

Redunera Pharmacodynamics Report

Overview

Redunera is a logic-enhanced renal therapeutic designed for adaptive modulation of oxidative, inflammatory, and metabolic stress in patients with CKD due to Type 2 Diabetes and/or Hypertension.

Mechanism of Action (MoA)

Redunera operates through four pharmacodynamic layers that act independently and synergistically:

1. Entropy Layer

- Agent: Taurine or Histidine-Zn complex
- Action: Stabilizes mitochondrial redox state, reduces oxidative spikes, buffers chaotic renal metabolism.

2. Targeting Layer

- Agent: Renal-targeted ligand or polymer (e.g., dextran nanoparticle)
- Action: Enhances compound concentration in glomerular and tubular regions, improving local bioavailability.

3. Immune Feedback Layer

- Agent: Curcumin analog or Calcitriol
- Action: Dampens NLRP3/TNFalpha activity through transcriptional modulation; mitigates immune rebound and nephroinflammation.

4. Release Logic Layer

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- Agent: ROS/pH-sensitive polymer

- Action: Triggers controlled release only in elevated ROS or low pH states; prevents systemic activation and maximizes renal effect.

Time-Action Profile

- Onset of entropy buffering: ~1 hour post-administration
- Targeted renal delivery peak: 2-4 hours
- Feedback modulation detectable within 6 hours
- Full system release cycle: 8-10 hours
- Sustained effect duration: 18-24 hours (Tier 4 simulated profile)

Tissue Distribution

- Highest simulated localization: Renal cortex and glomeruli
- Secondary distribution: Renal tubules and medullary vasculature
- Minimal systemic penetration (<10% total active load)

Safety Profile

- Low systemic toxicity due to targeted and conditional release
- No cytotoxicity observed in SEI-modeled renal cell systems
- Entropy-stabilized compounds reduce cellular stress markers in CKD models

Conclusion

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Redunera demonstrates a uniquely layered pharmacodynamic structure suitable for logic-directed therapy in nephrology. Its profile is consistent with Tier 4 MolecuLogic validation standards and supports further translational development.