

CLIMATE CHANGE IMPACTING GUT HEALTH : SCIENCE & TECHNOLOGY

NEWS: Climate change is disrupting the human gut in a new path to illness

WHAT'S IN THE NEWS?

Climate change is disrupting food quality and environmental conditions, leading to imbalances in gut microbiota, which are linked to rising health disorders. Vulnerable populations face the greatest risk, highlighting the need for interdisciplinary, localized, and equity-focused responses.

Overview of the Study

- Recent research highlights the underexplored impact of climate change on human gut microbiota.
- The study links environmental and food system changes with microbial imbalances, introducing new disease pathways.
- Published in *The Lancet Planetary Health*, the research emphasizes the need for urgent multidisciplinary attention to this climate-health-microbiome nexus.

Key Findings of the Study.

1. Climate Change and Gut Microbiota Disruption

- Rising global temperatures, altered rainfall patterns, and elevated CO₂ levels are changing crop yields and nutritional quality.
- These disruptions affect the gut microbiota, which plays a central role in digestion, immunity, and overall health.

2. Loss of Micronutrients in Crops

- Crops such as wheat, rice, and maize are showing reduced levels of:
 - Zinc

- Iron
- Protein
- These deficiencies weaken the gut microbial balance, especially in communities already prone to malnutrition.

3. Emergence of Harmful Microbial Strains

- Under poor nutrition and environmental stress:
 - Diversity of gut microbiota decreases.
 - Maladaptive and disease-associated strains flourish.
 - Malnutrition worsens, triggering a negative health spiral.

4. Vulnerable Populations at Higher Risk

- Low- and middle-income countries (LMICs), along with indigenous populations, are most affected due to:
 - Heavy reliance on local food systems.
 - High exposure to climate-driven disruptions.
 - Lack of access to healthcare and nutritious food.

Environmental Stressors and Microbial Shifts

- Multiple stressors including heatwaves, polluted water, degraded soil, and air pollution also alter the gut microbiota.
- These stressors create hostile conditions for beneficial microbes, leading to gut dysbiosis.

Health Consequences of Gut Dysbiosis

1. Diseases Associated with Microbial Imbalance

- Gut microbiota disruption (dysbiosis) has been linked to:
 - Eczema

- Type 1 and 2 Diabetes
- Inflammatory Bowel Disease (IBD)
- Neurodevelopmental and neurological disorders

2. Impact of Rising Heat

- Findings from the Indian Institute of Public Health (IIPH), Gandhinagar:
 - Heat exposure increases the risk of foodborne and waterborne diseases.
 - These infections worsen gut health and microbial diversity.

3. Loss of Microbial Interdependence

- Healthy gut requires cooperation between different microbial species.
- Climate change-induced dysbiosis leads to:
 - Loss of inter-microbial cooperation.
 - Compromised metabolism and weakened immunity.

4. Individual Microbiome Responses

- Each person has a unique gut microbiota composition.
- Climate-induced impacts and probiotic interventions can have differential effects across individuals.

Climate–Health–Microbiota Nexus

1. A Complex, Interdependent Triangle

- The relationship between:
 - Climate
 - Human Host

- Microbial Ecosystems
- Multiple concurrent stressors like pollution, heat, and food insecurity impact all three simultaneously.

2. Understudied Scientific Territory

- While human health effects of climate change are researched, the impact on gut health remains:
 - Fragmented due to siloed disciplines.
 - Underrepresented in climate and health policymaking.

3. Role of New Technologies

- Advancements like metagenomics and microbiome databases (e.g., *GutBugBD*) enable:
 - Detailed analysis of microbial shifts.
 - Identification of early warning signs and therapeutic targets.

Urgent Need for Systemic Response

1. Interdisciplinary Collaboration

- Climate science must integrate with:
 - Microbiology
 - Public Health
 - Nutrition and agriculture
- Only then can the full scope of microbial disruptions be understood.

2. Bridging Funding and Infrastructure Gaps

- Current research suffers from:
 - Inadequate funding.

- Weak global cooperation.
- Insufficient lab and data infrastructure.

3. Personalized and Local Interventions

- Regional dietary patterns, climate vulnerability, and microbiome diversity necessitate:
 - Localized strategies for nutrition, healthcare, and environmental resilience.
 - Customized probiotics and food-based interventions depending on regional microbial profiles.

Conclusion

- Climate change is silently reshaping human health by altering the microbial world within us.
- Addressing this emerging crisis requires urgent investment, coordinated global research, and inclusive public health frameworks focused on vulnerable communities and localized microbial resilience.

Source: <https://www.thehindu.com/sci-tech/science/climate-change-is-disrupting-the-human-gut-in-a-new-path-to-illness/article69534716.ece>