

HEMPOXY MECHANICAL ONCOLOGY PLATFORM

MASTER RESEARCH & DEVELOPMENT PLAN (PHASES I-II) | LANDRY INDUSTRIES

1. Executive Summary & Core Objective

Problem Statement: Conventional oncology relies heavily on chemical and biological pathways facing profound limitations due to intrinsic cellular resistance mechanisms and systemic toxicity.

Proposed Solution: A non-chemical, physical approach utilizing engineered microneedles and nanostructures fabricated from hemp-fiber reinforced epoxy composites ("Hempoxies"). Guided by real-time AI impedance sensing, these structures physically disrupt malignant cell membranes via mechanical lysis.

2. Core Material Categories & Mechanics

Hemp-Derived Epoxies ("Hempoxies")

Utilized for structural, tunable, and biocompatible scaffolding. Selected for tensile strength profiles and hierarchical nanoreinforcement using hemp-derived carbon nanosheets.

Metallic Substrates

Stainless steel and titanium reserved for micro/nano structural applications requiring exceptional rigidity, tight tolerance precision machining, and proven biocompatibility.

Functional Hypotheses

Mechanical Lysis: Designing microneedle arrays to physically puncture cell membranes, bypassing traditional biochemical resistance.

Tuning Shred-Rate: Regulating physical dynamics to prevent tumor lysis syndrome (TLS) while securing structural integrity. Biodegradable variants are explored to eliminate residual waste.

3. Phase Breakdown & Timeline Matrix

Phase	Task Focus	Milestone Description & Deliverables
Phase I Months 1–3	Material Characterization	ASTM D638 tensile validation, microneedle micro-fabrication, chitosan debris binding kinetics, and preliminary biocompatibility screening.
Phase II Months 4–6	Tumor-on-Chip Validation	PDMS microfluidic testbed fabrication, 3D tumor spheroid embedding, EIS electrical monitoring, and selective lysis verification.
Phase III Months 7–12	AI Targeting & Control	Impedance feature engineering, machine learning classification model training, and real-time rolling-wave automated hardware control.
Phase IV Months 13–18	Preclinical In Vivo	Xenograft tumor model deployment, longitudinal survival efficacy studies, continuous serum biomarker tracking, and histopathology.

4. Strategic Outputs & IP Roadmap

Publishing Strategy & Patent Filings

Phased Dissemination: Rollout across materials science journals (Month 6), bioengineering platforms (Month 10), AI/biomedical computing (Month 16), and clinical oncology (Month 22).

Intellectual Property: Comprehensive patent coverage targeting hemp-epoxy formulations, micro-array mechanical lysis geometries, and AI-driven impedance targeting control systems.