CBD Supa Shield p53 Formula

Delivery System: (CBD) x (Lin-NPs)

- **Linalool Nanoparticles (Lin-NPs)**
  - → **Enables BBB Penetration**
  - ↑ **Enhances Bioavailability**
- **Cannabidiol (CBD) - Active Therapeutic Agent:** → **High Therapeutic Concentration** at Disease Sites (e.g., Brain Tumor, ↓ **Aβ Plaques**)

Phase I: Anti-Inflammatory & Antioxidant Foundation

- **CBD Antioxidant Activity**
  - ↓ **ROS**
  - ↑ **FOXO3** (Antioxidant Genes: SOD2, Catalase)
  - ↓ **NLRP3 Inflammasome**
  - ↓ **CASPASE-1**
  - ↓ **IL-1β**
  - ↓ **IL-18**
- Downstream **Outcome**:
  - ↓ **Neuroinflammation**
  - ↓ **Aβ Plaques**
  - **Creates Permissive Environment for Apoptosis**

Phase II: Pro-Apoptotic Stress Priming

- **CBD x (Lin-NPs)**, Linalool Metabolic Modulation
  - ↓ **Mitochondrial Membrane Potential (ΔΨm)**
  - ↓ **PI3K / ↓ Akt / ↓ mTOR Pathway**
    - ↑ **FOXO3** (Pro-apoptotic Genes: BIM, PUMA)
  - ↑ **Cytosolic Ca^{2+}**
- Downstream **Outcome**:
  - **Generates Pro-apoptotic Cellular Stress**
  - **Activates → p53 / p73 & FOXO3 Arms**

Phase III: Core Apoptosis Trigger: "CBD Supa Shield p53"

- **CBD as "Pharmacological Chaperone"**
  - → **Binds mutant p53 (via Cys adducts)**
  - → **Refolds mutant p53 to functional form**
  - → **Releases sequestered p73 / YAP**
  - Result: ↑ **Functional p53 / p73 / FOXO3** → ↑ **PUMA/NOXA/BAX**
- **Apoptosis Execution Cascade / Synergistic Effect**:
  - ↑ Transcription of ↑ **PUMA** ↑ **NOXA** ↑ **BAX**
  - Dual **p53 / FOXO3** Pro-apoptotic Machinery

Phase IV: Apoptosis Execution

- **PUMA / NOXA / BAX Activation**
  - Inhibit **Bcl-2 / Mcl-1**

    - → **BAX / BAK Activation** & Oligomerization
    - Mitochondrial Outer Membrane Permeabilization **(MOMP)**
    - ↑ **Cytochrome c** / **SMAC** Release
    - → **Apoptosome Formation**
    - → ↑ **CASPASE-9**
    - → ↑ **CASPASE-3**
- **Final Outcome**:
    - Systematic Cell Dismantling ↑ **APOPTOSIS**

Phase V: Amplification & Synergy Loops

- **CBD + Linalool Secondary Pathways**
    - → **TRAIL** → ↑ **Caspase-8**
    - → **BID** → **Enhances MOMP**
- **Feedback Loops**
    - **MOMP** Reinforces Stress Signaling
    - **Apoptosis Stabilizes p53 / p73 via DNA Damage Response**
    - ↑ **PPARγ** → Reinforces Anti-inflammatory State
    - ↑ **FOXO3** → Reinforces Pro-apoptotic Signal
- **Overall Result**:
    - **Virtuous Cycle of ↓ Inflammation / ↑ APOPTOSIS**