SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support, habitats and EVA Systems (7)

Author: Mr. S. S. M.
Marvels-X, Australia

UNCAGED-REVEALED: (NATURAL) HUMAN TORPOR

Abstract

Metabolic down-regulation is an ancient, back-up life-support strategy that is common & found everywhere, serving numerous diverse creatures. Widespread in mammals, termed torpor. Torpor expresses in response to threatened or compromised metabolic pathways of: oxygen, water, nutrients, temperature, light, reproduction, &/or waste-management. Torpor confers profound & sophisticated (bet-hedging) prophylactic & therapeutic protection. It can effectively cope, albeit to varying degrees, with a seriously impressive long-list of threats, e.g., hypoxia, asphyxia, decompression, dehydration, starvation, obesity, hypothermia, hyperthermia, ionizing-radiation, darkness, traumatic-injury (e.g., brain, spinal-cord, muscle, etc.), scarring, blood-loss, shock, ischemia-reperfusion injury (e.g., cardioprotection), inflammation, (e.g., viral, bacterial, etc.) infection/pathogenesis, toxins/poisons, cancer-metastasis, disuse-atrophy, degenerative-wear & -clutter, accelerated/premature ageing, brief life-span, confinement / seclusion; & even long-distance travel (e.g., migrating hummingbirds). As such torpor tantamounts to a body-shield with sci-fi-like 'superpowers' for dealing with extremely broad-spectrum of seriously bad-agents. These are the very types of intractable health & performance problems that humans venturing into deep-space will face.

Torpor, credibly seems like that gateway technology to resolve many of these serious challenges, undoubtedly fast-tracking, even outright enabling deep-space ambitions. Aside forementioned biomedical benefits, torpor would obviate the need to eat, drink, & exercise; it is near-self-sufficient. Oxygen, habitat-size, & radiation-shielding needs could be near-order-of-magnitude-reduced, plummeting life-support launch-costs. Furthermore, because torpor slows metabolic-rate, perceived travel-time would correspondingly contract, even collapse, i.e., suspended-animation with time-jumping. The unmatched protection & endurance conferred by biological time-dilation might permit Mars transfer-trajectories otherwise deemed too exposing but that could outright-enable such capabilities; broaden launch-windows; relax architectural, engineering & operational constraints; reduce risks & costs; &, affordably-sustain mission-frequencies.

However, despite voluminous research on this animal marvel &, moreover, broad-spectrum expression by several (tropical-jungle) primates, including an archetypical-form – (half-year-long-plus) deep hibernation – awakening this dormant biomedical capability in humans, naturally, let alone full-blown, on-demand & ultra-fast, i.e., for truly effective space-travel/exploration, remains a four-centuries-longstanding-elusive grand-challenge. This holy-grail is made all the more difficult because no 'dimmer-switch' nor 'trigger' has ever been frank-identified in any even consummate torpid critter, i.e., complete enigma.

Unveiled here, unequivocal evidence of a latent, natural human torpor capability, in several (Australian) extremophiles. This phenomenal, routinely relied upon latent capability is expressible on-demand, nocturnally, & emergency-like: fast-&-deep. Described, a constellation of classic, say, 'shining-star' animal-like physiological hallmarks, necessarily including metabolic-rate depression, to below the normal basal rate; extensive, spontaneous body-cooling, including, notably brain-cooling. Present R&D investigations are focused on determining ultimate metabolic & temperature depth- & time-limits.