Saving life by slowing life — reducing the metabolic rate via a multiscale enzymology and computational approach to trauma-responsive drug discovery

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Summary:

Severe traumatic injuries in combat zones often occur far from advanced medical care, where evacuation delays can be fatal. Limb trauma is among the most common battlefield wounds and frequently leads to amputation when tissue damage progresses rapidly before treatment is available. We propose to develop a field-deployable drug that temporarily slows key physiological processes in injured limbs. By selectively and reversibly inhibiting enzymes in critical pathways, these drugs would reduce energy demand, limit tissue damage, and preserve viability until medical care is available. Our project will identify high-priority enzymatic targets through a systematic review of limb trauma biology, then demonstrate a proof-of-concept computational–experimental pipeline for discovering small-molecule modulators. This work will lay the foundation for a new class of early trauma interventions to extend survival and improve outcomes.