Industrial Probiotics Production Training: From Lab Bench to Large-Scale Manufacturing

Join our Industrial Probiotics Production Training at NTHRYS to gain end-to-end expertise from isolation and characterization to large-scale manufacturing. Learn fermentation, downstream processing, QC, and regulatory compliance for global probiotic markets.

Empower your biotech career with NTHRYS' Probiotics Production Training, designed to transform beginners into industry-ready professionals by covering every step from microbial strain selection to large-scale manufacturing, ensuring you master both science and market-ready product development.

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Module 1 – Fundamentals of Probiotics (Theory - Online)

Fees: Rs 5000/-

1. Introduction to probiotics: definitions, types, health benefits, industrial use-cases.
2. Taxonomy & common genera: *Lactobacillus*, *Bifidobacterium*, *Streptococcus*, *Enterococcus*, *Saccharomyces*.
3. GRAS & QPS concepts; overview of FDA, EFSA, FSSAI frameworks.
4. Product formats: bulk powders, capsules, fermented foods, beverages, animal feed.
5. Strain selection criteria: safety, functionality, techno-feasibility, IP considerations.

Module 2 – Lab-Scale Isolation & Phenotypic Characterization

Fees: Rs 60000/-

1. Source selection & sampling: dairy, plant fermentations, gut-associated sources.
2. Selective enrichment & isolation on MRS/modified media; colony purification.
3. Acid and bile tolerance screening; osmotic and thermal stress assays.

4. Adhesion surrogates: mucin binding, Caco-2/HT-29 cell line assays (in vitro).
5. Antagonism tests vs. pathogens; bacteriocin spot-on-lawn assays.
6. Antibiotic susceptibility & safety flags (hemolysis, DNase, gelatinase).

Module 3 – Molecular Characterization

Fees: Rs 45000/-

1. Genomic DNA extraction & 16S rRNA identification; phylogenetic placement.
2. Targeted PCR for functional loci (bacteriocins, BSH, stress-response genes).
3. Plasmid profiling; genetic stability under serial passaging.
4. WGS-based confirmation, AMR gene screening, virulence factor exclusion.
5. Strain banking: master/working cell banks, stability documentation.

Module 4 – Lab-Scale Cultivation & Upstream Optimization

Fees: Rs 65000/-

1. Media design & carbon/nitrogen optimization for growth and CFU yield.
2. Shake-flask kinetics; growth curve modeling; CFU and OD600 correlations.
3. 1–5 L bioreactor setup: pH, temperature, agitation, aeration/microaeration.
4. Fed-batch introductions: feed composition, DO-pH cascade control.
5. Harvest preparation: antifoam strategies; CIP/SIP fundamentals.

Module 5 – Pilot-Scale Production (50–200 L)

Fees: Rs 250000/-

1. Scale-up criteria: k_La, P/V, tip speed, mixing time, geometric similarity.
2. Inoculum train development: seed flasks → seed fermenter → production tank.
3. Online monitoring: pH, DO, off-gas (CO_2/O_2), foam sensors.
4. Process analytical technology (PAT) setup & in-process sampling plan.
5. Batch vs. fed-batch vs. continuous considerations; changeover minimization.

Module 6 – Downstream Processing & Stabilization

Fees: Rs 190000/-

1. Cell harvest: continuous centrifugation vs. microfiltration; wash buffers.
2. Concentration & cryoprotectants: skim milk, trehalose, sucrose, glycerol.
3. Lyophilization cycle design: freezing rate, primary/secondary drying endpoints.
4. Spray-drying for robust strains: inlet/outlet temps, residence time, yield.
5. Microencapsulation: alginate, chitosan, lipid-based beads; release profiling.

Module 7 – Formulation & Packaging

Fees: Rs 150000/-

1. Blend design: carriers (maltodextrin), flow aids, anti-caking agents.
2. Synbiotic builds: pairing with prebiotics (FOS, inulin, GOS) and dosage logic.
3. Capsule/tablet development: excipient compatibility, hardness/disintegration.
4. Food matrix incorporation: yogurt, cheese, plant beverages; process hotspots.
5. Moisture/oxygen control: barrier films, desiccants, nitrogen flushing, MAP.

Module 8 – Quality Control, QA & Regulatory Dossier

Fees: Rs 85000/-

1. Viable count methods: plate counts, impedance options.
2. Contaminant panel: coliforms, yeasts/molds, pathogens (ISO/IS methods).
3. Stability studies (ICH): real-time & accelerated; Arrhenius-based predictions.
4. Functional analytics: BSH activity, acid/bile re-challenge, antioxidant assays.
5. Documentation: batch records, CoA/CoC, labeling claims, dossier compilation.

Module 9 – Industrial Applications & Case Studies

Fees: Rs 190000/-

1. Nutraceuticals & OTC products: positioning, claim substantiation overview.
2. Dairy & non-dairy foods: process integration, post-pasteurization dosing.
3. Aquaculture & animal nutrition: dose forms, water stability, delivery routes.
4. Case study: large-scale production of *L. rhamnosus* GG—critical control points.
5. Postbiotics: cell-free supernatants, peptides, exopolysaccharides workflows.

Module 10 – Advanced Topics & R&D

Fees: Rs 450000/-

1. Multi-strain consortia: compatibility matrices, co-culture kinetics.
2. Controlled-release microcapsules: coating architectures, GI-targeting.
3. AI-driven bioprocess optimization: surrogate models, Bayesian tuning.
4. CRISPR-enabled trait improvement: stress tolerance, metabolite tuning.
5. Green manufacturing & sustainability: waste valorization, energy minimization.

Deliverables & Outcomes

1. End-to-end SOP set for upstream, downstream, formulation, QC/QA.
2. Template batch records, master/working cell bank documentation.
3. Stability protocols and label-claim justification framework.
4. Scale-up checklist (lab → pilot → production) and risk register.

5. Regulatory dossier skeleton compatible with multiple jurisdictions.

Optional Add-Ons

1. Hands-on lyophilization cycle development workshop.
2. Flow cytometry-based viability & membrane integrity masterclass.
3. Encapsulation design sprint: alginate/chitosan and lipid-core systems.
4. Design of Experiments (DoE) for fermentation & drying optimization.
5. Packaging validation: MVTR/OTR testing and shelf-life modeling.