



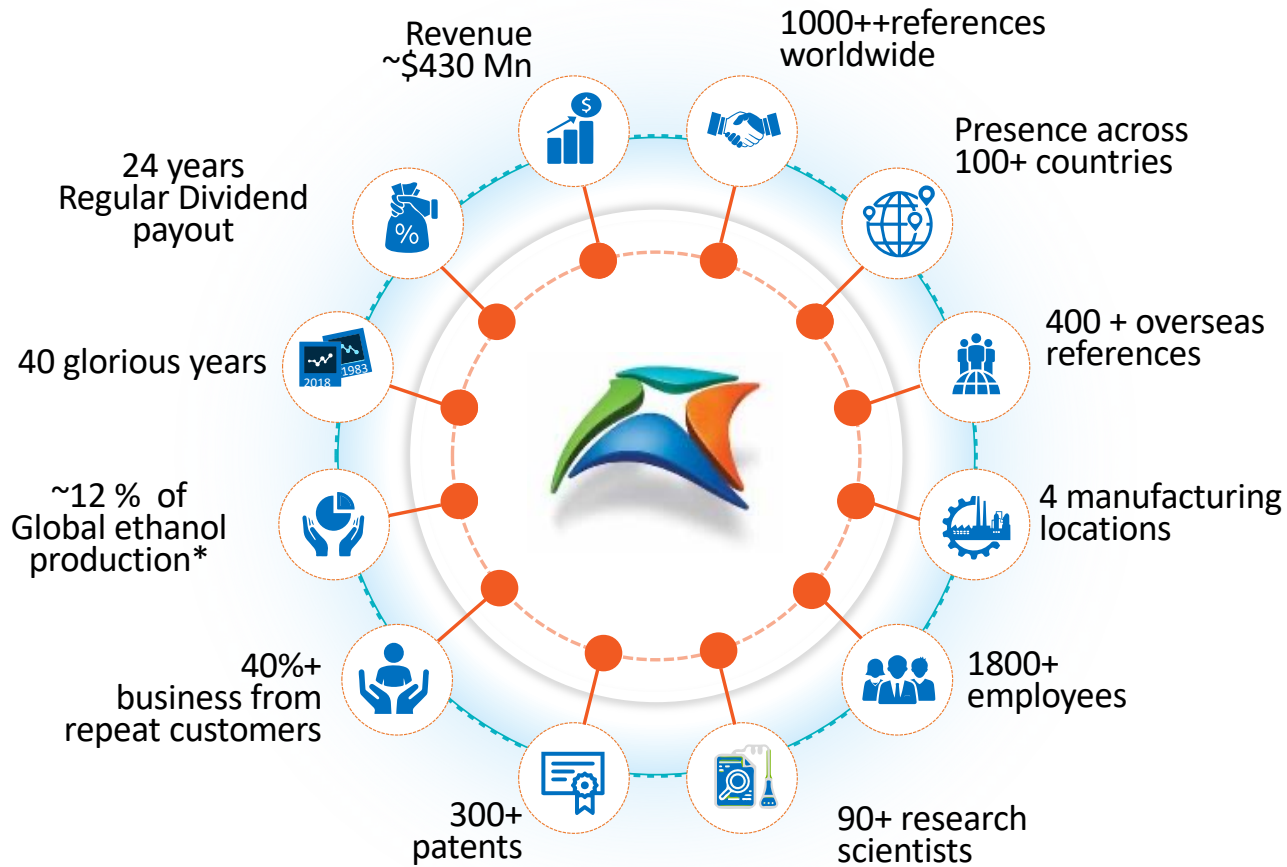
PRAJ INDUSTRIES LIMITED



George Washington Carver Award 2020 Presented to Dr. Pramod Chaudhari



William C. Holmberg Award 2022



*Excluding China



Praj Business Verticals



Bioenergy

BioMobility™ :
1G & 2G Bio-Ethanol plants
Modernization & upgradation,
Compressed Bio-Gas

High Purity

High purity applications for pharma, biotech, cosmetics industry

Engineering Businesses

Brewery and beverages

Critical process equipment & Modularization

Effluent Recycling & ZLD

R&D

BioPrism™: Renewable Chemicals and Materials
Customized Research Services & Solutions, Bio-products.

4 decades of leadership in Industrial Bio-technology Space



PLA Platform Technology: Enabling the Bioplastic Circular Economy

Dr. Phaneeswara Rao Kommoju

24 MARCH 2025

Impact of Plastics on environment

Environmental Persistence

- Plastics take centuries to degrade
- Continuous threat to ecosystem

Landfill Overflow

- Plastics make up a significant portion of landfill waste
- Leaching of harmful chemicals into soil and water

Ocean Pollution

- Millions of tons of plastic enter oceans yearly
- Forms vast floating garbage patches, harming marine life



Why Sustainable Alternatives

Microplastic Pollution

- Found in oceans, soil, air, and even food
- Potential health risks for humans and wildlife

Wildlife Endangerment

- Ingested plastics can block digestive systems or release toxins
- Threatens many species and biodiversity

Aesthetic & Economic Impact

- Littered plastics detracts tourism & property values
- Cleanup costs place a burden on local economies

Impact of Plastic on Human Health - An Alarming Situation

Chemosphere
Volume 161, August 2024, 142380

Nano/micro-plastic, an invisible threat getting into the brain

Ajeet Kaushik ^a, Avtar Singh ^b, V Kumar Gupta ^c, Yogendra Kumar Mishra ^d

Focus

- Pathways,
- Pathogenesis,
- Risk – Assessments
- Optimizing Therapies

Scope

- Exploring Nanotechnology for N/M-P management

N/M – P getting into the brain

Environment International
Volume 163, May 2022, 107199

Full length article

Discovery and quantification of plastic particle pollution in human blood

Heather A. Leslie ^a, Martin J.M. van Velzen ^a, Sicco H. Brandsma ^a, A. Dick Vethaak ^{a, b}, Juan J. Garcia-Vallejo ^c, Marja H. Lamoree ^a

Preprint
Made publicly accessible prior to peer review

Res Sq [Preprint]. 2024 May 6;rs.3.rs-4345687. [Version 1] doi: 10.21203/rs.3.rs-4345687/v1

Bioaccumulation of Microplastics in Decedent Human Brains Assessed by Pyrolysis Gas Chromatography-Mass Spectrometry

Matthew Carmona ¹, Alexander Nihart ², Marcos Garcia ³, Rui Liu ⁴, Marlon Oliveira ⁵, Eliso Castillo ⁶, Barry Bleske ⁷, Justin Scott ⁸, Tamara Howard ⁹, Jorge Gonzalez-Estrella ¹⁰, Natalie Adolphi ¹¹, Daniel Gallego ¹², Eliane El Hwari ¹³

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PMCID: PMC11100893 PMID: 38765867

The complete version history of this preprint is available at [Research Square](#).

Abstract

Rising global concentrations of environmental micro- and nanoplastics (MNPs) drive concerns for human exposure and health outcomes. Applying pyrolysis gas chromatography-mass spectrometry (Py-GC/MS) methods to isolate and quantify MNPs from human samples, we compared MNP accumulation in kidneys, livers, and brains. Autopsy samples from the Office of the Medical Investigator in Albuquerque, NM, collected in 2016 and in 2024, were digested for Py-GC/MS analysis of 12 polymers. Brains exhibited higher concentrations of MNPs than liver or kidney samples. All organs exhibited significant increases from 2016 to 2024. Polyethylene was the predominant polymer; the relative proportion of polyethylene MNPs was greater in brain samples than in liver or kidney. Transmission electron microscopy verified the nanoscale nature of isolated particles, which largely appeared to be aged, shard-like plastics remnants across a wide range of sizes. Results demonstrate that MNPs are selectively accumulated into the human brain and concentrations are rising over time.

genes

Genes (Basel). 2023 Feb 26;14(3):590. doi: 10.3390/genes14030590

Nanoplastics Toxicity Specific to Liver in Inducing Metabolic Dysfunction –A Comprehensive Review

Shoumi Halder ¹, Nourmawo Yhoma ¹, Yuvashree Muralidaran ¹, Sethi Kumar Rajagopal ¹, Prabhakar Mishra ^{1,7}

Editor: Selvarangan Ponnachagan ⁵

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Abstract

Plastic pollution in the world is widespread and growing. The environment is swamped with nanoplastics (<100 nm), and the health consequences of these less visible pollutants are unknown. Furthermore, there is evidence that microplastics can release nanoplastics by digestive disintegration, implying that macroplastic exposure can cause direct and indirect disease via nanoplastics. The existence and impact of nanoplastics in numerous tissues from invertebrates to larger vertebrates that consume significant amounts of plastics were investigated, and histopathological techniques were utilized to determine physiological reactions and inflammation from the plastics. Nanoplastics enters an organism through the respiratory and gastro-intestinal tract where they accumulate into the liver through blood circulation via absorption, or epidermal infiltration. It is stated that macroplastics can cause damage directly at the site of exposure, whereas nanoplastics can influence the liver, causing subsequent damage to other organs. Multi-organ dysfunction is brought on by liver changes, and nanoplastics can readily enter the gut-liver axis and disturb the gut microflora. By exploring the literature and summarizing the research that has been published to date, this review article reveals the deleterious effect and mechanisms of nanoplastics on the pathophysiological functions of the hepatic system.

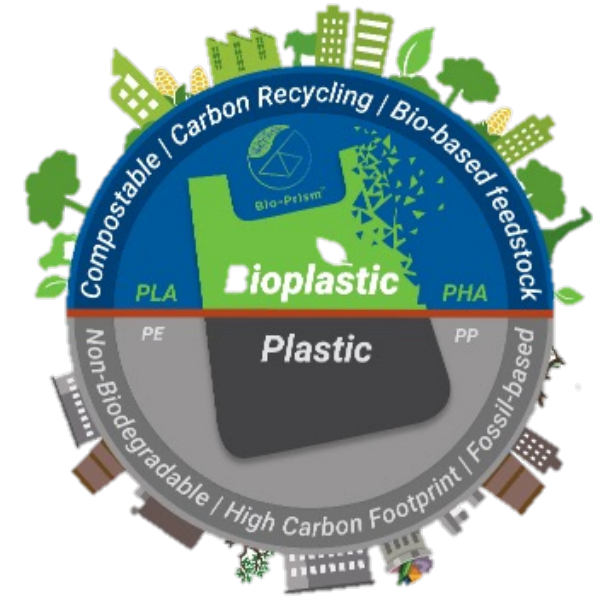
Keywords: nanoplastics, hepatic glucose metabolism, lipid peroxidation, metabolic dysfunction, gut-liver axis

Impact of fossil-based plastics:

- **Huge waste generation**
- **Environmental degradation** : Ecosystems imbalance
- **Health risks:** Microplastics/Nanoplastics
 - Found in **food, water, and human body parts**, raising concerns about long-term health implications such as endocrine disruption and other chronic diseases.

Bioplastics: A viable solution:

- Biodegradable, Health Safe solution
- Unavailability of technology for Polylactic Acid (PLA) production
- No local production of Lactic acid, Lactide or PLA in India



Innovation USP, Approach & Methodology

Innovation & USP:

Technology Innovation:

- Feedstock agnostic multi-product approach
- Robust proprietary microbial platforms and process
- Green process-Zero liquid discharge
- Cost-effective solution, appropriate for Indian market

Business Model Innovation:

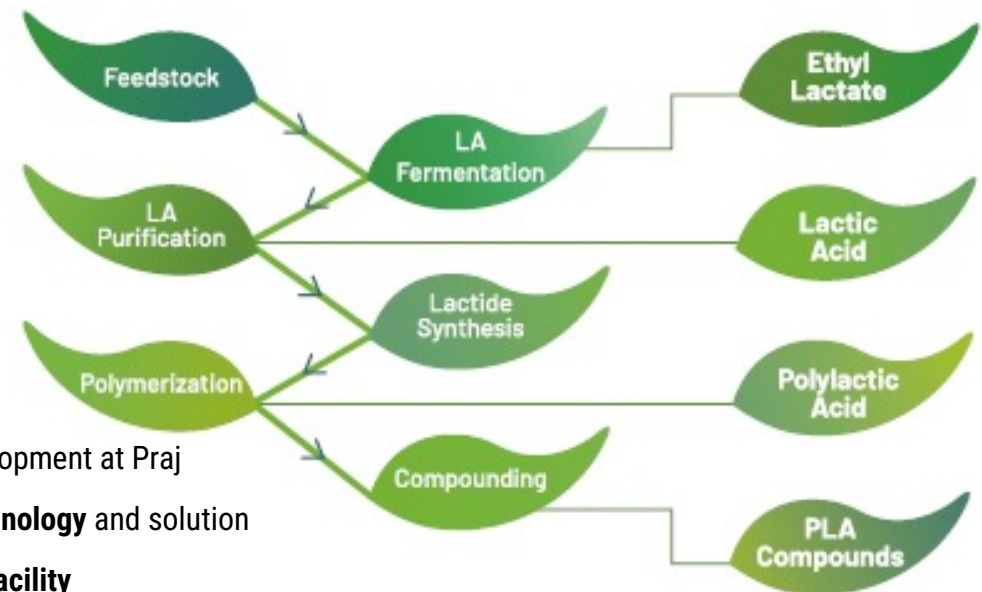
- Praj : One-stop-shop for PLA
- 360° solution

Approach & Methodology:

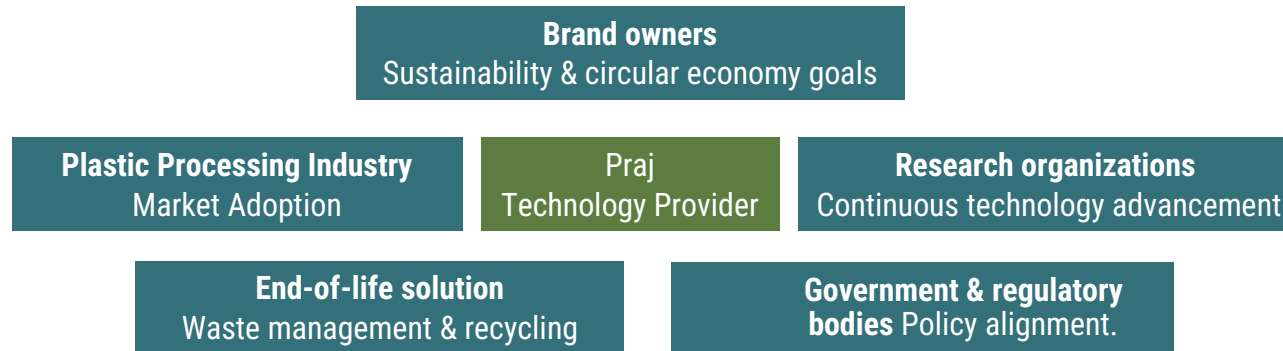
- **Recognizing the technology gap:** Inhouse end-to-end technology development at Praj
- Patented technology and know-how to offer **novel and proprietary technology** and solution
- Technology demonstration at **India's first biopolymer demonstration facility**
- **Technology & engineering solution:** Empowering industry players with indigenous solution
- Ecosystem development : **Bridging gaps** across the value chain

Advanced biorefinery

Multi-feed Multi-product Approach



Stakeholders Involved



Leadership Involvement & Support:

- Founder Chairman's vision driving innovation and sustainability
- Board members providing strategic investment support
- Senior management steering technology development and commercialization strategy

Geographical Coverage:

- Global applicability with a focus on India's self-reliance and sustainability leadership



Investment Made: Over INR 100 Cr invested in technology development & demonstration

Economic Benefits and Impact

- **Development of New Market Sector:**
 - Projected production capacity: **120,000 - 150,000 tonnes** of bioplastics worth 5000 Cr within the next **5-6 years**
 - Market potential: **INR 3500-4500 Cr**, creating a robust domestic market for PLA and its derivatives.
 - Cost-effective & competitive alternative to imported PLA and fossil-based materials, supporting आत्मनिर्भर भारत
- **Development of Allied Sectors:**
 - New opportunity for Plastic processing industry and allied sectors
- **Boosting the rural Economy:**
 - Helping farming community by creating new opportunities



Detergents



Cosmetics



Cutlery



Flexible & Rigid
Packaging



Electronics



Textiles

Environmental & Social Impact

Environmental Impact:

- Significant reduction in fossil-based plastic consumption and associated carbon footprint and plastic waste.
- Restoring balance of air, land and water ecosystems
- Sustainable bio-based production process, ensuring lowest energy, water, and resource consumption.
- Supports circular economy through bio-based feedstocks and end-of-life biodegradability.
- Reducing health impact on wildlife and humans.

Social Impact:

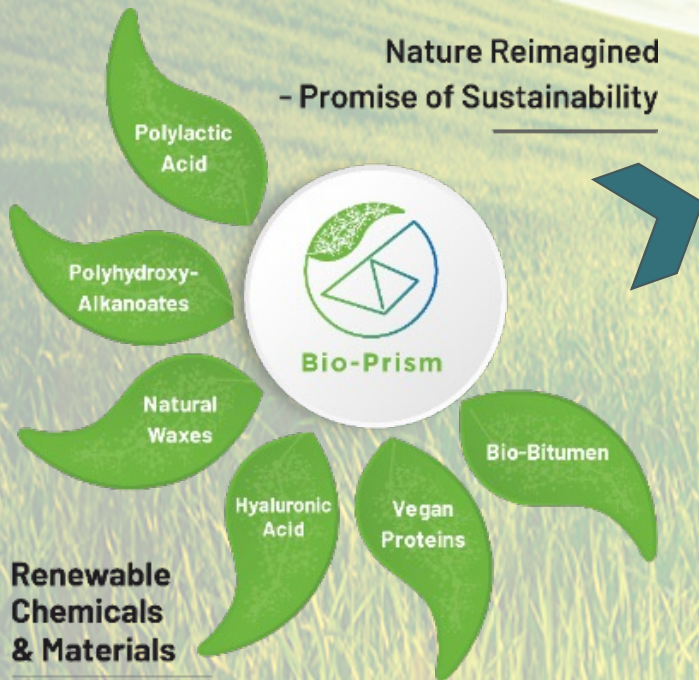
- Contribution to India's green economy, fostering innovation and entrepreneurship in bioplastics.
- Direct and indirect employment for 1000-1200 skilled and unskilled workers.
- Empowering the unorganized waste management system.
- Alignment with government policies promoting sustainable materials and waste management.



**Praj Foundation has been accredited
by the United Nations Environment
Programme (UNEP)**

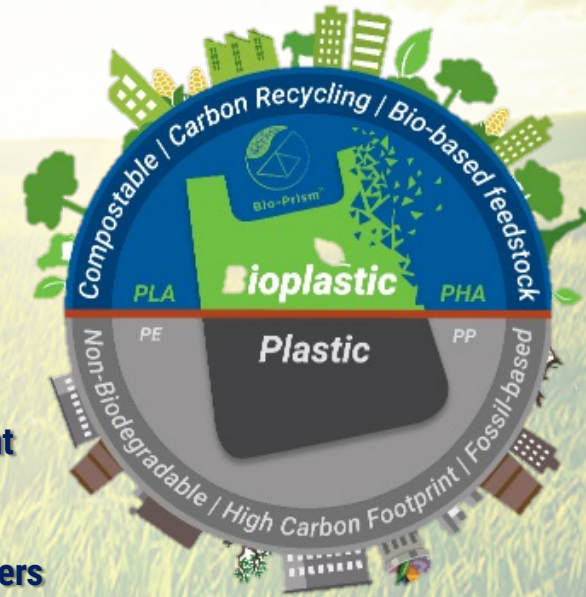
Praj's Bio-Prism portfolio: Focus on bioplastics

Nature Reimagined
- Promise of Sustainability



Polylactic acid PLA

- Validated technology at pilot scale
- Commercial scalability: 45-75 KTA of PLA
- Leadership support in R&D and potential production plant
- Application support: PPCEI at ICT Mumbai
- Industry collaboration with compounders and brand owners
- End-of-Life Solutions: PRAJ + NCL + NIIST
- Policy support from Govt. of India





THANK YOU!

