

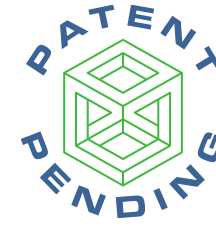
- In the human gut, **AM feeds off mucin**, a glycoprotein, in order to survive and thrive
- During fermentation, **mucin is required for AM to grow and survive**
- Most commercially available sources of mucin are **derived from animal sources**, and cannot be used
- After screening a library of plant-based gums, a few promising candidates **were identified with chemical similarities to human mucin**, making them potential **alternatives to animal-derived sources**

Mucin Structure



Microencapsulation

Provides extra protection from Heat, Water, Oxygen, and Humidity



Encapsulated Akkermansia

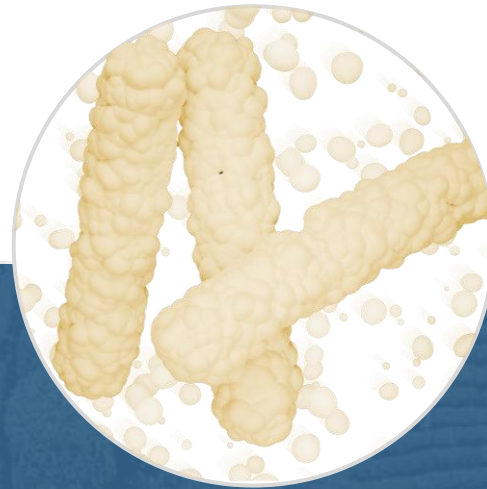
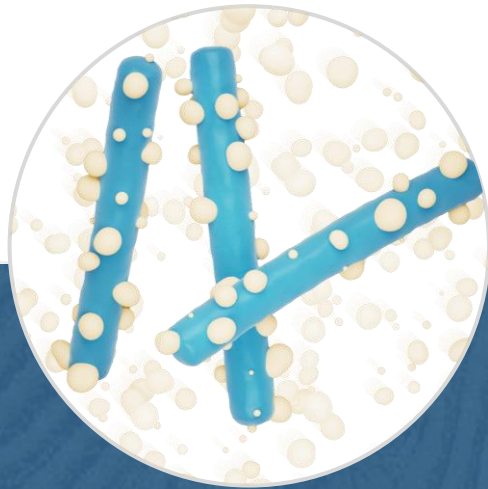
Spraying



Wetting

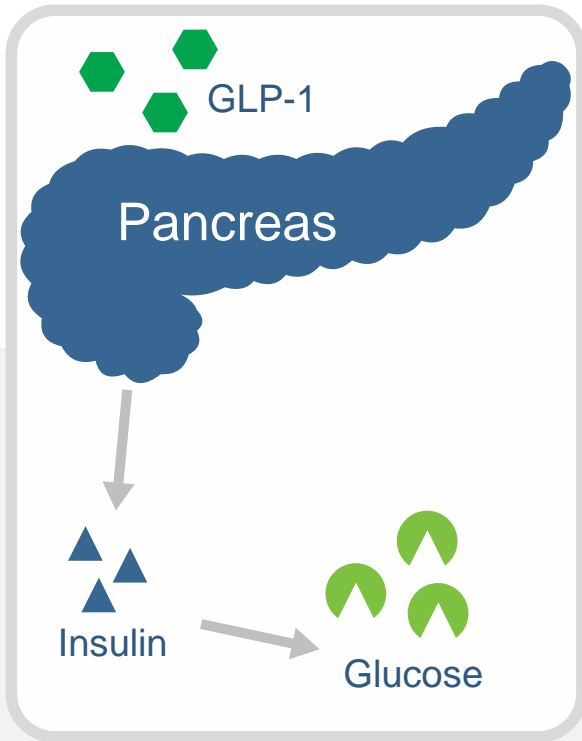


Spreading

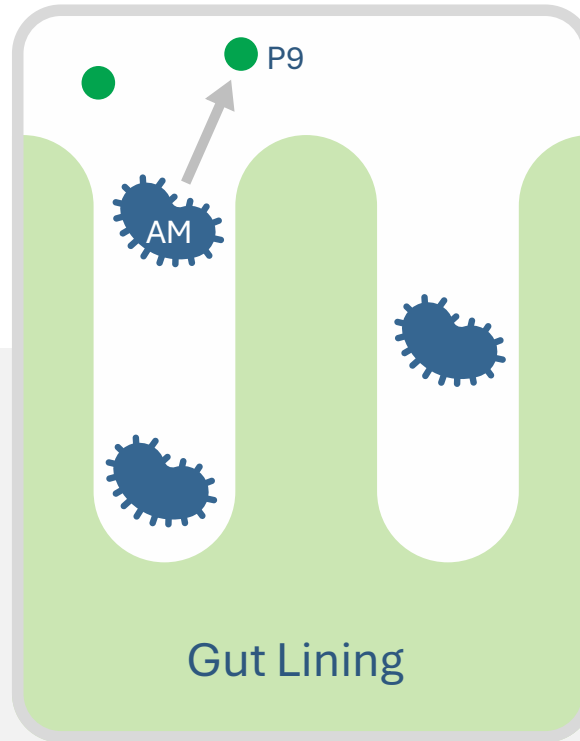


Impact of AM on GLP-1

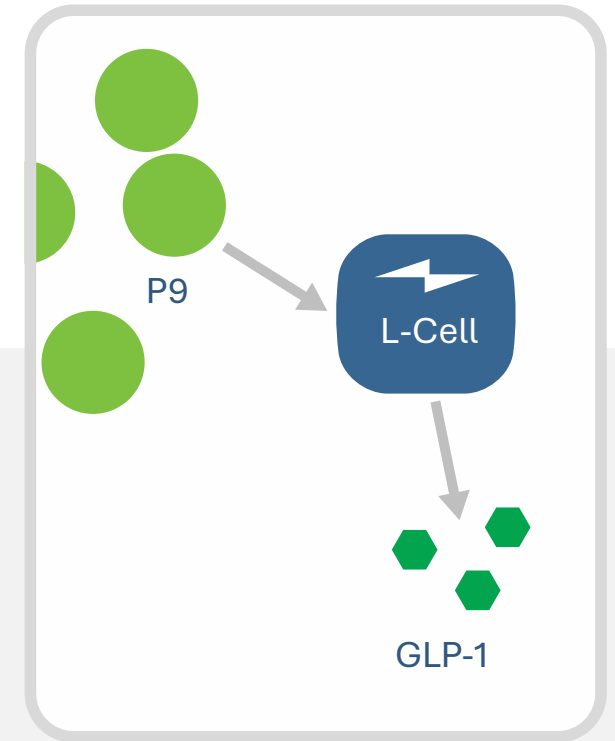
By using ELISA-based assays, we are currently testing how well our VHAKM AM can trigger L-cells in producing GLP-1, which further activates pancreas to produce insulin.



AM colonizes in the gut and produces metabolites such as P9

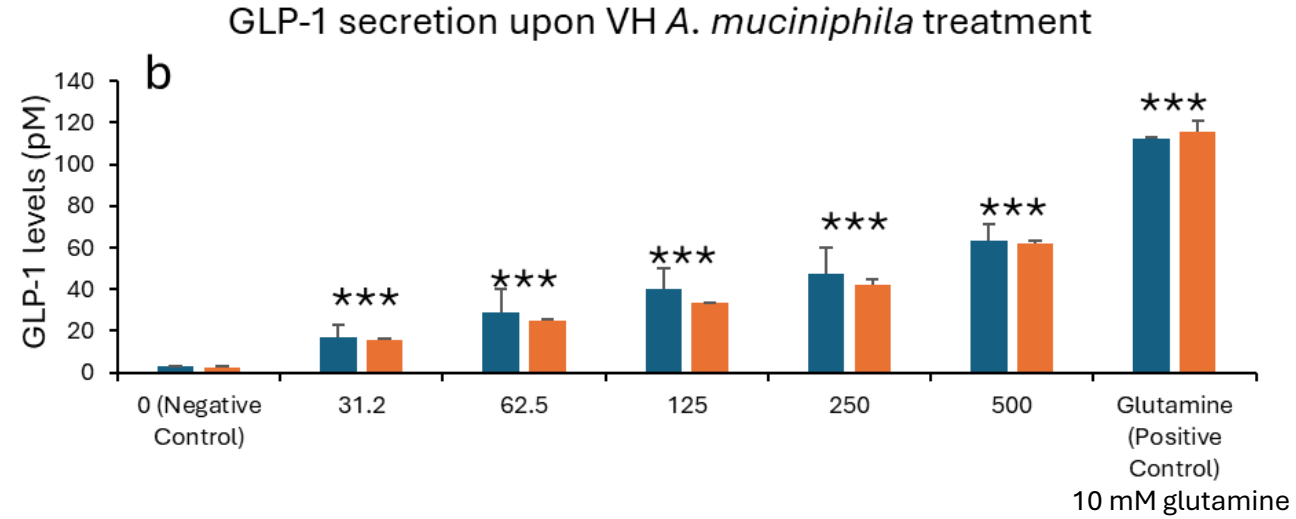


P9 secreted from AM can trigger L-Cells to produce GLP-1

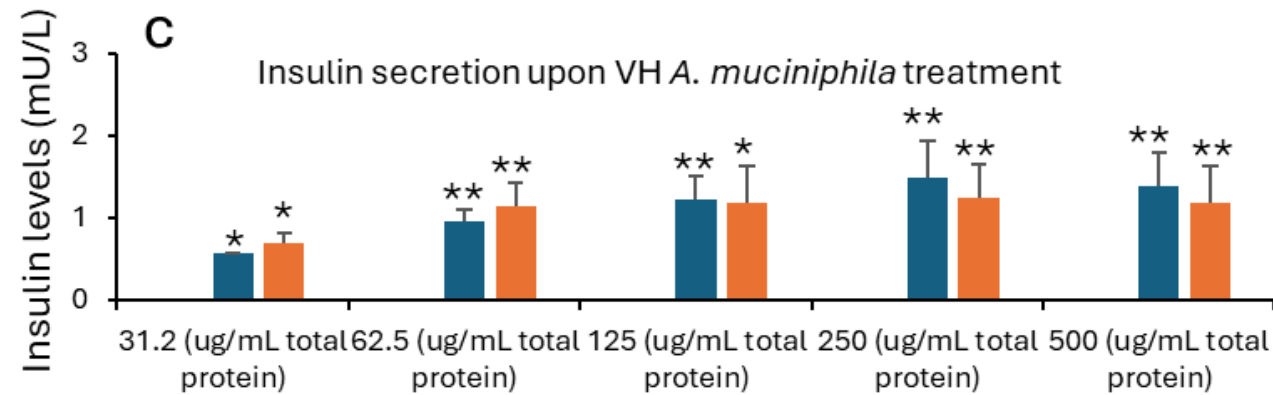


GLP-1 can trigger the pancreas to release insulin, cause lower blood sugar and supply cells with energy

Impact of AM on GLP-1



Impact of AM on Insulin Secretion



The total protein concentration of 31.2, 62.5, 125, 250, 500 ug/mL are equivalent of 0.625, 1.25, 2.5, 5 and 10 billion/ mL CFUs, respectively.



Live Akkermansia Clinicals



Clinical Study on Digestion: 5 B CFU

Study Design

- 5B CFU of Akkermansia muciniphila daily supplementation
- During the 6 visits over the 3 months of the study, participants will take part in:

Genetic Marker Testing

- FUT2 and GCKR are genes that influence the composition of the gut microbiome, leading to a healthy happy gut.

Standard Questionnaire

- The Digestive Symptom Frequency Questionnaire (DSFQ) and Daily Bowel Habits Diary with Bristol Stool Scale (BBS) will provide an overview of how gut health has changed over time.

Enzyme Testing

- Lactase and Amylase testing will provide information on important enzymes that help break down food in the gut.

Fecal Microbiome and Metabolites

- Identifies different kinds of bacteria in the GI tract that support digestive health.

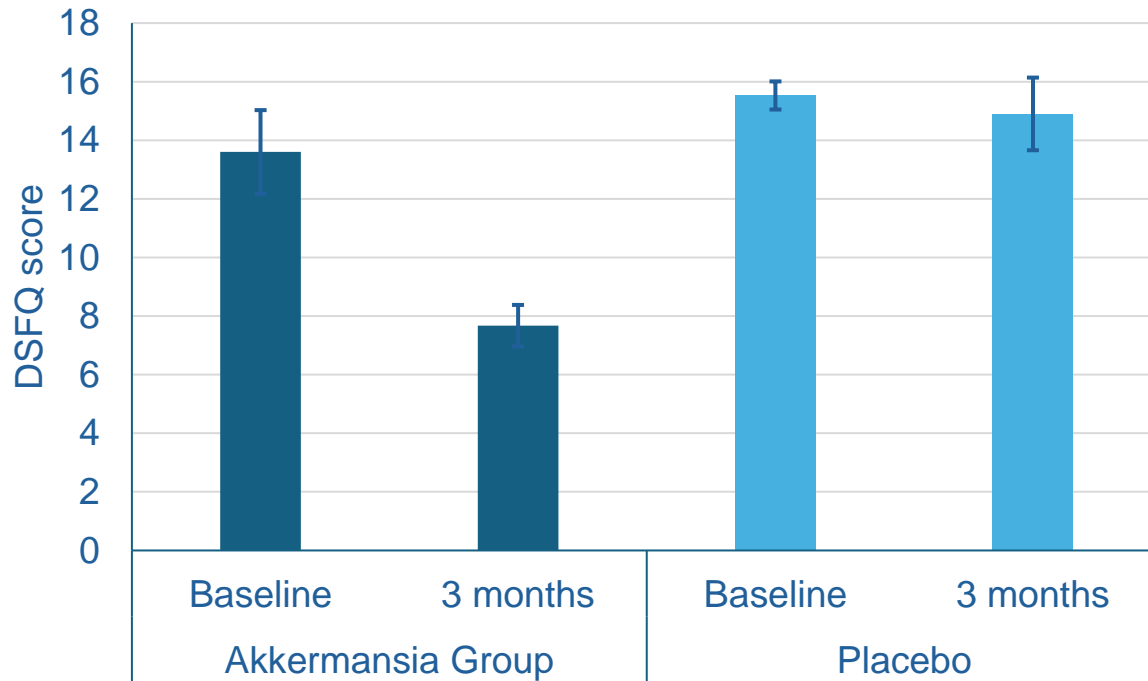
vidya



5B CFU Akkermansia Supplementation improves digestive symptoms on DSFQ score



DSFQ score across participants



DIGESTIVE SYMPTOMS FREQUENCY QUESTIONNAIRE

4 Digestive Symptoms –

- Abdominal pain/discomfort
- Bloating,
- Flatulence/passage of gas
- Rumbling stomach

Methodology –

The frequency of each digestive symptom over a 1- week period was assessed with a 5-point Likert scale

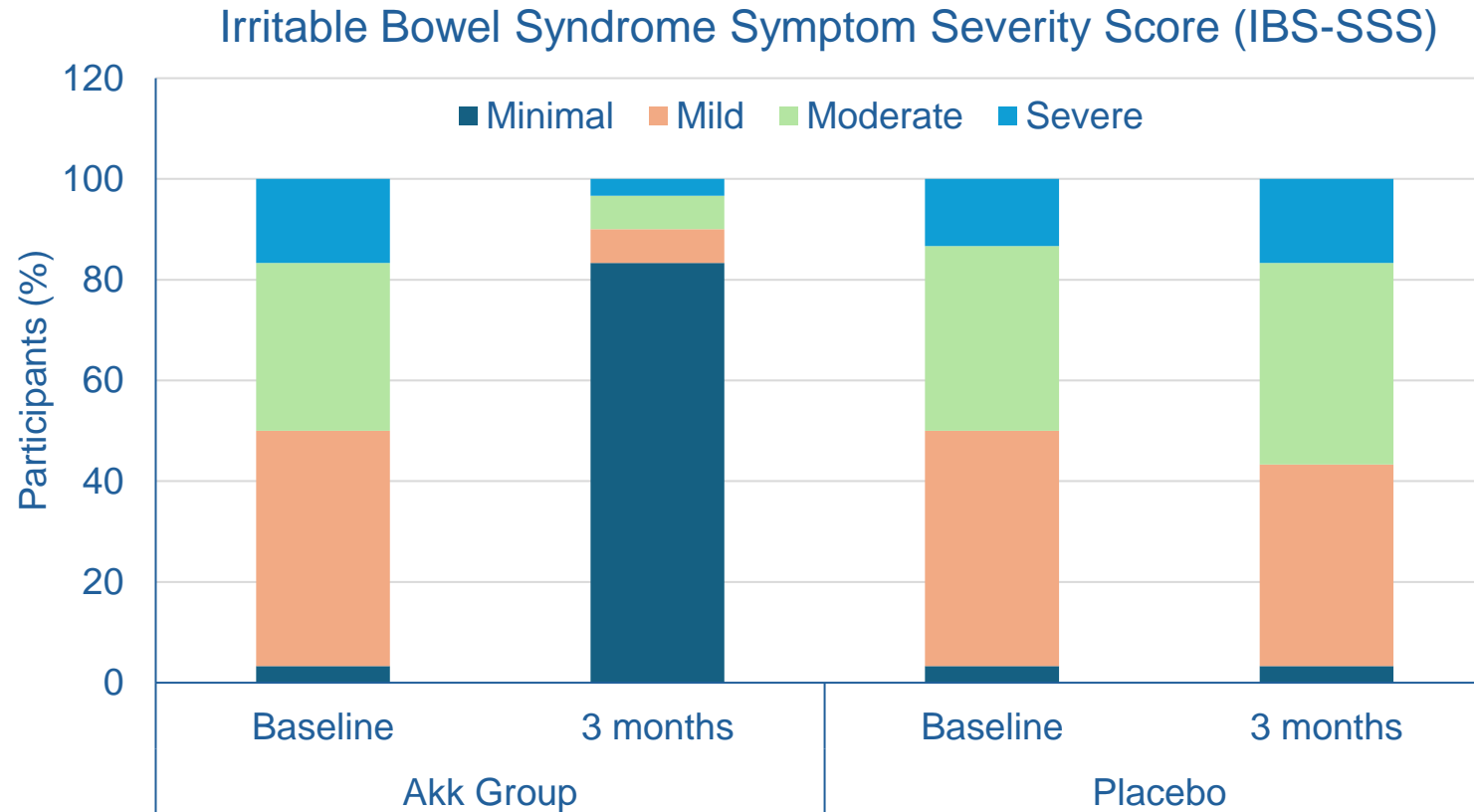
Score

0
1
2
3
4

Incidents

never
1 time per week
2 to 3 days per week
4 to 6 days per week
every day during the week

5B CFU Akkermansia Supplementation improves IBS symptoms



The Irritable Bowel Syndrome Symptom Severity Score (IBS-SSS) is a valuable tool used to assess the severity of symptoms in individuals with IBS. It evaluates IBS criteria such as pain severity, pain frequency, bloating, bowel dysfunction, and quality of life.

Clinical Study on Cognitive Functions: 7 B CFU

Study Design

- 7B CFU of Akkermansia muciniphila daily supplementation
- During the 3 visits over the 2 months of the study, participants will take part in:

Reaction Time Measurement

- Reaction time will be measured using a computerized reaction test following acute stress. Scores will be compared from Day 1 to 60.

Accuracy Testing

- Accuracy on computerized testing will reveal alertness. Scores will be compared from Day 1 to 60.

Vitals and physical examination

Cognitive Control and Flexibility Questionnaire (CCFQ)

- Self-reported cognitive control and flexibility will be determined through the Cognitive Control and Flexibility Questionnaire (CCFQ).

Anxiety/Sleep Questionnaire

- Depression, Anxiety, and Stress Scale Short Form (DASS-21) and Pittsburgh Sleep Quality Index (PSQI) will provide insight into sleep and stress levels.

vidya



Clinical Study on Glucose and Cholesterol Profile Reduction: 10 B CFU

Study Design

- 10B CFU of Akkermansia muciniphila daily supplementation
- During the 3 visits over the 3 months of the study, participants will take part in:

Hematological and hepatic biomarkers

- Fasting blood sugar levels, post-prandial blood sugar levels, HbA1c, and lipid profile will be compared from Day 1 to 90.

Insulin Sensitivity and Secretion

- Insulin sensitivity measures how much insulin is required to lower blood glucose. Insulin secretion measures how much insulin leaves the pancreas to enter the bloodstream. These parameters are compared from Day 1 to 90.

Physique Changes

- Body weight, body mass index, and waist circumference will be evaluated and compared on Day 1 and 90.

Blood Pressure

- Systolic blood pressure and diastolic blood pressure will be measured at baseline and Day 90 with a digital sphygmomanometer three times in each arm to get an average.



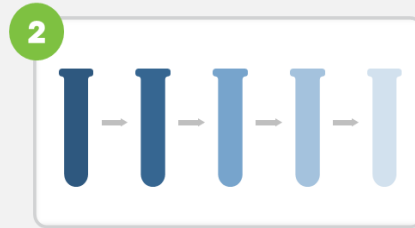
vidya

Akkermansia Muciniphila Testing

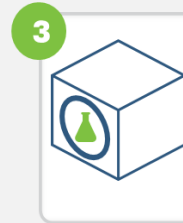
Microencapsulated Akkermansia Enumeration and PCR Identification Testing



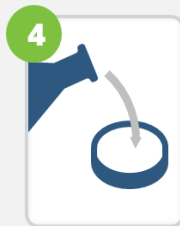
1 gram of AM to 99mL of sterile 0.1% Peptone Water. Homogenize then shake



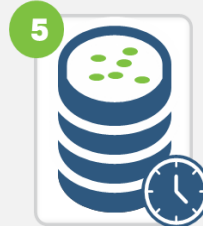
Serial dilution in 0.1% Peptone Water



3 Sterilize BHI agar and add mucin and cysteine-HCl



Once cooled, Agar solution put into petri dishes



Diluted AM to the agar-filled petri dish. Incubate anaerobically at 37°C for 96 hours.



Unique code expected by September. For now, refer to **[JLSPC] Probiotic enumeration by Vidya method for Akkermansia**



Use code **AkkVid Method** to complete enumeration testing for Akkermansia

Delivery Formats

Ensure Live Form with Maximum Protection:



Capsules:

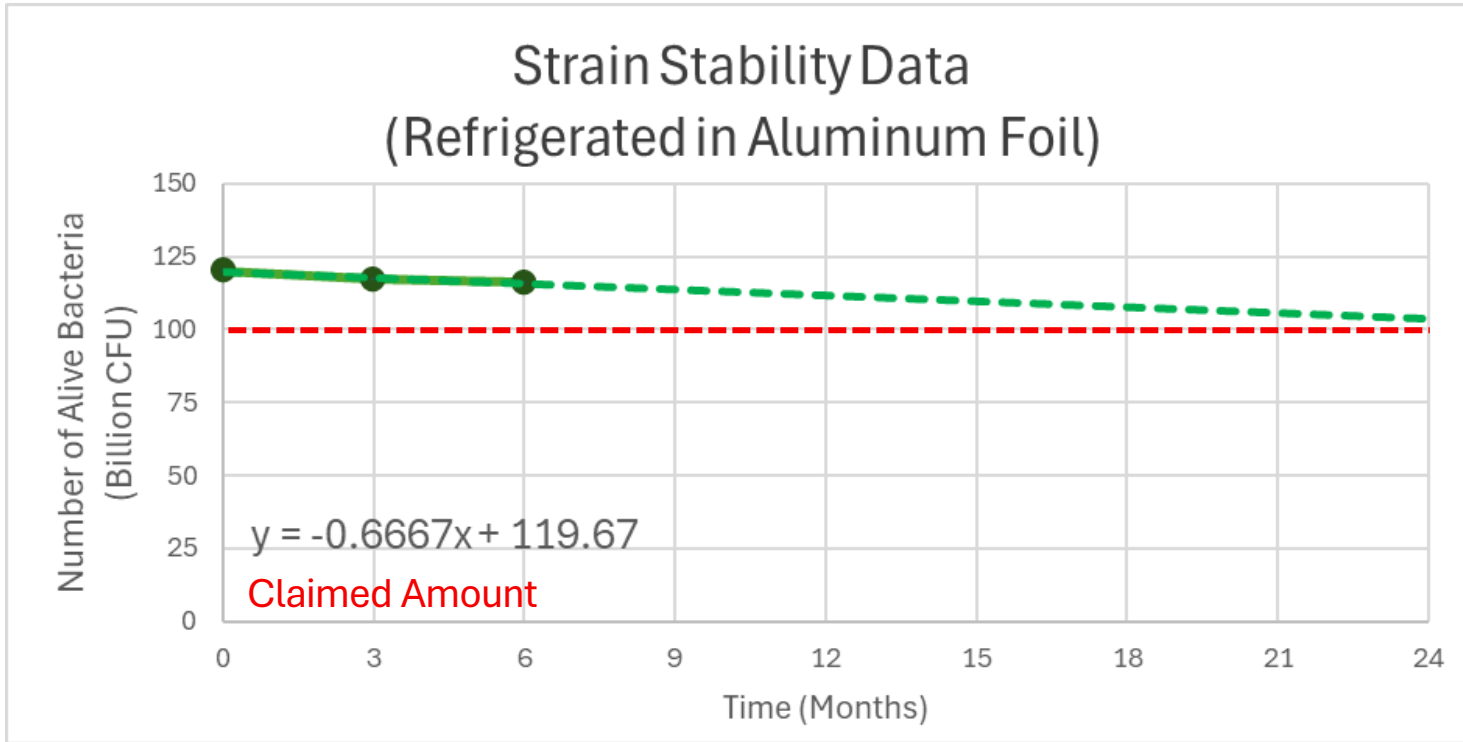
Desiccated CSP bottles minimize moisture and light transmission



Stick Packs:

Desiccated aluminum foil films ensure lower water activity throughout the shelf life

Refrigerated in Aluminum Foil

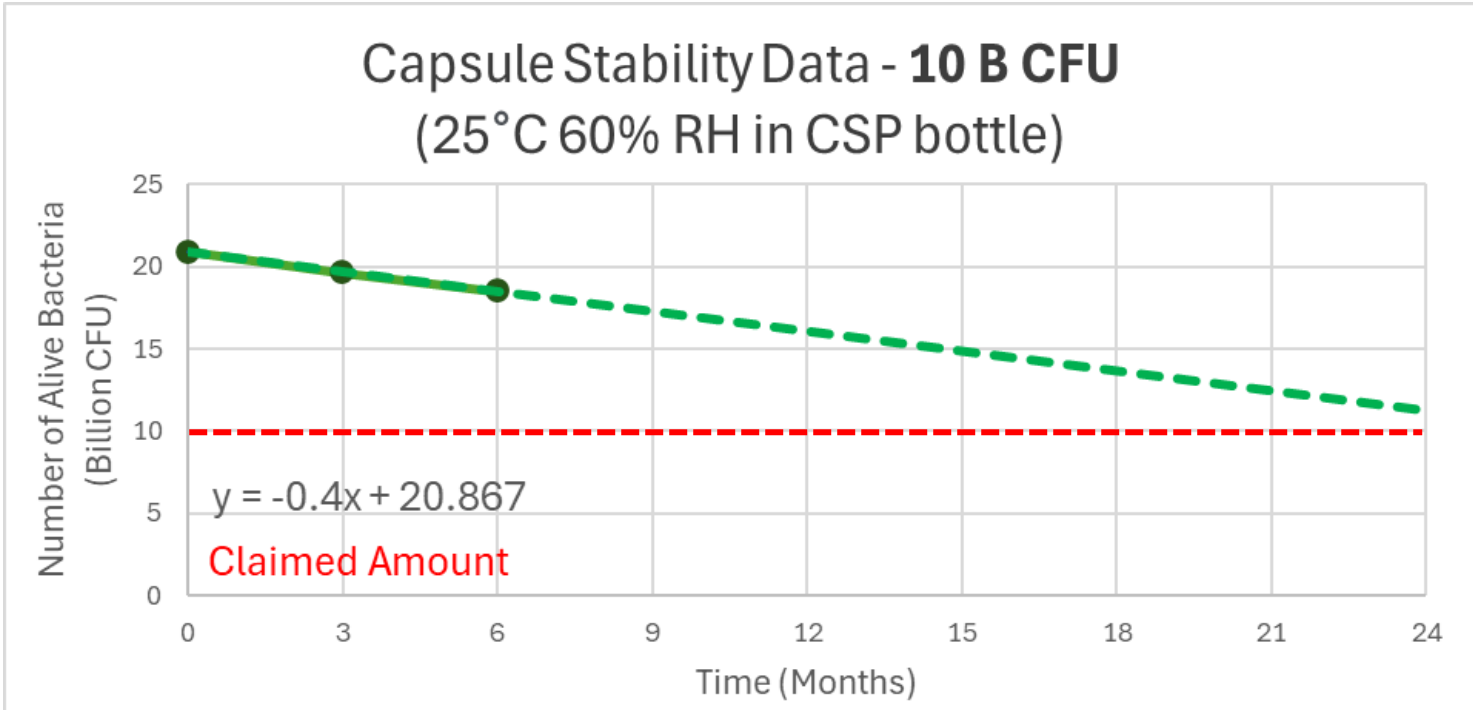


These Stability curves will clarify recommended overages, the probiotic stability, and how it interacts with other excipients.

Powder		
Refrigerated in Aluminum Foil		
Manufacturing Amount: 120 B CFU		
Months	Billion CFU	Water Activity (A _w)
1	120	0.06
3	117	0.08
6	116	0.08
9	113.6*	
12	111.6*	
15	109.6*	
18	107.6*	
21	105.6*	
24	103.6*	

* Predicated Data from Kinetics Study

25°C and 60% RH Stability in Capsules



These Stability curves will clarify recommended overages, the probiotic stability, and how it interacts with other excipients.

Capsule		
25°C and 60% RH		
Manufacturing Amount: 20 B CFU		
Months	Billion CFU	Water Activity (A _w)
0	20.9	0.15
3	19.6	0.18
6	18.5	0.17
9	17.3*	
12	16.1*	
15	14.9*	
18	13.7*	
21	12.5*	
24	11.3*	

* Predicated Data from Kinetics Study

Self-Affirmed GRAS Update

Process:

- ✓ Strain Identification
- ✓ Alignment to ATCC BAA-835 Strain
- ✓ Clinical trials
- ✓ Toxicity data
- ✓ Manufacturing process
- ✓ Stability

Submission under review to ensure its safety for our customers

Non-GMO verification are in process





Unlocking Akkermansia: A New Era in Probiotics

Dr. Rishi Raj Trivedi, PhD
Global Commercial Director, Probiotics

