



**ARNA Genext**  
Solutions Pvt Ltd

# GUT MICROBIOME REPORT



**Detailed Report:  
Test Report + Dietary Recommendations**

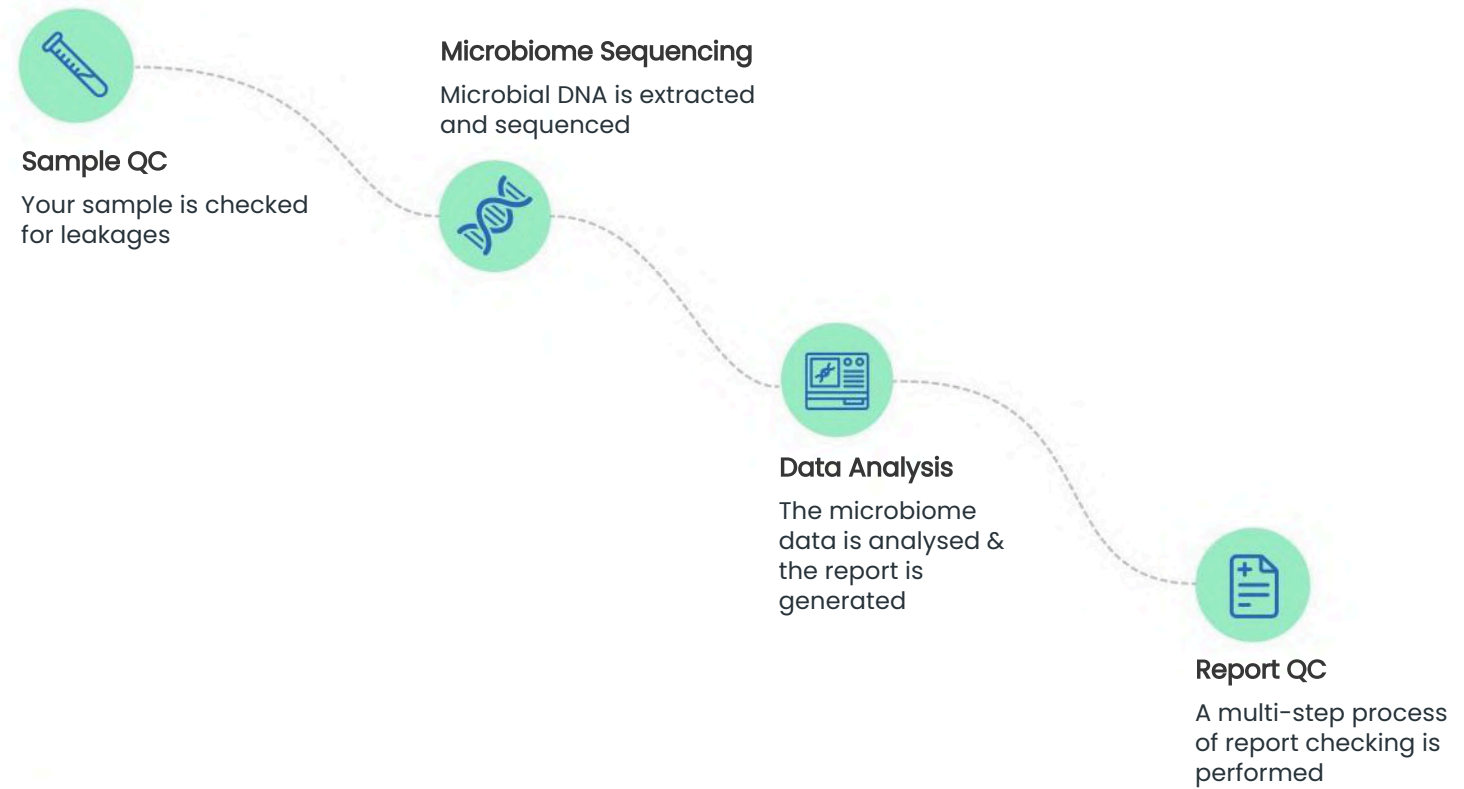
POWERED BY  
 **BugSpeaks**<sup>®</sup>

# We are a team of healthcare experts, scientists, researchers and engineers.

BugSpeaks report is researched and developed by Leucine Rich Bio, South Asia's first microbiome company. The company is a recipient of multiple awards such as Frost and Sullivan, National startup award (Govt. of India), Super Startup Asia award etc.



## What we do once we get your sample?



# Summary Report

This is your BugSpeaks® Gut Microbiome Summary Report. With this report, our endeavour is to provide key insights, with the hope that it will guide you to better understand your health and make necessary changes to your lifestyle to lead a healthier life. You can always refer our complete Scientific Report for a more detailed evidence-based interpretation of your gut microbiome data.

We have categorized the report into following sections:



**Please Note:**

1. This is not a diagnostic report and should be interpreted or used exclusively by or under the guidance of a practitioner, including but not limited to, certified physicians, clinicians, dietitians, nutritionists, sports therapists, and such other persons in similar profession having appropriate validation to undertake such practice. (Please See Disclaimers).





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# SUMMARY REPORT

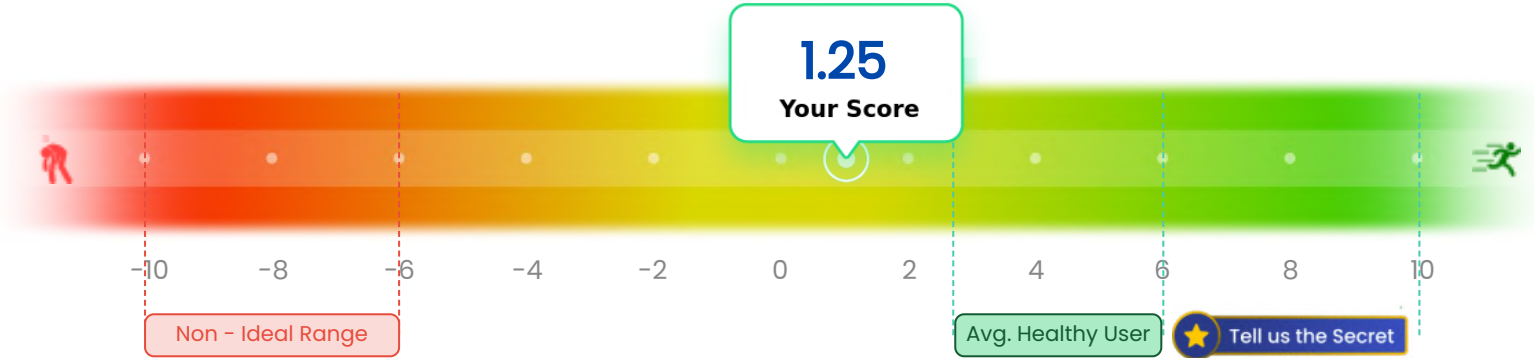


A one page report on your overall gut health,  
the probiotics you require & pathogen  
presence.

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# Rych Index – Your Gut Health Score

Scores in the Green Range represents a Healthy Gut and in the Red Range represents an Unhealthy Gut. Know More about "Rych Index" within the FAQ Section.



## Probiotics – The Good Microbes

You may require supplements that contain these probiotics. For more details please read the detailed report.



**Supplementation Needed**

- Bifidobacterium animalis
- Lactobacillus bulgaricus
- Lactobacillus delbrueckii
- Bacillus indicus
- Bacillus clausii
- Lactobacillus gasseri
- Saccharomyces boulardii
- Lactobacillus helveticus
- Lactobacillus caucasicus
- Limosilactobacillus fermentum
- Levilactobacillus brevis
- Lactocaseibacillus casei
- Bifidobacterium infantis
- Lactobacillus lactis
- Lactobacillus pnetosus
- Leuconostoc mesenteroides

## Pathogen – The Bad Microbes

The following "pathogens" abundance was found to be more than the average healthy individuals. Please correlate clinically and follow recommendations. For more details please read the detailed report.



**Follow Nutrition Guidelines**

- Candida tropicalis
- Blastocystis hominis



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# DETAILED REPORT

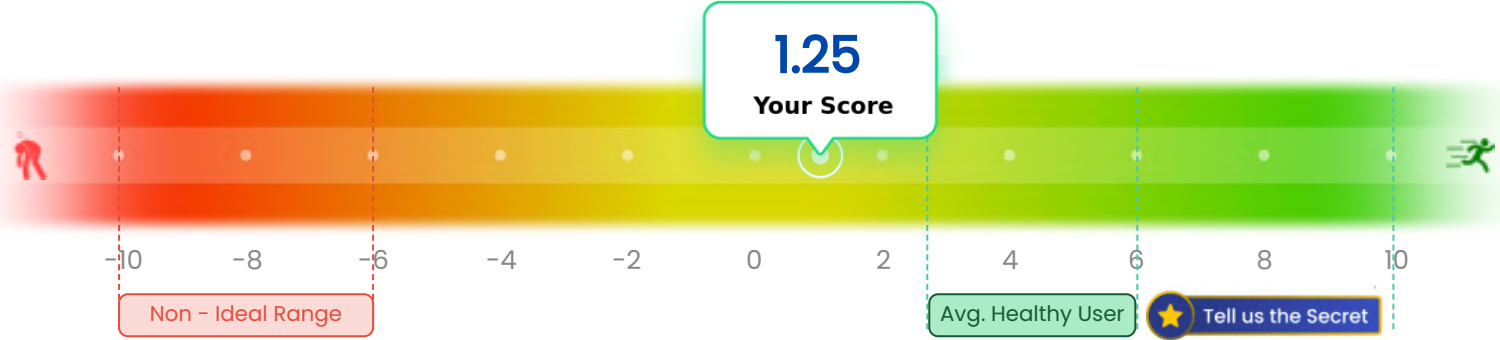


A detailed report of your gut microbiome.

POWERED BY  
 BugSpeaks®

# Rych Index – Your Gut Health Score

Rych Index is a proprietary algorithm based output that tends to indicate the overall gut health with respect to the microbiota profile. Various parameters such as abundance, diversity and richness have been used to come up with the Rych Index score. Know more about the 'Rych Index' in the FAQ section (Microbiome handbook section).



Pictorial graph representation of various components of your microbiome. Green colour represents healthy / good / favorable, red colour represents unhealthy / bad / unfavorable.

## Category Tag

BugSpeaks Diversity	Above Average
Kingdom Distribution	Non-Ideal
Foundation Microbiota	Average
Probiotic Characterization	Average
Pathogen Characterization	Average
Antibiotic Resistance	Ideal
Antibiotic Recovery Potential	Above Average
SCFA Production	Non-Ideal
Vitamin Production	Average
Neurotransmitters	Non-Ideal
Propensity to Disease Development	Average



# Bugspeaks Diversity

Category Tag

Above Average

This is a proprietary diversity score developed by us taking into consideration individual kingdom diversities and internal data analysis of healthy and unhealthy.

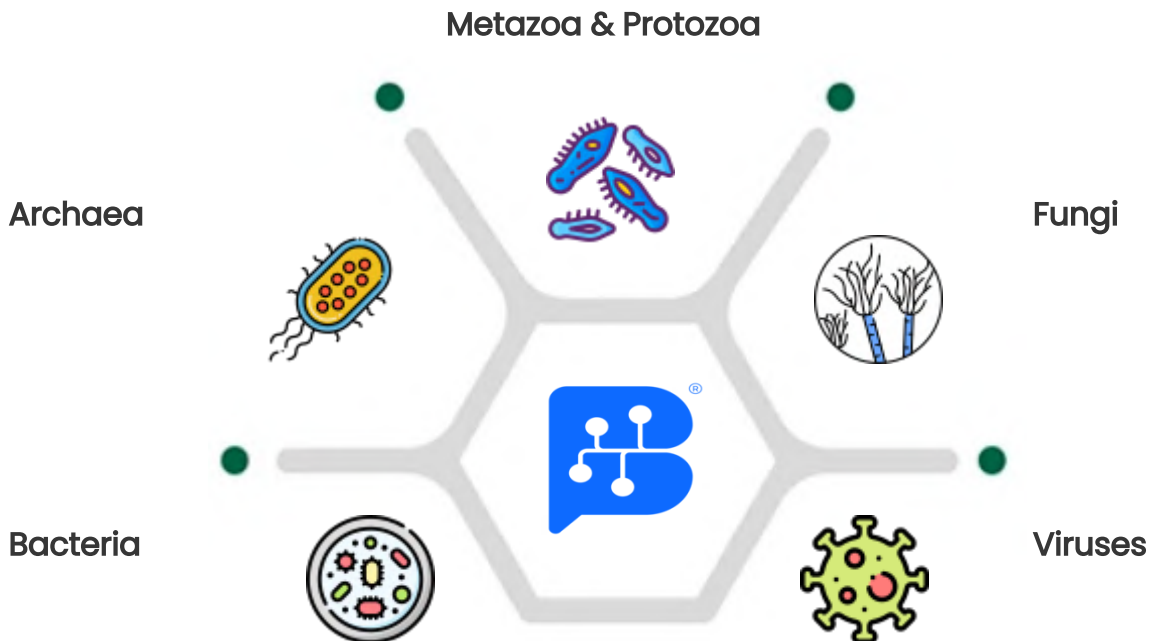
# Kingdom Distribution

Category Tag

Non-Ideal

Composition of gut microbiome is defined by 4 major groups of microorganisms - Bacteria, Archaea, Virus and Eukaryota (Fungi, Protozoa and Metazoa). Below is a representation highlighting these 4 groups, its corresponding abundance and what it means to you, in context of gut microbiome.

Kingdom Distribution	Range(%)	Your Sample Value	Tag
Bacteria	97.94% - 99.07%	99.732%	Atypical
Fungi	0.36% - 0.86%	0.134%	Atypical
Metazoa & Protozoa	0.21% - 0.51%	0.081%	Atypical
Archaea	0.11% - 0.28%	0.018%	Atypical
Viruses	0.25% - 1.06%	0.035%	Atypical





# Top Abundant Species

Top abundant species of Bacteria in your sample			
Prevotella copri	19.905 %	Ruminococcus sp. NSJ-71	2.951 %
Faecalibacterium prausnitzii	5.14 %	Prevotella stercorea	2.89 %
Coprococcus comes	3.602 %	Roseburia inulinivorans	2.663 %
Coprococcus sp. OM04-5BH	3.537 %	Ruminococcus sp. BSD2780120874_150323_B10	2.643 %
Prevotellamassilia timonensis	3.311 %	Dorea longicatena	2.036 %
Top abundant species of Archaea in your sample			
Halapricum sp. CBA1109	0.004 %	Methanotherix thermoacetophila	0.004 %
Halobellus captivus	0.004 %	Sulfolobus islandicus	0.004 %
Halorubrum kocurii	0.004 %		
Methanobrevibacter smithii	0.004 %		
Methanococcoides methylutens	0.004 %		
Top abundant species of Eukaryota in your sample			
Blastocystis hominis	0.012 %	Entamoeba invadens	0.004 %
Plasmodium chabaudi	0.012 %	Entamoeba nuttalli	0.004 %
Theileria orientalis	0.008 %	Leishmania mexicana	0.004 %
Toxoplasma gondii	0.008 %	Saprolegnia parasitica	0.004 %
Emiliana huxleyi	0.004 %	Trypanosoma rangeli	0.004 %
Top abundant species of Viruses in your sample			
crAssphage cr85_1	0.016 %	crAssphage cr7_1	0.004 %
crAssphage cr124_1	0.008 %	crAssphage cr131_1	0.004 %
uncultured crAssphage	0.004 %	Melanoplus sanguinipes entomopoxvirus	0.004 %
crAssphage cr11_1	0.004 %		
crAssphage cr52_1	0.004 %		
Top abundant species of Fungi in your sample			
Saccharomyces cerevisiae	0.02 %	Tetrapisispora blattae	0.008 %
Candida tropicalis	0.012 %	Aaosphaeria arxii	0.004 %
Botrytis deweyae	0.008 %	Aspergillus pseudotamarii	0.004 %
Melampsora larici-populina	0.008 %	Hirsutella rhossiliensis	0.004 %
Rhizophagus irregularis	0.008 %	Letharia columbiana	0.004 %

**Please Note:** All values are % relative abundances.

# Foundation Microbiota

Category Tag

Average

Perturbations of these keystone species can have large effects on the overall microbiome. If any keystone species is in atypical range, please strictly follow the dietary recommendations. Know More about "Foundation Microbiota" within the FAQ Section.

Keystone Species	Relative Abundance Range(%)	Your Sample Value	Conclusion
Akkermansia muciniphila	0.003% - 0.014%	0.02%	Typical
Bifidobacterium longum	1.142% - 3.743%	0.097%	Atypical
Faecalibacterium prausnitzii	0.235% - 3.008%	5.14%	Typical
Roseburia intestinalis	0.285% - 0.690%	0.826%	Typical
Ruminococcus bromii	0.061% - 0.171%	0.344%	Typical
Lactobacillus helveticus	0.003% - 0.010%	0.000%	Atypical
Lactobacillus delbrueckii	0.004% - 0.013%	0.004%	Typical
Lacticaseibacillus paracasei	0.004% - 0.014%	0.008%	Typical
Ligilactobacillus salivarius	0.005% - 0.011%	0.016%	Typical
Limosilactobacillus fermentum	0.006% - 0.019%	0.000%	Atypical
Limosilactobacillus reuteri	0.007% - 0.021%	0.004%	Atypical
Lactiplantibacillus mudanjiangensis	0.028% - 0.099%	0.012%	Atypical
Limosilactobacillus mucosae	0.044% - 0.200%	0.004%	Atypical
Lacticaseibacillus rhamnosus	0.047% - 0.102%	0.077%	Typical
Ligilactobacillus ruminis	0.273% - 0.586%	1.631%	Typical

# Probiotic Characterization

Category Tag

Average

BugSpeaks® identifies and characterizes many probiotics commonly known to be present and beneficial to gut health. These probiotics are reported with "indicative tags", which can be interpreted as described below.

**Supplementation Needed** - These probiotics were found either absent or very less in abundance in your sample.

**Follow Recommendation** - These probiotics were found to be present but less abundant.

**Follow your current diet** - These probiotics were present in adequate abundance in your sample.



## Supplementation Needed

- Bifidobacterium animalis
- Lactobacillus bulgaricus
- Lactobacillus delbrueckii
- Bacillus indicus
- Bacillus clausii
- Lactobacillus gasseri
- Saccharomyces boulardii
- Lactobacillus helveticus
- Lactobacillus caucasicus
- Limosilactobacillus fermentum
- Levilactobacillus brevis
- Lacticaseibacillus casei
- Bifidobacterium infantis
- Lactobacillus lactis
- Lactobacillus pnetosus
- Leuconostoc mesenteroides



## Follow Recommendations

- Bifidobacterium longum
- Bacillus subtilis
- Bifidobacterium breve
- Limosilactobacillus reuteri
- Bifidobacterium adolescentis



## Follow your Current Diet

- Bifidobacterium lactis
- Lacticaseibacillus paracasei
- Saccharomyces cerevisiae
- Streptococcus thermophilus
- Bifidobacterium bifidum
- Bacillus coagulans
- Lactobacillus johnsonii
- Ligilactobacillus salivarius
- Lacticaseibacillus rhamnosus
- Lactiplantibacillus plantarum
- Lactobacillus acidophilus
- Akkermansia muciniphila
- Enterococcus durans

# Pathogen Characterization

Category Tag

Average

BugSpeaks® identifies and characterizes many pathogens commonly known to cause gut infections and other health issues. These pathogens are reported with "indicative tags", which can be interpreted as described below. This is not a diagnostic and are not correlated clinically with cfu/ug. Know More about "Pathogen Characterization" within the FAQ Section.

- Nothing to Worry
- Please follow recommendations and if any symptoms present then correlate clinically and consult a doctor.

Species	Species
<b>Bacterial Pathogens / Primary Pathogens</b>	<b>Opportunistic Bacteria</b>
Campylobacter jejuni	Bacillus cereus
Clostridioides difficile	Enterococcus faecalis
Escherichia coli	Enterococcus faecium
Helicobacter pylori	Listeria monocytogenes
Salmonella enterica	Pseudomonas aeruginosa
Shigella dysenteriae	Staphylococcus aureus
Vibrio cholerae	Staphylococcus epidermidis
Yersinia enterocolitica	Staphylococcus saprophyticus
<b>Potential Autoimmune Triggers</b>	Streptococcus agalactiae
Klebsiella pneumoniae	Streptococcus pneumoniae
Mycobacterium avium	<b>Worms</b>
Proteus mirabilis	Giardia intestinalis
Citrobacter freundii	Necator americanus
Fusobacterium nucleatum	Trichuris trichiura
	Ancylostoma duodenale
	Ascaris lumbricoides



Species		Species	
<b>Protozoa</b>		<b>Fungi / Yeast</b>	
Blastocystis hominis	↑	Candida albicans	×
Chilomastix mesnili	×	[Candida] glabrata	×
Cryptosporidium	×	Candida tropicalis	↑
Dientamoeba fragilis	×	Candida parapsilosis	×
Endolimax nana	×	Pichia kudriavzevii	×
Entamoeba coli	×	Aspergillus fumigatus	×
Entamoeba histolytica	×	Aspergillus flavus	×
Pentatrichomonas hominis	×	Aspergillus niger	×
<b>Dysbiotic / Overgrowth Bacteria</b>		Aspergillus terreus	×
Citrobacter freundii	×	Aspergillus nidulans	×

**Disclaimer:**

1. This is not a diagnostic report. This is not a microbiology (culture based) report.
2. We quantify these pathogens using sequencing-based method, and hence represent quantity only as "% abundances" of these pathogens. Also, the "indicative tags" does not represent standard scientific notation such as colony forming units per gram of stool (CFU/g).
3. Please correlate clinically.

# Antibiotic Resistance

Category Tag

Ideal

Some bacteria are known to possess genes that can lead to resistance to antibiotics. Our algorithm based output provides information on possible antibiotic resistance based on the genomic analysis of the sample. This is not a microbiological assay based output and hence clinical validation is necessary.

Antibiotic Name		Antibiotic Name	
Amikacin	Susceptible	Ceftriaxone	Susceptible
Aminocoumarin	Susceptible	Cephalothin	Susceptible
Amoxicillin	Susceptible	Cephamycin	Susceptible
Amoxicillin+Clavulanic_Acid	Susceptible	Ciprofloxacin	Susceptible
Ampicillin	Susceptible	Clindamycin	Susceptible
Ampicillin+Clavulanic_Acid	Susceptible	Colistin	Susceptible
Avilamycin	Susceptible	Dalfopristin	Susceptible
Azithromycin	Susceptible	Diaminopyrimidine	Susceptible
Aztreonam	Susceptible	Doxycycline	Susceptible
Benzalkonium_Chloride	Susceptible	Elfamycin	Susceptible
Bicyclomycin	Susceptible	Ertapenem	Susceptible
Bleomycin	Susceptible	Erythromycin	Susceptible
Carbapenem	Susceptible	Florfenicol	Susceptible
Carbomycin	Susceptible	Fosfomycin	Susceptible
Cefepime	Susceptible	Fusidic_Acid	Susceptible
Cefixime	Susceptible	Gentamicin	Susceptible
Cefotaxime	Susceptible	Glycylcycline	Susceptible
Cefotaxime+Clavulanic_Acid	Susceptible	Hygromycin	Susceptible
Cefoxitin	Susceptible	Imipenem	Susceptible
Ceftazidime	Susceptible	Isoniazid	Susceptible
Ceftazidime+Avibactam	Susceptible	Kanamycin	Susceptible

# Detailed Report

Antibiotic Name		Antibiotic Name	
Kasugamycin	Susceptible	Spectinomycin	Susceptible
Lincomycin	Susceptible	Spiramycin	Susceptible
Lincosamide	Susceptible	Streptomycin	Susceptible
Linezolid	Susceptible	Streptothricin	Susceptible
Meropenem	Susceptible	Sulfamethoxazole	Susceptible
Methicillin	Susceptible	Teicoplanin	Susceptible
Minocycline	Susceptible	Telithromycin	Susceptible
Monobactam	Susceptible	Temocillin	Susceptible
Mupirocin	Susceptible	Tetracenomycin	Susceptible
Nalidixic_Acid	Susceptible	Tetracycline	Susceptible
Nitrofurantoin	Susceptible	Thiostrepton	Susceptible
Nitroimidazole	Susceptible	Tiamulin	Susceptible
Oleandomycin	Susceptible	Ticarcillin	Susceptible
Penicillin	Susceptible	Ticarcillin+Clavulanic_Acid	Susceptible
Phenicol	Susceptible	Tigecycline	Susceptible
Piperacillin	Susceptible	Tobramycin	Susceptible
Piperacillin+Tazobactam	Susceptible	Tobramycin	Susceptible
Pleuromutilin	Susceptible	Triclosan	Susceptible
Pristinamycin_la	Susceptible	Trimethoprim	Susceptible
Pristinamycin_lia	Susceptible	Tylosin	Susceptible
Quinupristin	Susceptible	Vancomycin	Susceptible
Quinupristin+Dalfopristin	Susceptible	Viomycin	Susceptible
Rhodamine	Susceptible	Virginiamycin_M	Susceptible
Rifampin	Susceptible	Virginiamycin_S	Susceptible
Rifamycin	Susceptible	Zorbamycin	Susceptible

# Microbiota Recovery Potential Post Antibiotic Course

Category Tag

Above Average

Antibiotics are known to disrupt the microbiota ecosystem dramatically. Research suggest that recovery of the microbial ecosystem may be dependent on few species of bacteria among other factors. Our proprietary matrix and algorithm-based output predicts the microbiota recovery potential after a course of antibiotics. Know More about "Microbiota Recovery Potential" within the FAQ Section.

- Poor potential to recover to a good microbiota
- Good potential to recover to a good microbiota



**Please Note:**

This is not a diagnostic conclusion and clinical relevance is yet to be ascertained



## SCFA Production Potential

Category Tag	Non-Ideal
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Short Chain Fatty Acids improve the gut health through a number of local effects, ranging from maintenance of intestinal barrier integrity, mucus production, and protection against inflammation. Our proprietary algorithms based output suggests the following status of SCFA production in your gut based on your gut microbiota profile.

SCFA Production Potential	
Butyrate	Non-Ideal
Propionate	Non-Ideal
Acetate	Non-Ideal

## Vitamin Production Potential

Category Tag	Average
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The gut microbiota produce a variety of vitamins. Our proprietary algorithms based output suggests the following status of vitamin production in your gut based on your gut microbiota profile. Please follow your clinician, nutritionist's advice.

Vitamin Production Potential	
Vitamin B7	Ideal
Vitamin B12	Non-Ideal
Vitamin A	Ideal
Vitamin B2	Non-Ideal

## Neurotransmitters

Category Tag	Non-Ideal
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Gut microbiome produce neurotransmitters such as serotonin, dopamine and GABA, all of which play a key role in mood and other brain functions. Our proprietary algorithms based output suggests the following status of neurotransmitter production in your gut based on your gut microbiota profile. This has not been clinically validated.

Neurotransmitters	
Norepinephrine	Non-Ideal
Serotonin	Non-Ideal
Noradrenaline	Non-Ideal
Tryptophan *	Non-Ideal
Acetylcholine	Ideal
Dopamine	Non-Ideal
GABA	Non-Ideal
Histamine	Ideal

**Please Note:** \* Tryptophan is a precursor of many neurotransmitters.

# Propensity to Disease Development

Category Tag

Average

The disease susceptibility index is based on our patent pending algorithm and matrix. Briefly, microorganisms in the gut are linked to various diseases. We have developed technology to assess the vulnerability of an individual to various diseases based on the gut microbiota profile. Know More about "Propensity to Disease Development" within the FAQ Section.

Gut Related Diseases			
Inflammatory Bowel Disease	Low Risk	Clostridium Difficile Infection	Low Risk
Irritable Bowel Syndrome	Low Risk	Colorectal Neoplasm	Low Risk
Leaky Gut	Low Risk	Constipation	Low Risk
Obesity	Low Risk	Crohns Disease	Low Risk
Ulcerative Colitis	Low Risk		
Lifestyle Diseases & Traits			
Aerobic Endurance	Unfavorable	Diabetes Mellitus Type 2	Low Risk
Muscle Strength	Favorable	Hypertension	Low Risk
Physical Endurance	Favorable	Sleep	Unfavorable
Prone to Fatigue	Unlikely		
Other Diseases			
Depression	Moderate Risk	Anxiety	Moderate Risk
Non-Alcoholic Fatty Liver Disease	Low Risk	Atherosclerosis	Low Risk
Rheumatoid Arthritis	Moderate Risk	Chronic Kidney Disease	Low Risk

**Disclaimer:**

This is not a diagnostic report, but an algorithm-based susceptibility score based on the gut microbiota profile. Please correlate clinically. This indicates only susceptibility and not actual disease, hence this does not mean that individuals with diseases under low risk category will not clinically manifest the diseases or individuals with high disease risk will clinically manifest those diseases, as there are many factors apart from the gut microbiota that may result in the disease outcome.



**ARNA Genext**  
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# NUTRITIONAL REPORT



**3 Phase (12 Week) Nutritional & Dietary  
Recommendations.**

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 **BugSpeaks®**

# Dietary Recommendations

Our approach to restore the gut balance is based on a three stage strategy:

## Phase 1 Restoring your gut microbiome – 2 Weeks

Involves restoration or resetting of your gut microbiome, where we minimize the composition and abundance of pathogenic or opportunistic microorganisms, to create a gut environment ideal for beneficial microorganisms to grow in Phase 2. This phase requires strict changes in your diet for a short period of time and supplementation with anti-inflammatory foods, natural antibiotics, and through restriction of selected inflammatory foods.

## Phase 2 Rebuilding your microbiome – 8 Weeks

Involves rebuilding of your healthy gut microbiome, through re-inoculation and replacement with mostly beneficial microorganisms. We achieve this through incorporation of prebiotics and probiotics, via natural dietary sources and commercially available supplements. This lasts for up to 10th week of your diet plan (a total of 8 weeks), which ensure the complete restoration of your gut microbiota.

## Phase 3 Maintaining the healthy gut – 2 Weeks

Largely involves a streamlined method for sustaining the healthy gut microbiome built during phase 2. These dietary, prebiotic and probiotic recommendations can be adopted for long term sustenance, spanning up to 2 weeks of your diet plan.

All 3 phases have a total of 6 food categories, each containing a list of foods and a frequency tag. We have used a total of 4 frequency tags that indicates how frequently you can include a specific food in your meal plan.

-  can be consumed everyday [in 1 meal/day]
-  can be consumed once in 3 days [in 1 meal/3 days]
-  can be consumed every alternate day [in 1 meal/2 days]
-  Avoid the consumption as much as possible

Please Note:

These recommendations are largely beneficial, with no or minimal negative impact on your health. Even though these dietary charts are evidence based recommendations, we would strongly suggest you to consult a physician/nutritionist, before implementing these in your lifestyle. This is specifically true about the extent of inclusion and exclusion of a specific food and for individuals who are either diabetic, hypertensive and/or having special dietary needs.



## General Guidelines

- **Dietary Plan:** Tailored to your current state of gut microbiome only. It does not consider your genetics or other major health conditions.
- **Meal Quantities:** Are approximates and for informational purposes only. For a more personalized guidance, please consult a healthcare professional.
- **Milletts:** Start with small quantities, one type at a time. Soak overnight before cooking, especially if you are trying millets out for the first time.
- **Exercise:** Essential to adhere to a comprehensive regimen for optimal results. Try to engage in at least 30 minutes of moderate physical activity each day.
- **Hydration:** The diet recommended has high fibre content. Please, consume minimum 2 litres of water daily.
- **Sleep:** Aim for a minimum 7 hours of quality sleep each night for good gut health.

## Medications & Supplementations

- **Antibiotic / Antacid Course:** Complete full course before initiating dietary recommendations.
- **Supplements:** Recommendations based on gut microbiome report, decision rests with you with regard to the brand or product of choice. we do not endorse or cannot prescribe any specific supplement.
- **Probiotic Supplement:** It's common to experience mild stomach discomfort [like bloating or gassy movements] when you start taking probiotics supplementation. Discontinue and consult healthcare provider if discomfort persists for more than a week.
- **Healthcare Advisor:** Keep them informed and seek their guidance before implementing significant lifestyle changes.

## Are you Diabetic? or are you at Moderate or High Risk for Diabetes on Page-15?

- **Sweetened Beverages:** Avoid these regardless of the source (jaggery, sugar, honey). Refrain from probiotics with added sugars.
- **High-Carbohydrate Foods:** Limit foods like rice, whole wheat, and millets to 25% of your meal.
- **Plate Meal Method:** Refer to the shared image below for guidance.
- **Protein-Rich Foods:** Prioritize tofu, sprouts, legumes, peanuts, eggs, chicken and fish, along with salads before consuming grains like rice, roti, or millets during each meal.
- **Early Dinners:** Opt for these to aid digestion and prevent elevated fasting glucose levels.
- **Insulin Usage:** Follow the provided meal plan under the guidance of your healthcare expert.
- **Medications:** Do not alter or discontinue any medications or dosages without consulting your clinician.

## HEALTHY EATING TIPS



### Are you suffering from IBS or IBD? or are you at Moderate or High Risk for IBS or IBD on Page-15?

- **FODMAP Foods:** FODMAP Stands for "Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols". Select low FODMAP foods in phases 1 and 2 to prevent symptom flare-ups. Gradually introduce high FODMAP foods in phase 3 to assess tolerance.
- **Trigger Foods:** Reintroduction of suspected trigger foods should be supervised by a qualified dietitian or nutritionist.
- **Some Avoids:** Dairy products (except buttermilk/curd), wheat-based products, and barley are pro-inflammatory and can exacerbate symptoms. Avoid sugary or packaged juices and beverages.
- **Food Diary:** Maintain this to identify food triggers. Eliminate them for two phases, then gradually reintroduce in phase 3, but continue to avoid dairy and gluten.

### Are you suffering from any Autoimmune conditions? or are you at Moderate or High Risk for Rheumatoid Arthritis on Page-15?

- **Dietary Restrictions:** Avoid dairy products (except curd/buttermilk) and gluten-containing foods.
- **Lifestyle Factors:** Prioritize good sleep, regular exercise, and stress management, in addition to dietary adjustments. Try to swim frequently, along with yoga.
- **Food Diary:** Maintain this to identify food triggers. Eliminate them for two phases, then gradually reintroduce in phase 3, but continue to avoid dairy and gluten.

## Re-Test

*Recommended after 4 months to assess improvement and for a refined dietary recommendations and meal plan for long term implementation.*

# Greens & Vegetables

Items				Items			
	Phase 1	Phase 2	Phase 3		Phase 1	Phase 2	Phase 3
Ash Gourd				Cucumber			
Beet Root				Drumstick			
Bengal Gram				Fenugreek Leaves			
Bitter Gourd				Field Bean			
Bottle Gourd				French Beans			
Brinjal				Gogu Leaves			
Broad Beans				Green Chillies			
Broccoli				Green Gram			
Cabbage				Green Peas			
Capsicum				Horse Gram			
Carrot				Kidney Beans			
Cauliflower				Knol			
Chickpeas				Ladies Finger			
Cho Cho				Moth Bean			
Cluster Beans				Mung Bean			
Cowpea				Mushrooms			

Items	Phase 1	Phase 2	Phase 3	Items	Phase 1	Phase 2	Phase 3
Onion				Snake Gourd			
Pigeon Pea				Spinach			
Pointed Gourd				Sweet Corn			
Potato				Sweet Potato			
Pumpkin				Tinda			
Radish				Tomatoes			
Ridge Gourd				Yam			

## Cereals, Herbs & Condiments

Items	Phase 1	Phase 2	Phase 3	Items	Phase 1	Phase 2	Phase 3
Almond				Coriander Leaves			
Asafoetida				Coriander Seeds			
Cardamom				Cumin Seeds			
Cashew Nut				Curry Leaves			
Cloves				Dates			
Coconut				Fenugreek Seeds			
Coconut Oil				Finger Millet			

Items				Items			
	Phase 1	Phase 2	Phase 3		Phase 1	Phase 2	Phase 3
Garlic				Pistachio Nuts			
Ghee				Poppy Seeds			
Ginger				Red Chilli Powder			
Ground Nut				Rice Bran Oil			
Honey				Rice Flakes			
Jaggery				Rice Puffed			
Kodo Millets				Semame Oil			
Little Millets				Sesame Seeds			
Maize				Shalgam			
Mint Leaves				Sunflower Oil			
Mustard Oil				Sunflower Seeds			
Mustard Seeds				Turmeric Powder			
Olive Oil				Walnut			
Palm Oil				Wheat			
Pearl Millet				Wheat Flour			
Pepper				White Rice			

# Fruits

Items	Phase 1	Phase 2	Phase 3	Items	Phase 1	Phase 2	Phase 3
Apple				Mosambi			
Banana				Muskmelon			
Custard Apple				Orange			
Fig				Papaya			
Goosberry				Pear			
Grapes				Pineapple			
Guava				Pomegranate			
Jack Fruit				Raisins			
Kala Jamun				Sapota			
Kokum				Strawberry			
Lychee				Watermelon			
Mango				Wood Apple			

# Egg & Meat

Items	Phase 1	Phase 2	Phase 3	Items	Phase 1	Phase 2	Phase 3
Beef				Catla			



Items	Phase 1	Phase 2	Phase 3	Items	Phase 1	Phase 2	Phase 3
Chicken				Prawns			
Crab				Rohu			
Egg				Salmon			
Goat				Sardine			
Haddock				Sheep			
Mussels				Trout			
Oysters				Tuna			
Pork				Turkey			

## Milk & Fermented Products

Items	Phase 1	Phase 2	Phase 3	Items	Phase 1	Phase 2	Phase 3
Butter Milk				Kombucha			
Cheese				Panner			
Soy Products				Sauerkraut			
Kefir				Shrikhand			
Kimchi				Yogurt			

## Processed Foods

Items	Phase 1	Phase 2	Phase 3	Items	Phase 1	Phase 2	Phase 3
Artificial Sweeteners				Ice Cream			
Bakery Breads				Milk Chocolate			
Burger				Noodles			
Cake				Pasta			
Cookies				Pastry			
Crackers				Pizza			
Dark Chocolate				Rolls			
French Toast				Sandwich			
Garlic Bread				Taco			

## Drinks & Beverages

Items	Phase 1	Phase 2	Phase 3	Items	Phase 1	Phase 2	Phase 3
Beer				Red Wine			
Carbonated Beverages				Soy Milk			
Distilled Alcoholic Beverages				Sugarcane Juice			
Milk Shakes				Tender Coconut			

# Supplements

## Probiotics

Probiotics are a set of beneficial microorganisms that help you metabolize the food you eat and have significantly positive impact on your overall gut health. Consuming foods or supplements rich in these probiotics will aid in restoring and maintaining a healthy gut in the long run. Below we have listed of probiotics species along with one example of its natural source.

Bifidobacterium animalis	Fermented dairy products	Limosilactobacillus fermentum	Fruits
Lactobacillus bulgaricus	Greek yogurt	Levilactobacillus brevis	Kimchi
Lactobacillus delbrueckii	Greek yogurt	Lacticaseibacillus casei	Fermented milk
Bacillus indicus	Soyabean Natto	Lactobacillus lactis	Cheddar cheese
Bacillus clausii	Fruit Juices	Lactobacillus pnetosus	Fermented dairy
Lactobacillus gasseri	Kimchi	Leuconostoc mesenteroides	Sauerkraut
Saccharomyces boulardii	Kefir	Limosilactobacillus reuteri	Kefir
Lactobacillus helveticus	Italian Cheeses	Bacillus subtilis	Tempeh & Miso
Lactobacillus caucasicus	Kefir & Cheese	Bifidobacterium breve	Fermented Vegetables

Also, these supplements are available for purchase through online retailers. Example of a probiotic supplement include RychBiome.

## Prebiotics

PREBIOTICS are a special form of dietary fibers that act as fertilizers for the probiotics in your gut (listed above). Below we have listed a set of prebiotics along with one example of its natural source.

Isomalto-oligosaccharides	Honey	Hemicellulosic oligosaccharide	Garlic
Arabinoxylan oligosaccharides	Cluster beans	Inulin	Onions
Dextran	Artichokes	Lactulose	Oats
Fructo-oligosaccharides	Sugar cane	Mannose and Galactose	Yogurt
Galacto-oligosaccharides	Bamboo shoots	Resistant starch	Rice bran

Also, these supplements are available for purchase through online retailers. Example of a Prebiotic supplement include Prebiotic D - a natural fiber to promote colon and gut health.

# Meal Plan Phase-1

The following meal plan is based on the personalized nutritional recommendation which in turn is based on your specific gut microbiota profile.

Time	Food Items/ Dishes	Portion Size
Early Morning 🕒 6:00 AM	Cumin seeds water	200ml
Breakfast 🕒 8:00 AM	Jowar upma with vegetables/Oats upma with vegetables (semi-solid consistency)	1 katori/1 bowl
	Sprouted moong dosa/chilla OR Mixed dal dosa with any veg curry	2 no, 1 katori
	Millet idli with drumstick-lobia sambar OR Millet dhokla with pudina chutney	3-4, 1katori/1 tbspc
	Poha with sprouted moong, carrot, onion, peanuts, pomegranate, 1 tsp roasted seed mix	1 katori
	Peas/Sattu/radish paratha with curd, pudina chutney (once a week)	2 medium, 1 katori, 1 tbspc
Mid-Morning 🕒 10:30 AM	Apple/ Banana/Fig/Gooseberry/Grapes/Kala Jamun/Kokum/Orange/Wood Apple OR	100g/ 1 no
	any seasonal fruit locally available, one variety everyday, Restrict Mousambi to once a week	100g/ 1 no
Lunch 🕒 1:00 PM	Millet masala veg Khichdi (using millet-Kodo/Little & mung dal), bhindi fry OR	1 katori each
	Jowar/Bajra bhakri with masoor palak dal and cauliflower sabzi, salad OR	2 no, 1 katori each
	White rice OR Methi-peas pulao with any legume curry + salad (1-2 times a week)	1 katori
	legume curry - Chickpea curry /Rajma curry/Field bean curry/Mung bean curry OR	1 medium katori
	Cow pea curry/Mothbean curry (Once in 2 days) Horsegram curry/Greengram curry (Once in 3 days)	1 medium katori
	Ash gourd/Brinjal/Broccoli/Pointed gourd/Snake gourd Sabji OR	1 Katori
	Bitter gourd/Bottle gourd/Broad beans/Cabbage/Cauliflower/Cluster beans /Drumstick/Methi/French beans/Knol/Ladies finger/Ridge gourd/Spinach/Tinda/Yam Sabji (Once in 2 days)	1 Katori
	Pumpkin/Mushroom/Sweet corn/Sweet Potato (restrict to 1-2 times a week)	1 Katori
	Salad- Beetroot/Carrot/Onion/Radish OR - can be grated/sliced/cut into sticks	few slices/sticks
	Salad- Cucumber/Tomato (Once in 2 days)	few slices/sticks

Time	Food Items/ Dishes	Portion Size
Evening 🕒 4:30 PM	Tender Coconut Water + puffed rice & peanuts OR roasted makhana with nuts and seeds	150ml, 1 small cup
	Sugarcane juice (1-2 times a week) with 5-6 soaked and peeled almonds	150 ml
Dinner 🕒 7:30 PM	Broccoli/Carrot/onion/tomato/bean soup (No Cream or Cornflour) with one of the main course	1 bowl
	millet rajma khichdi OR	1 katori
	Bajra dosa with mixed veg-lobia curry	2 no, 1 katori
	Kodo/foxtail millet rice with any legume curry/dal/sambar	1/2 katori, 1 katori
	Chickpea curry /Rajma curry/Field bean curry/Mung bean curry OR	1 Katori
	Horsegram curry/Greengram curry (Once in 3 days), Cow pea curry/Mothbean curry (Once in 2 days)	1 Katori
	Ash gourd/Brinjal/Broccoli/Pointed gourd/Snake gourd Sabji OR	1 Katori
	Bitter gourd/Bottle gourd/Broad beans/Cabbage/Cauliflower/Cluster beans /Drumstick/Methi/French beans/Knol/Ladies finger/Ridge gourd/Spinach/Tinda/Yam Sabji (Once in 2 days)	1 Katori
	Mushroom/Sweet corn/Sweet Potato/potato ( restrict to 1-2 times a week)	1 Katori
	Salad- Beetroot/Carrot/Onion/Radish OR	few slices/sticks
	Salad- Cucumber/Tomato (Once in 2 days)	few slices/sticks
Avoid all processed and packaged foods, dairy milk, non-veg, eggs in this phase. Restrict wheat & rice, instead include millets, pseudocereals like rajgira. Curd/buttermilk can be taken 1-2 times a week. Drink not less than 2 litres of water in a day.		
Bedtime 🕒 10:00 PM	Fresh ginger-turmeric tea	150 ml

# Meal Plan Phase-2

The following meal plan is based on the personalized nutritional recommendation which in turn is based on your specific gut microbiota profile.

Time	Food Items/ Dishes	Portion Size
Early Morning 🕒 6:00 AM	Fenugreek seeds tea with 1 tsp seeds soaked overnight	200ml
Breakfast 🕒 8:00 AM	Rajgira poori with chana masala (once a week) OR Poha with sprouts, carrot, peas and onion & curds	3 no, 1 katori/1 katori, 1 small cup
	Oats porridge with nuts and fruits OR Oats khichdi with vegetables (no dairy added)	1 bowl
	Millet based idli or dosa with veg sambar	3/2no, 1 katori
	Sourdough bread sandwich with baked beans & vegetables/egg omelet (once a week)	2 slices
Mid-Morning 🕒 10:30 AM	Apple/Banana/Grapes/Orange/Wood Apple OR 1 seasonal and local fruit daily	100 g/1 small cup
	Almond banana milk shake OR nuts & dates curd smoothie	1 glass
Lunch 🕒 1:00 PM	Egg/tofu/soya chunks pulao or fried rice + onion raita (once a week)	1 katori, 1 small cup
	Quinoa fried rice/cauliflower fried rice (can add egg/prawns - if nonvegetarian) (Once in 2 days) OR	1 katori
	jowar/bajra/ragi roti (twice a week) with one of the legume curry & sabzi	1 katori
	Chickpea curry/Rajma curry OR Chicken/fish/prawn curry (2-3 times a week) OR	1 medium katori/2 pieces
	Moth bean/Mung bean/Horsegram/Cowpea curry (Once in 2 days)	1 medium katori
	Brinjal/Broccoli/Field beans/Pointed Gourd Sabji OR	1 Katori
	Ash gourd/Beetroot/Bitter gourd/Bottle gourd/Broad beans/Cabbage/Capsicum/Cauliflower/Cho Cho/ Cluster beans/Fenugreek leaves/French beans/Ladies finger/Mushroom/Pumpkin/Ridge Gourd/Snake Gourd/Spinach/Tinda Sabji (Once in 2 days)	1 Katori
	Salad- Carrot/Onion/Radish OR	1 Katori
Salad- Beetroot/Cucumber/Tomato (Once in 2 days)	1 Katori	



Time	Food Items/ Dishes	Portion Size
Evening 🕒 4:30 PM	Tender coconut water OR Buttermilk/Kefir OR one fresh fruit as per the list	150ml
	Guacamole with sweetpotato sticks/cucumber/carrot sticks OR Oats-nuts smoothie	1 small cup/1 glass
	roasted makhana/roasted chana/roasted bajra khakra with hung curd dip	1 small cup/1-2 no.
Dinner 🕒 7:30 PM	Broccoli/Carrot/onion/tomato/bean/sweet corn soup (No Cream or Cornflour) - different soup daily	1 bowl
	Millet idli with sambar (2-3 times a week)	2-3 no, 1 katori
	Millet rice/Millet roti (2-3 times a week)	1 katori, 1 no.
	Bajra/Jowar roti/Kathi roll with rajma/chana filling with vegetables & mint/tamarind chutney	1-2 no
	Chickpea curry/Rajma curry/egg/chicken curry with millet rice/roti OR	1 Katori
	Moth bean/Mung bean/Horsegram/Cowpea curry (Once in 2 days)	1 Katori
	Brinjal/Broccoli/Field beans/Pointed Gourd Sabji OR	1 Katori
	Ash gourd/Beetroot/Bitter gourd/Bottle gourd/Broad beans/Cabbage/Capsicum/Cauliflower/Cho Cho/ Cluster beans/Fenugreek leaves/French beans/Ladies finger/Mushroom/Pumpkin/Ridge Gourd/Snake Gourd/Spinach/Tinda Sabji (Once in 2 days)	1 Katori
	Salad- Carrot/Onion/Radish OR	few slices/sticks
Salad- Beetroot/Cucumber/Tomato (Once in 2 days)	few slices/sticks	
Avoid all processed and packaged foods in this phase. Probiotic supplement and probiotic from food like curd, buttermilk, srikhand, kefir, kombucha, kimchi can be included. Avoid dairy & restrict wheat. Chicken, fish, egg can be included twice a week if non-vegetarian. Avoid meat.		
Bedtime 🕒 10:00 PM	Coriander seeds tea	150 ml

# Meal Plan Phase-3

The following meal plan is based on the personalized nutritional recommendation which in turn is based on your specific gut microbiota profile.

Time	Food Items/ Dishes	Portion Size
Early Morning 🕒 6:00 AM	Warm water with a tbsp of soaked chia seeds	200 ml
Breakfast 🕒 8:00 AM	Pearl millet idli with vegetables (carrot and onion) with ghee, curd based coconut chutney OR	2, 1tbsp
	Kuttu paratha/thalipeeth, mint chutney, curd (Once in 2 days) OR	2 small, 1 tbsp, 1 cup
	Foxtail millet dosa with mixed veg curry	2 medium, 1 katori
	sourdough bread with hummus/grated veggies in hung curd/with an egg omelet	2 slices
	Fermented millet porridge/ganji with spices and seasonings (1-2 times a week), fistful of nuts & seeds	1 glass
Mid-Morning 🕒 10:30 AM	Apple/Banana/Grapes/Orange/Wood Apple OR 1 seasonal and local fruit daily	100g/ 1 Small cup
	1 cup home set curd with raisins and a tsp of roasted pumpkin seeds	
Lunch 🕒 1:00 PM	Millet rice with any veg-legume sambar/dal/non-veg curry, salad, buttermilk	3/4 katori, 1.5 katori
	Veg fried rice with tofu/prawn/chicken curry (Once a week) OR	1 katori, 1 katori
	Bajra/ Jowar bhakri with sabzi and legume curry/dal OR	1 medium, 1 small cup
	Rajma/chana pulao or Jeera millet rice with curd based curry like kadhi/avial (2-3 times a week)	1 bowl/1 katori
	Chickpea curry/Field beans curry OR	1 medium katori
	Rajma curry/Moth bean curry/Mung curry/Horse gram curry (Once in 2 days) OR	1 medium katori
	Brinjal/Broccoli/Field beans sabji OR	1 katori
	Ash gourd/Bitter gourd/Bottle gourd/Broad beans/Capsicum/Cho Cho/Cluster beans/Fenugreek leaves/French beans / Mushroom/Pointed gourd/Pumpkin/Snake gourd/Tinda (Once in 2 days) OR	1 katori
	Tomato/knol kol/ladies finger/cabbage/Green peas/cauliflower/Pigeon pea/Ridge gourd/Spinach/Yam (Once in 3 days)	1 Katori
	Salad: Carrot/Onion/Radish OR	few slices/sticks
Salad: Beetroot/Corn/Tomato (Once in 2 days)	few slices/sticks	

Time	Food Items/ Dishes	Portion Size
Evening 🕒 4:30 PM	Tender coconut water (Once in 2 days) OR kefir-fruit smoothie (1-2 times a week)	150ml/250 ml
	Kokam sharbat OR sugarcane juice (1-2 times a week)	150ml
	roasted makhana/roasted chana/roasted bajra khakra with yoghurt dip/hummus/guacamole	1 small cup
Dinner 🕒 7:30 PM	Chicken soup/Sweet corn soup/tomato/3 bean soup/mushroom soup (No cream or cornflour) (Once in 2 days) OR	1 katori
	Rajgira poori with mix veg curry & jeera dal (once a week)	2 no, 1 katori
	Bajra/jowar roti OR Millet rice OR Quinoa (thrice a week)	1 katori
	Millet Khichadi (using Kodo/Little millet and Mung dal) with plain kadhi (Once in 2 days)	1 katori each
	Bajra-rajgira methi Chapati with beetroot raita, mushroom/tempeh stir fry (Once in 3 days) OR	2, 1 katori
	Vegetable - chana Pulao/egg biryani (1-2 times a week) with raita	1 katori
	Chickpea curry/Field beans curry OR	1 Katori
	Rajma curry/Moth bean curry/Mung curry/Horse gram curry (Once in 2 days) OR	1 Katori
	Brinjal/Broccoli/Field beans sabji OR	1 katori
	Ash gourd/Bitter gourd/Bottle gourd/Broad beans/Capsicum/Cho Cho/Cluster beans/Fenugreek leaves/French beans / Mushroom/Pointed gourd/Pumpkin/Snake gourd/Tinda (Once in 2 days) OR	1 katori
	Tomato/knol koj/ladies finger/cabbage/Green peas/Knol/Pigeon pea/Ridge gourd/Spinach/Yam (Once in 3 days)	1 katori
	Salad: Carrot/Onion/Radish OR	1 katori
	Salad: Beetroot/Cucumber/Tomato (Once in 2 days)	1 katori
Avoid all processed and packaged foods in this phase. Soy product, Kefir, Sauerkraut, kombucha, Shrikhand can be consumed once in 3 days. Restrict milk, rice, wheat. Eat more millets, legumes. If non-vegetarian - egg, chicken, fish can be included thrice a week, avoid meat.		



**ARNA Genext**  
Solutions Pvt Ltd

# MICROBIOME HANDBOOK



An exhaustive collection of all the terms  
& frequently asked questions.

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# Disease Description

## Colorectal Neoplasm

Gut bacteria like *Escherichia coli*, *Bacteroides fragilis*, *Enterococcus* etc., produces toxins that are reported to be involved in the development of cancers. Specifically, these toxins are called enterotoxigenic (in simpler terms - toxic to genes), which means these toxins can directly damage the DNA resulting in activation of uncontrollable cell proliferation, which eventually leads to cancer.

## Non-Alcoholic Fatty Liver Disease

Microbiota promote the absorption of monosaccharides from the gut, thereby triggering lipogenesis in the liver. Dysbiosis is associated with reduced synthesis and secretion of fasting-induced adipocyte factor a powerful metabolism and adiposity regulator belonging to the angiopoietin-like protein family in enterocytes, which results in increased activity of lipoprotein lipase (LPL), responsible for the secretion of triglycerides (TG) from very low-density lipoprotein, eventually resulting in the augmented uptake of fatty acids and accumulation of TG in the adipocytes and leading to NAFLD.

## Inflammatory Bowel Disease

The abundant bacteria in the gut needs complex polysaccharides to survive, which if absent in your gut, starts eating the mucus layer shielding the colon lining which leads to many opportunistic infections aided by Roseburia and Actinobacteria, which will further activate several enteric pathogens and triggers inflammatory pathways and causes inflammation in walls of gastrointestinal tract.

## Hypertension

The fermentation of dietary fiber by gut microbiota generates short-chain fatty acids (SCFAs) like acetate, propionate, and butyrate. Butyrate is used by colonocytes (cells of the colon) to maintain the intestinal barrier and decrease local inflammation, while small amounts are transported with acetate and propionate to the liver through the portal vein. Most of the propionate is metabolized by the hepatocytes (liver cells), whereas acetate and remaining proportions of propionate and butyrate are released into the systemic circulation, they can reach organs involved in the regulation of blood pressure and help to maintain or reduce the blood pressure.

## Crohns Disease

Increased abundance of Enterobacteriaceae activates other enteric pathogens that trigger a set of inflammatory pathways, causing irritation of your gut. For instance, Sulfate reducing bacteria inflame the lining of the gut, while *Clostridium* and certain fungi trigger the factors that decrease anti-inflammatory bacteria (*Lactobacillus*, *Faecalibacterium*), cumulatively triggering or inducing to Crohn's disease.

## Ulcerative Colitis

*Bifidobacterium* and *Lactobacillus* maintains the gut mucosal integrity through the expression of many tight junction encoding genes (connections that bridge and hold the cells). Reduction of *Bifidobacterium* results in marked reduction in the tight junction expression, in turn reducing the gut integrity. Parallely, increased abundance of *E. coli* activates bacterial TLR2 ligands and other downstream signaling, contributing to colitis pathology.

## Clostridium Difficile Infection

A dysbiotic microbiota can result in the loss of colonization resistance due to changes in the structural and/or metabolic environment. The loss of specific community members potentially affects the levels of microbial and host-generated metabolites, resulting in a different functional state that promotes spore germination and vegetative outgrowth. A dysbiotic microbiota may also result in an imbalanced immune response through the loss of immune regulation and a proinflammatory state, both of which may affect disease development. Toxin production by vegetative *C. difficile* can stimulate the production of inflammatory cytokines, neutrophils, and antitoxin antibodies.

## Prone to Fatigue

Tiredness can be a normal response to physical and mental activity. In most normal individuals are quickly relieved from regular fatigue (usually in hours to about a day, depending on the intensity of the activity). However, extreme tiredness resulting from physical exertion defines the state of fatigue. Twitch muscle fibers maintains the contractile responses while performing different motor tasks, and is directly associated with fatigue. Higher abundance of *Lactobacillus acidophilus*, and supplementation with multi-strain probiotic of *Lactobacillus* and *Bifidobacterium* have shown better contractile responses and hence minimizing fatigue.

## Atherosclerosis

Trimethylamine-N-oxide (TMAO) is a product of microbial-human co-metabolic pathway, which is derived from dietary (food based) choline and carnitine and converted to trimethylamine (TMA) by anaerobic bacteria residing within the lumen of the gut. TMA is then oxidized by a liver enzyme to TMAO. This TMAO is known to be a pro-atherogenic compound, which is directly implicated in the development of plaques inside the arteries. A dysbiosis in the intestinal microbiota, resulting in increased anaerobic bacteria, is thought to contribute to the chronic inflammatory state, production of TMAO and eventually atherosclerosis.

## Chronic Kidney Disease

Delivery of undigested protein to the colon results in the proliferation of proteolytic bacteria. These bacteria ferment proteins and amino acids to generate potential uremic toxins, including p-cresol, indoxyl sulfate and trimethylamine N-oxide. Impaired gut barrier function allows translocation of uremic toxin into systemic circulation. This contributes to chronic kidney disease (CKD) progression.

## Diabetes Mellitus Type 2

Diabetes mellitus is associated with chronic (slow developing) low-grade inflammation, and gut microbes have been shown to contribute to this. Lipopolysaccharides (LPS), which are components of the cell walls of Gramnegative bacteria, play a key role in the development of such chronic inflammation, resulting insulin resistance in fat, liver and muscle cells, eventually leading to Diabetes Mellitus Type 2.

## Constipation

There are two important luminal (gut) factors, modulated by the gut microbiota, which maintains smooth muscle contraction and balanced bowel movements. The factors include short chain fatty acids (SCFAs) and bile acids. The absence of SCFAs due to low-fiber diet inhibit mucin secretion by intestinal goblet cells, reduce stool volume by stimulating water and electrolyte absorption, and inhibit smooth muscle contraction in the colon, causing imbalanced bowel movements/constipation.



## Obesity

Fermentation of polysaccharides by gut microbes results in the production of short chain fatty acids (butyrate, propionate, acetate), carbon dioxide (CO<sub>2</sub>), and hydrogen (H<sub>2</sub>). Butyrate is an important energy substrate for the colonic epithelium. Acetate and propionate can be taken up by the liver and used as substrates for lipogenesis and gluconeogenesis. This result in increased availability of calories and adiposity to the host leading to obesity.

## Rheumatoid Arthritis

The human gut microbiota and their metabolites can regulate immune cells and cytokines via epigenetic modifications. For example, short-chain fatty acids (SCFAs) produced by gut microbiota promote the differentiation of natural T cell into Treg cells by suppressing histone deacetylases (HDACs). Thus, resulting bacterial metabolites cause aberrant immune responses via epigenetic modifications, leading to Rheumatoid arthritis.

## Depression

Depression is a syndrome (a group of symptoms) characterized by sad or irritable mood exceeding normal sadness or grief, both in its intensity and duration. On one end, specific gut microbes (like *Blautia*, *Clostridium*, *Klebsiella* etc.) are known to be higher in individuals with depression, which increase inflammation causing biochemicals that cause depression. On the other end, certain beneficial microbes (like *Lactobacillus rhamnosus*, *Bifidobacterium breve* etc.) are known to increase serotonin activity, and decrease norepinephrine and dopamine activities, overall reducing symptoms of depression.

## Anxiety

It is defined as intense, excessive and persistent worry and fear about everyday situations. Anxiety is mostly induced by stress that triggers immune cells to produce biochemicals (like Interleukin-6) that cause symptoms of anxiety. Several gut microorganisms, like species of *Bifidobacterium* and other belonging to group of *Bacteroides*, release tryptophan, a precursor of neurotransmitter serotonin and *Bacillus*, *Enterococcus* species produce norepinephrine, and dopamine. All these three biochemicals together reduce the symptoms of anxiety by increasing the action of a brain chemical called gamma-aminobutyric acid (GABA). Hence, gut microbiome has emerged as a key factor to manage anxiety.

## Physical Endurance

The ability to perform strenuous, large-muscle exercise or activities for a prolonged period is termed as physical endurance. High endurance sports / training is accompanied with production of oxidative stress, due to over production of reactive oxygen species (ROS) and reactive nitrogen species (RNS). Studies have observed that high abundance of *Lactobacillus paracasei*, *Bifidobacterium* sp., *Lactobacillus rhamnosus* and *Faecalibacterium prausnitzii*, in the gut aids in management of oxidative stress and hence positively correlated with endurance.

## Aerobic Endurance

Aerobic endurance is the ability to sustain an aerobic effort over time, such as distance running or cycling. Aerobic endurance maintains the ability of the cardiovascular system to deliver oxygen to working muscles and the ability of the muscles to utilize that oxygen. The most common quantification of endurance is the maximal rate of oxygen uptake (VO<sub>2</sub>max). High abundance of *Faecalibacterium prausnitzii* has been associated with higher aerobic endurance.

## Muscle Strength

Muscular strength is a component of fitness that is necessary for optimal well-being and quality of life. In general, physical endurance is directly correlated to muscle strength. Smooth muscle works most efficiently, and needs much less energy for its activity and they display considerable plasticity when healthy and young. However, these cells can switch to largely non-contractile mode in response to inflammatory stimuli, diet or other factors, which result in loss of plasticity and in turn contractibility. Supplementation with multi-strain probiotic of Lactobacillus and Bifidobacterium have shown better contractile responses and hence better muscle strength.

## Leaky Gut

The occurrence of harmful bacteria in our gut may cause a leaky gut syndrome, which happens due to the high permeability of the intestinal walls, causing leakage of undigested food particles, bacteria, and many other substances into the nearby tissues. The leaky gut syndrome is directly connected with several health problems, such as chronic fatigue, Stomach aches, Insomnia, Inflammatory Bowel Syndrome, Constipation, Diarrhoea, Headaches, Depression, Cardiac problems, Pancreatic illness, etc. By populating friendly bacteria in your gut for optimal health, in turn through foods for a healthy gut, ensures the best way to restore your gut flora. This also ensures recovery to better gut health, specifically via probiotics which heal leaky gut to a great extent.

## Sleep

The researchers have observed that gut microbiome plays a significant role in circadian clock along with other phenotypic characteristics, like, immunity, metabolism, and others. The circadian rhythm is our inner clock, which controls our body's energy disbursement, hunger, and snooze. We usually get about seven hours of sound sleep every night. In the morning, when we wake up, our body warms up to conduct daily chores. To run our body, we need energy, and energy comes from the food we eat during the day. At night, our body needs rest to rewind, so we fast and go to sleep. Gut microbiome resonates with this bodily rhythm. The scientific world now accepts the robust connection between sleep and intestinal wellbeing. A good quality night sleep allows more flourishing and better functioning gut microbiome and vice versa. Gut flora follows the rhythm by secreting specific molecules at certain times of the day. At night, secretion of factors responsible for energy metabolism, DNA repair, and proliferation occurs. During daytime, flora harbouring in the gut releases molecules essential for their colonization. Neurotransmitters like serotonin and GABA secreted by brain control our sleep-wake cycle. Astoundingly, certain intestinal bacteria including, Turicibacter sanguinis and Clostridia sp., release specific signalling molecules that trigger the production of serotonin. By modulating serotonin levels, the gut microbiome can interfere or improve our sleep pattern.

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# Frequently Asked Questions

## 1. Is BugSpeaks a diagnostic report?

No, BugSpeaks is not a diagnostic report however the information provided can be used to take complimentary / supplementary measures along with standard treatment if needed. A lot of information contained in the report are actionable and provides guidance for living healthy!

## 2. What is Rych Index and how it can help?

Rych Index is a patent pending algorithm based intestinal health score developed by us. It tries to give a snapshot of the intestinal health with respect to the microbiota profile (microorganisms in the gut). It is not a diagnostic marker but can be used as an information to ascertain the gut health.

## 3. Is Rych Index only criteria for determining the gut health?

Rych index has been designed to take into consideration various gut microbiota characteristics, which in turn are known to influence the host health. However, this is an evolving research area and gut microbiota alone is not responsible of the complete gut health, although it plays a primary role. Genetics, gut architecture, gender, hormones, food, lifestyle etc. also play a role in defining the gut health.

## 4. Can “disease susceptibility” section be used as diagnostic?

No, disease susceptibility is a score-based prediction that is dependant on the microbiota profile. This is not a diagnostic assessment, but only a risk assessment. This can be used a guide for health. Preventive health check-ups can be performed if required.

## 5. Can pathogen characterization be used directly as indicator of pathogen load?

Pathogen characterization section uses bioinformatics tools to ascertain relative abundance of the various microbes. It is not based on culture assays and is not an indicator of absolute abundance of the microbes represented. However, this information can be used to correlate clinically and/or validated by other assays as may deem fit by the medical practitioner.

## 6. What is the “antibiotic recovery potential” section all about?

This is a unique score developed by us to provide an estimate of how well one’s gut microbiota may recover post an antibiotic course. As it is known, antibiotics not only kills that pathogen in question but can also destroy other bacteria in the gut leading to short term to long term deleterious effects. Everyone takes different time to recover their gut microbiota post an antibiotic course. Our effort here is to provide a prediction of the potential of this recovery, post an antibiotic course. A lower score/potential means the person might need additional nutritional/supplemental support during or post an antibiotic course to recover faster and better.

## 7. What is foundation microbiota?

Foundation microbiota, also called as keystone species, are a set of organisms fundamental for the ecosystem to survive. These organisms help hold the system together and hence any perturbation in their abundance may have a deleterious effect on the overall ecosystem.

## 8. Is the nutritional recommendation personalized and can it cure my disease?

The nutritional recommendation is based on the gut microbiota profile of the individual. As the gut microbiota gets influenced by the food we eat, it is possible to modulate them by changing the food habit. Therefore, the microbiota profile based nutritional recommendation in this report tries to modulate the microbes in the gut to a balanced state (eubiosis) from a disbalanced or dysbiotic state. The nutritional recommendation in this report is disease agnostic, in other words it is not specifically targeted against any disease per se. However, if the balance is restored in the gut by following the nutritional recommendations, then there is a good chance that many of the clinical manifestations of various diseases that cropped up due to dysbiosis in the gut can be rectified.

## 9. Do I need to follow the nutritional recommendation for 3 months only?

Nutritional recommendations are designed in 3 phases for 3 months for better compliance. However, you may continue with the recommendations beyond 3 months till the time it is convenient for you.

## 10. What technology is used for making this report?

We use next generation sequencing or NGS. More specifically we use whole genome shotgun metagenomics approach that can profile all microbes including bacteria, viruses, fungi, helminths etc. We have our own curated databases and patent pending algorithms and interpretation engine that led to the generation of this unique report.

For more "Frequently Asked Questions" please visit <https://www.bugspeaks.com/faq>

# Disclaimer

- Throughout this Disclaimer (hereinafter referred to as "Disclaimer"), Leucine Rich Bio Private Limited is referred to as "We/Us/Our" and the person to whom the specimen belongs ( including such person's guardian or any person acting on his/her behalf) shall be referred to as "You/Your".
- This is not a diagnostic report (hereinafter referred to as this "Report") and therefore should be used for Research Use Only (RUO) or Investigational Use Only (IUO) and should be interpreted or used exclusively by or under the guidance of a practitioner, including but not limited to, certified physicians, clinicians, dietitians, nutritionists, sports therapists and such other persons in similar profession having appropriate validation to undertake such practice (from here on referred to as "Professional Practitioners"). It is imperative that any preventative or therapeutic measures taken, by placing reliance on this Report, for any of the diagnosis should be solely under the guidance of a "Professional Practitioner". In the event of You executing any preventative or therapeutic measures by virtue of practicing self-medication and/or undergoing diagnosis from persons other than Professional Practitioners, then We cannot be held responsible in any manner for any loss, liability, counter-effect and so on suffered by You as a result of ignorance of this Disclaimer. Further, We shall not be held responsible for any misinterpretation by Your "Professional Practitioner" of this Report or for any other matter arising out of this Report.
- This Report's role is limited to providing insights of Your gut microbiome, with a general set of dietary recommendations and risk managements. General risk management strategies provided in Our Report are for information purpose only and in this regard, it is essential to understand that every person's resistance, immunity, sensitivity and response to medication is different and therefore not all general risk management strategies may be suitable to everyone. It is also essential to note that, while assessing Your Report and providing these recommendations, We assume that You are in a general state of good health, and do not consider Your past or existing health conditions and or any medication taken by You (either in the past or currently), even if You have provided Us with such information. Therefore, it is essential that, You consult a Professional Practitioners for detailed recommendations or risk managements that may be specific / customized for You. In other words, information contained in this Report is not intended to replace medical or professional advice offered by Professional Practitioners.
- We would like to bring it to Your notice that not all disease-associated microbial groups may have been identified, validated and recorded by the scientific community, and the clinical significance of many microbial groups are also not well understood. Hence, it should be noted that this analysis and this Report does not cover all clinically relevant microbes' that have been identified or reported till date. This Report is limited only to those variants within Your gut microbiome which has strong evidence of causing or contributing to a disease or a drug response or a metabolism related issue till date.
- We would also like to bring to Your attention that the microbiome sequencing data is being constantly updated both with new taxonomic groups and curation of old microbial databases. Hence, it is subject to revision-based updates, based on the latest scientific research. Therefore, it is important to note that it is possible that the interpretation of the results that have been reported herein may vary or be altered, subject to these revisions. Hence, We would recommend that You to undergo periodical reinterpretation of Your microbiome data that You possess, especially when a specific disease is confirmed through diagnosis or new symptoms arise, in the future.



- Microbiome information must always be considered in conjunction with other information about Your health, including, but not limited to, Your age, sex, ethnicity, lifestyle, bio-medical history, family health history and any other information that You may provide to the "Professional Practitioner". This is especially critical with respect to the pharmacogenomics data (therapies and drugs), where a person's response to various medications is determined by the above listed factors.
- We would like to bring to Your attention that very specific and rare microbial groups are not reliably detected by current sequencing methods or downstream analysis pipelines, hence they are not analyzed and interpreted within the current Report.
- Overall, Your reliance upon this Report is solely at Your own discretion. Adequate care should be exercised in using all health and medical related information and recommendations provided in this Report. We cannot be held responsible in any manner for non – adherence by You to the terms and conditions contained in this Disclaimer. Further, We shall not be responsible for any findings in this Report and disclaims any responsibility for any errors, including but not limited to human error in reporting, and/or omissions by the sampler or agent either during collection of DNA samples (stool etc.,) or delivery of the DNA sample to Us. With respect to this Report or process undertaken to arrive at the findings reflected or reported in the Report, We make no warranties of any kind including, without limitation, the implied warranties as to its merchantability, fitness for a specific purpose, accuracy and non- infringement.



**Thanks for taking the test with us.**

Nurture your gut health for a better tomorrow. Visit our website and connect with our experts for an all-inclusive solution. Take charge of your well-being now!