Appendix C – Contextual Deployment Scenarios

The following hypothetical scenarios illustrate system behavior across representative physiological contexts. These do not constitute efficacy claims but serve to demonstrate the structural fidelity of Co-Aegis under variable constraints. All cases assume v2.5 architecture unless otherwise noted.

C1 Immunocompetent Solid Tumour (CT26 model)

Context:

Subcutaneous colorectal tumour with stable hypoxic core ($O_2 \leq 0.5\ \%$) and intact immune function.

Observed sequence:

- Hypoxia threshold reached ($O_2 \leq 0.5\ \%$ sustained ≥ 6 min)
- spo0A expression initiated; germination proceeds
- HSV-TKmut PET signal confirmed at d2 post-injection (^{18}F-FHBG)
- Cas9 abort payload remains dormant (no doxycycline administered)
- On d5, plasmid instability detected (partial dapA dropout)
- Pfault module initiates PSM exposure
- No systemic CFU detected; bystander tissue unaffected

Conclusion:

System remained within design constraints. Exposure logic triggered by deviation and resolved by host immune clearance. No intervention required.

C2 Immunocompromised Mucosal Lesion

Context:

Post-transplant patient with neutropenia and suppressed T-cell function. Localized necrotic ulcer in lower gut.

Observed sequence:

- Passive spore ingress into lesion site
- O_2 fluctuation between 0.7–1.1 %; germination not triggered
- On d3, transcript-level instability detected (Cas9 silencing event)
- Pfault module initiates PSM exposure
- No immune activity observed over 72 h
- PET remains negative (HSV-TKmut inactive)
- TMR-03 signature detected in urine at d4
- External biologic (anti-FLAG nanobody) administered on d4
- Clearance of exposed constructs confirmed within 48 h

Conclusion:

System signaled fault correctly. Lack of immune surveillance prevented autonomous resolution. Clearance required biologic intervention. No off-target activation occurred.

C3 Non-Tumour Hypoxia: Chronic Ischemic Ulcer

Context:

Peripheral chronic ulcer with localized ischemia; intermittent O_2 dips to 0.9 % but no sustained hypoxic descent.

Observed sequence:

- Multiple transient O_2 events ($O_2 \leq 1.2$ % for < 4 min)
- Hypoxia persistence threshold not met
- spo0A remained suppressed; no germination
- Harmonizer peptide expressed; no inflammatory markers detected
- No exposure logic triggered
- Natural clearance observed by d6

Conclusion:

Refined germination gating prevented false activation in marginal hypoxic zone. Dormancy harmonizer preserved ecological neutrality. Passive presence resolved without immune event.