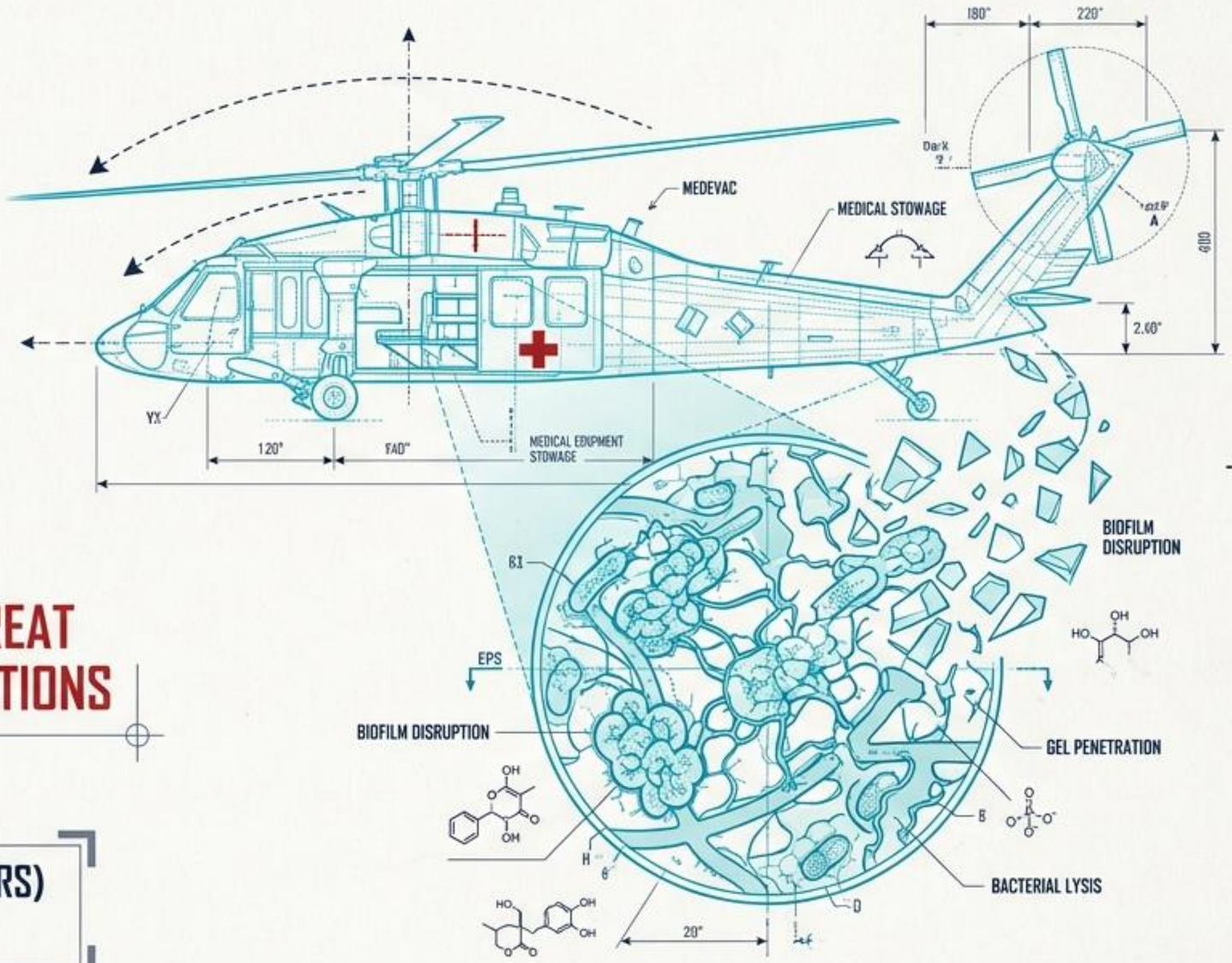
BROAD-SPECTRUM, CAVITY-FILLING ANTIMICROBIAL GEL TO ADDRESS PROLONGED FIELD CARE WOUND CHALLENGES

MITIGATING THE 72-HOUR BIOFILM THREAT IN MULTI-DOMAIN CONTESTED EVACUATIONS



Military Health System Research Symposium (MHSRS)

Lt Col Steven Jeffery RAMS

Acknowledgments:

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Dr. Jayachchandran Visvalingam
Dr. Robert Huizinga

Disclosures:

- **Lt Col Steven Jeffery has no conflicts to report**
- **Dr. Miloslav Sailer, Dr. Jeyachchandran Visvalingam, Dr. Robert Huizinga are employees of Kane Biotech**

The Paradigm Shift: From the "Golden Hour" to Prolonged Field Care (PFC)

The Golden Hour (OEF / OIF)

Military MEDEVAC

Forward Surgical Tent

Historically, the average time to care was reduced to ~45 minutes. Air superiority guaranteed rapid transport, yielding exceptionally high survivability rates.

Prolonged Field Care (Future Multi-Domain)

Contested Airspace

Cyber/Comms Jamming

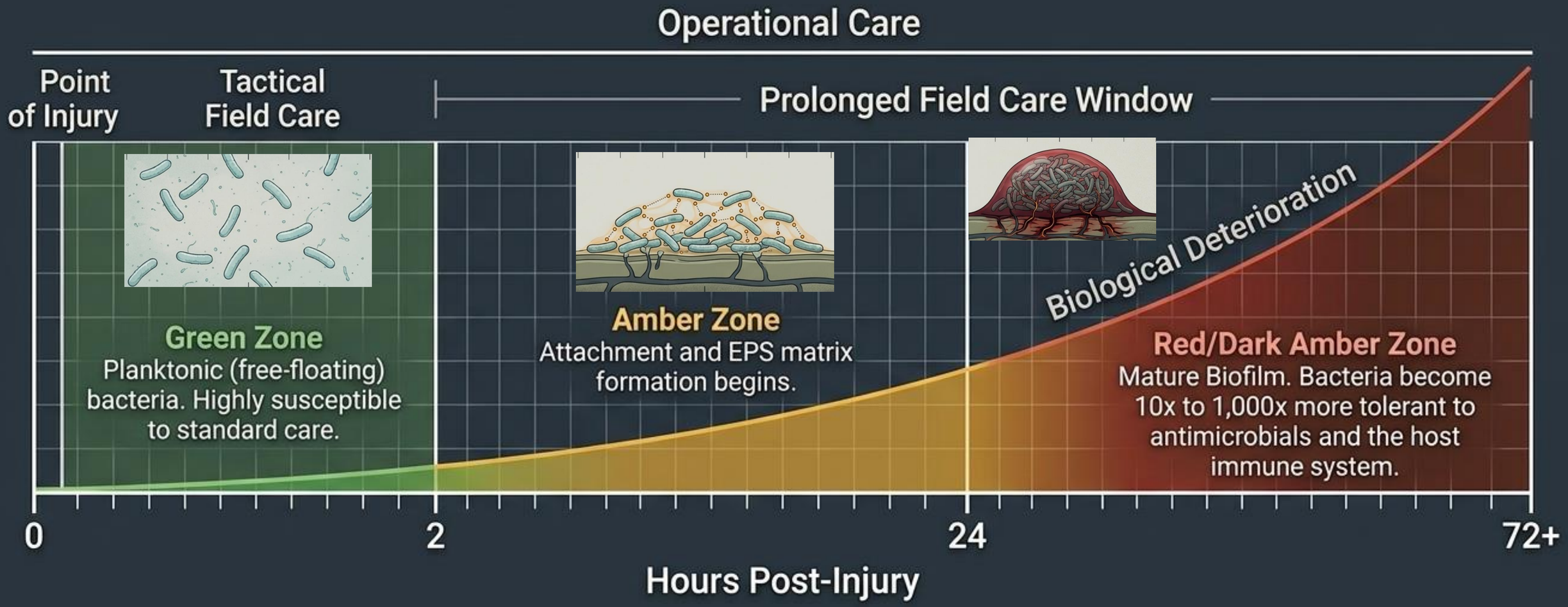
Overwhelmed Field Medic

HUD

Field medical care applied beyond doctrinal planning time-lines by a tactical medical practitioner to decrease patient mortality and morbidity.

Wounded service members will face hours to days in austere, non-sterile environments before receiving definitive surgical care

The Biological Threat: When Time Works Against Us



Time dictates the biological battlefield. If planktonic bacteria are not rapidly eradicated during delayed evacuation, they convert into deeply anchored, highly resistant biofilms.

The Infection Burden of Combat-Related Extremity Trauma

1

Baseline Severity

Of combat casualties sustain extremity trauma (predominantly IED blast injuries).

2

The Infection Rate

Overall Combat-Related Extremity Wound Infection (CEWI) rate among 1,271 patients.

3

The Amputation Danger

Infection rate specifically in traumatic amputations.

4

The Long-Term Threat

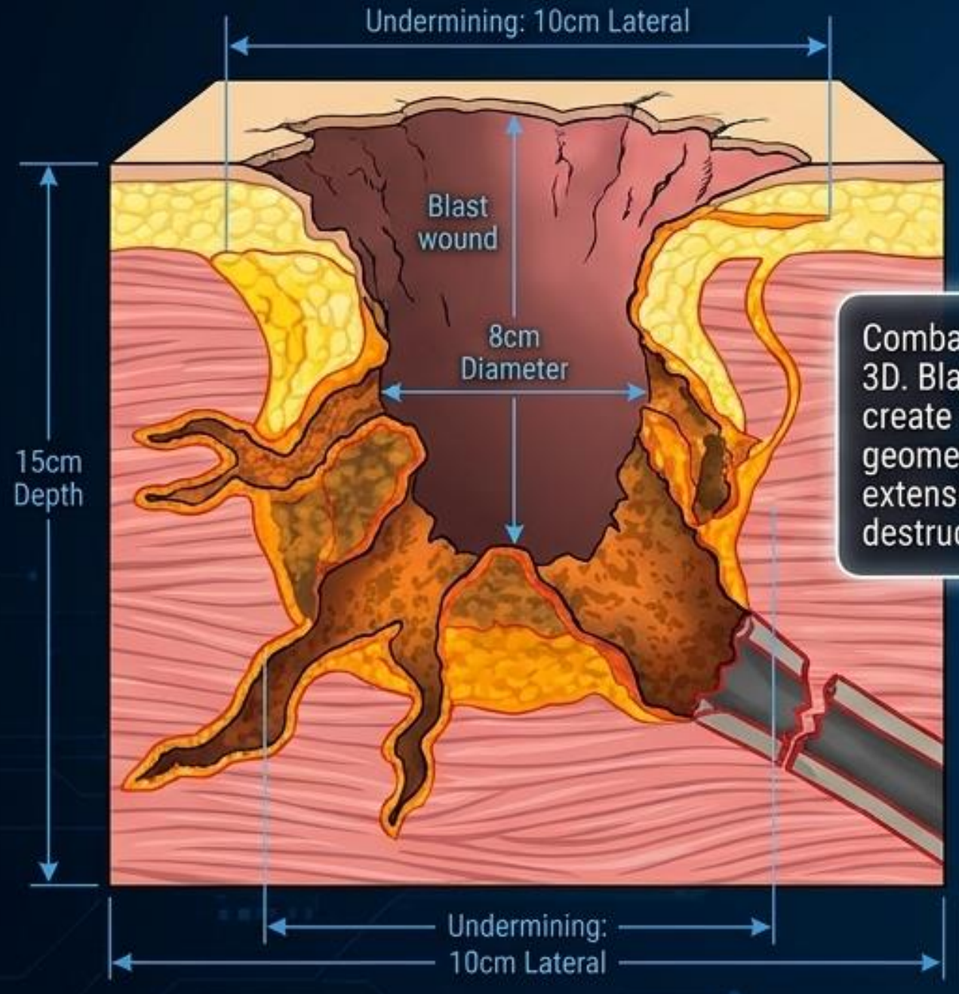
Patients develop new or recurrent infections after hospital discharge.

Delayed care creates an infection cascade. Survival is no longer the only metric; we must preserve tissue viability to prevent delayed amputations.

Owens BD, et al. *J Orthop Trauma*. 2007;21:254-257. Petfield JL, et al. *Mil Med*. 2022;187(Suppl 2):25-33. Tribble DR, et al. *Surg Infect*. 2018;19:494-503

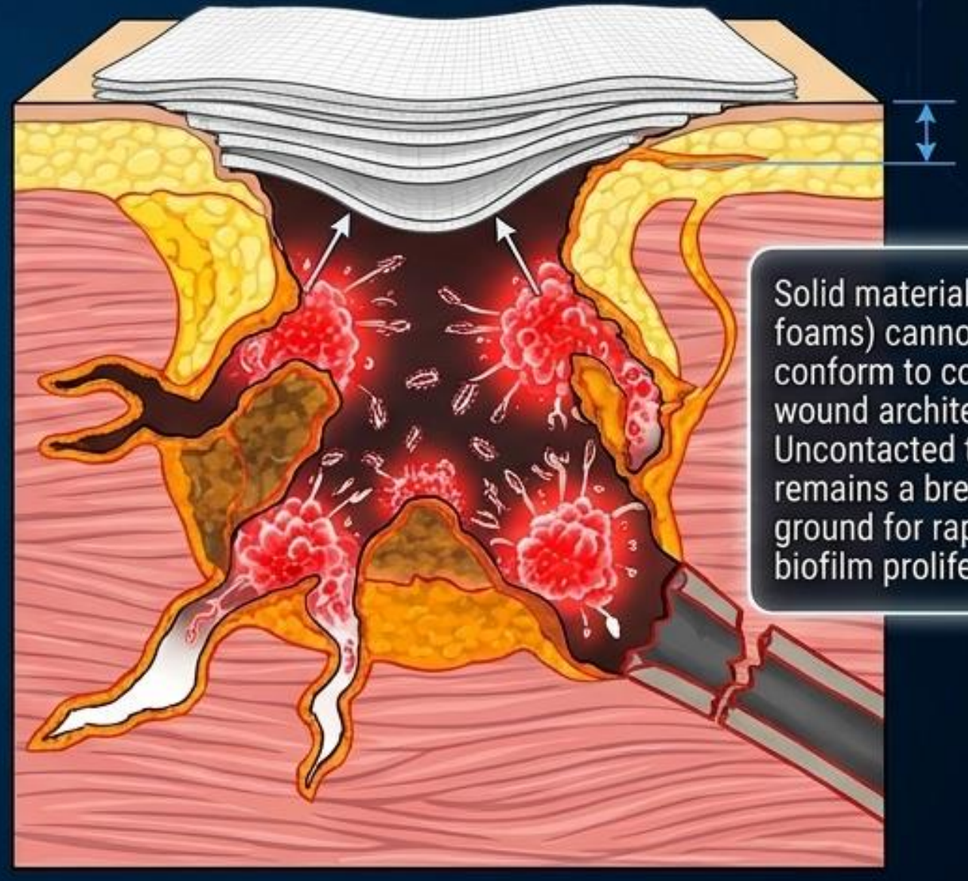
The Geometry of Combat Trauma Defies Standard Dressings

The Clinical Reality (3D Cavities)



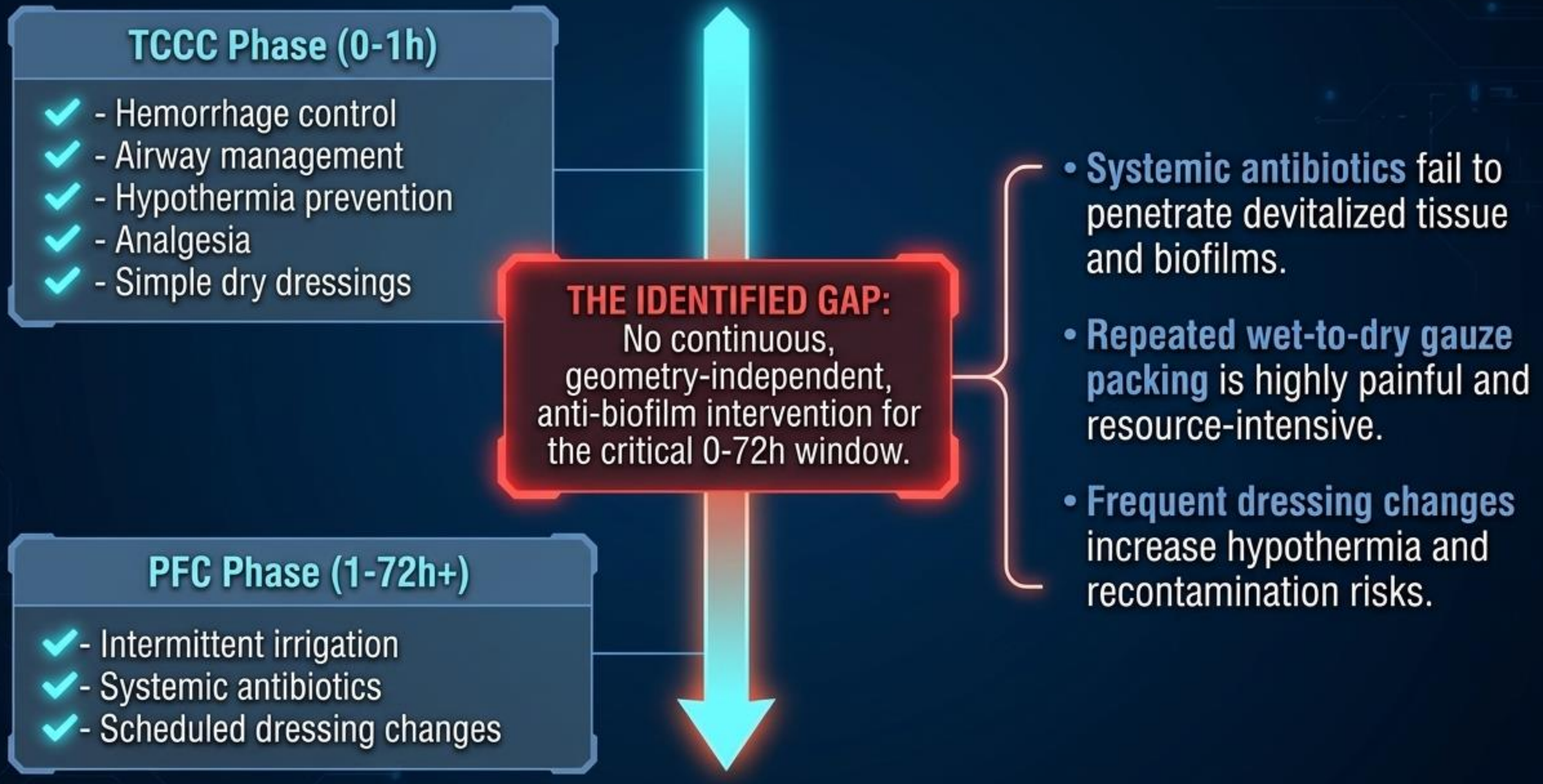
Combat trauma is 3D. Blast injuries create irregular geometries with extensive tissue destruction.

The Standard of Care Failure (Planar Solutions)



Solid materials (gauze, foams) cannot conform to complex 3D wound architectures. Uncontacted tissue remains a breeding ground for rapid biofilm proliferation.

The Capability Gap in Current TCCC/PFC Doctrine



Design Criteria for the Future Battlefield Solution

Logistics Light

Low SWaP (Size, Weight, and Power). <1kg weight, requiring no external power or suction.

Cold-Chain Independent

Shelf-stable across extreme operational temperatures (-30°C to 50°C).

Nonspecialist Usability

Rapidly administrable (seconds to minutes) by a Role 1 combat medic or via self-administration under stress.

Biological Efficacy

Must deliver sustained anti-biofilm activity without requiring frequent dressing changes.

Atraumatic Re-entry

Must allow for painless wound inspection and staged debridement in austere settings without tissue stripping.

Introducing Antimicrobial Wound Gel

The Tactical-Biological Blueprint for Austere Wound Management.

- ☑ Self-Administrable
- ☑ Zero Power
- ☑ Shelf-Stable
- ☑ Universal 3D Conformation
- ☑ Low SWaP
- ☑ Biofilm Disruption

- A novel, sprayable, thermo-reversible antimicrobial hydrogel.
- Patented coactiv+™ technology.
- Engineered specifically for rapid, **contactless stabilization of complex conflict wounds** in 0–72 hour evacuation delays.

FDA 510(k) Cleared Technology

Anatomy of the Gel: Integrated Microenvironment Control

Broad-Spectrum Eradication

Active Agent: Polyhexanide (PHMB).

Kills planktonic and biofilm pathogens (MRSA, *P. aeruginosa*, *A. baumannii*) common in modern conflict trauma.

Biofilm Disruption

Active Agents: Poloxamer 407 + EDTA/Citrate Chelators.

Physically destabilizes the metal-dependent biofilm Extracellular Polymeric Substance (EPS) matrix.

Structural Conformity

Thermo-reversible Poloxamer Matrix.

Expands and thickens upon contact with body heat to provide absolute 3D coverage of irregular cavities.

Host Defense Support

Citric Acid + Glycerol.

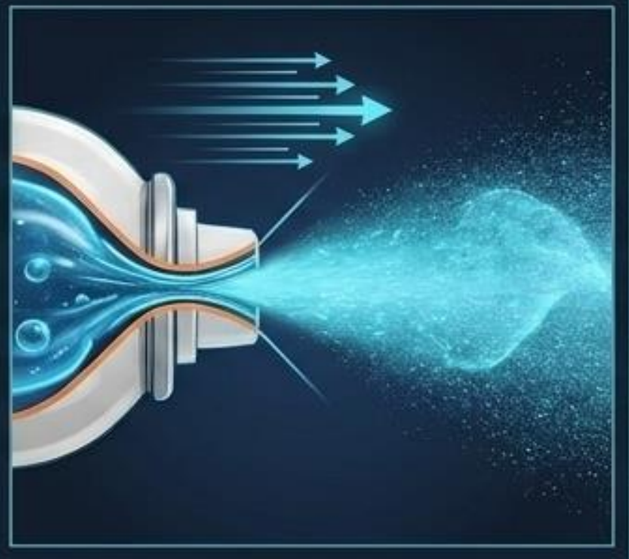
Maintains an acidic pH (5.9) and optimal moisture balance to sequester harmful metalloproteases and promote tissue viability.

THE PHYSICS OF APPLICATION: SHEAR-THINNING DELIVERY

THE CORE MECHANIC

The product natively exists in the can as a thick gel.

CONTACT-FREE APPLICATION



High-velocity shear force from the actuator temporarily thins the gel, allowing it to be sprayed from a safe distance (3-4 inches).

INSTANT CONFORMATION

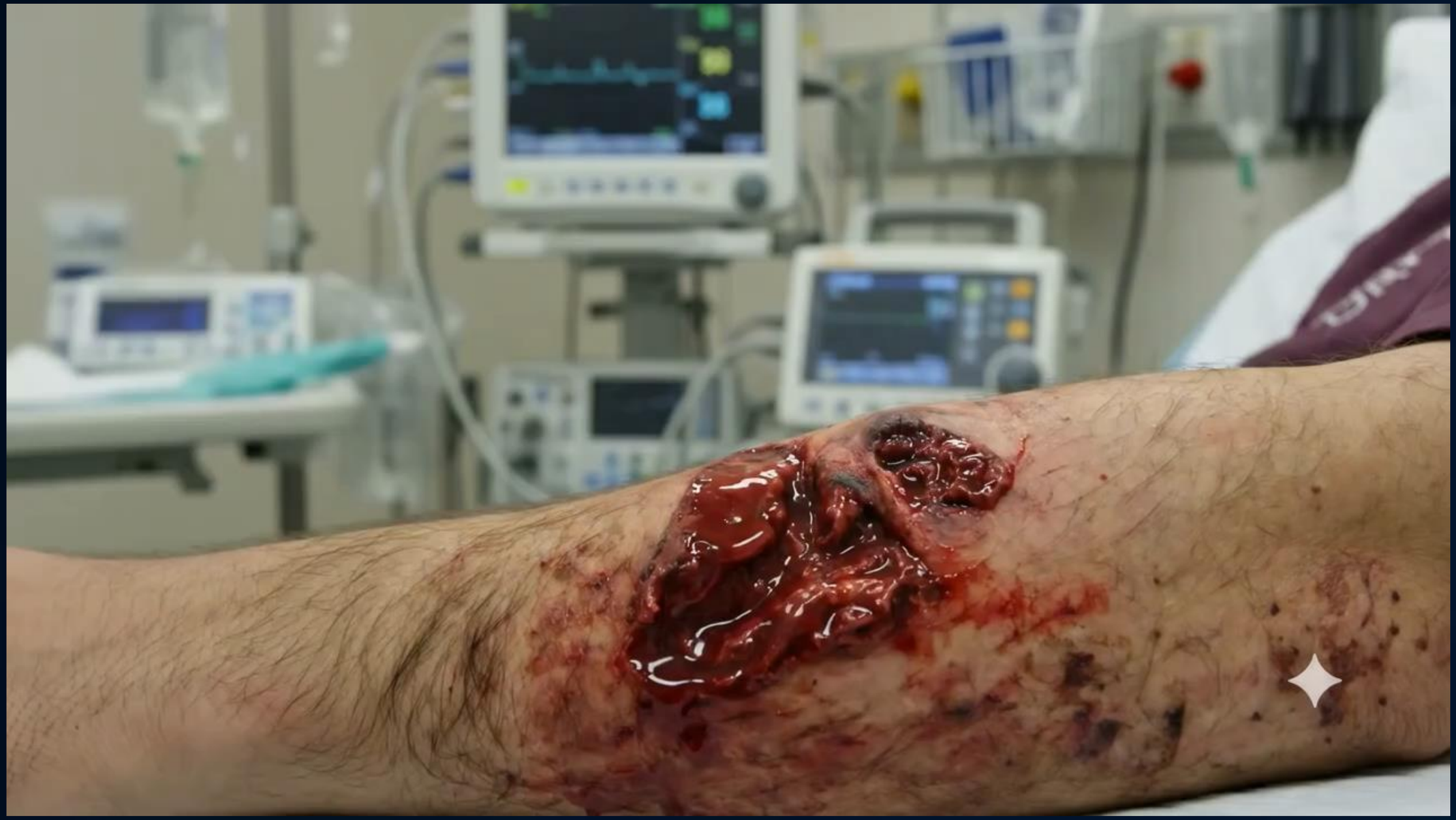
Upon deposition, the shear force is removed. The product is deposited into the complex wound architecture and instantly regains its stable gel structure without manual packing or manipulation.

CANISTER PRESSURE

ACTUATOR SHEAR

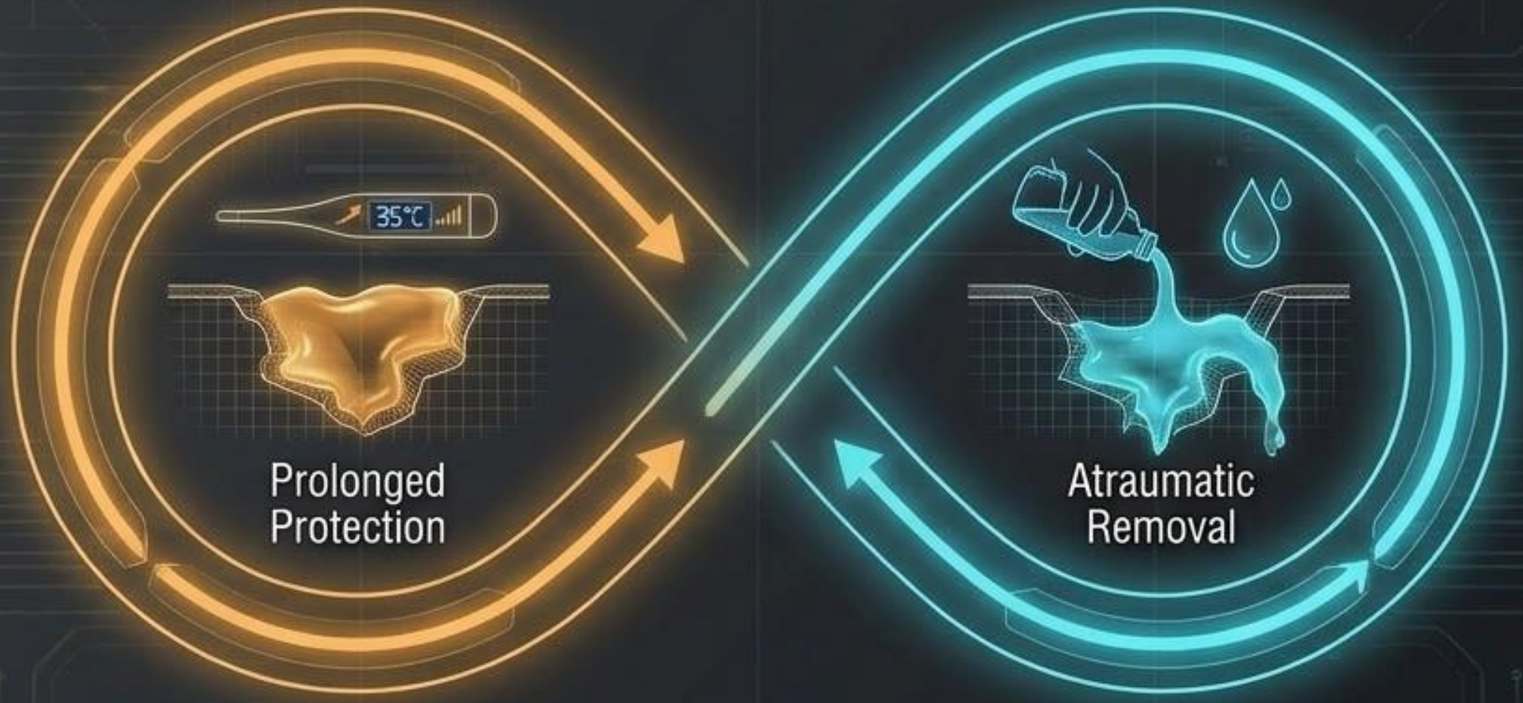
INSTANT GEL STABILITY

TACTICAL BLUEPRINT



Sustained Hold, Atraumatic Re-entry

Stable
When Warm



Reversible
When Chilled

The Tactical Advantage

Current gauze interventions require painful, tissue-tearing manual extraction. revyve liquefies instantly with chilled saline.

Workflow Impact

Enables low-resource, low-pain re-entry for cavity inspection, staged debridement, or field-forward evacuation reassessments by Role 1 personnel.

Synergistic Biofilm Disruption

Chelators & Surfactants

Actively strip metal ions and destabilize the extracellular polymeric substance (EPS) matrix, tearing open the protective shield to expose hidden bacteria.

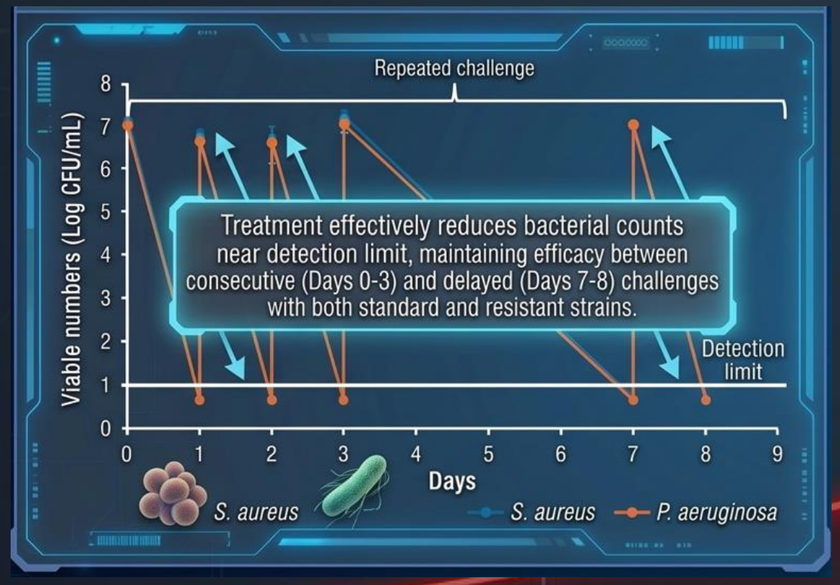
PHMB (Polyhexamethylene Biguanide)

A broad-spectrum antimicrobial agent that infiltrates the disrupted, weakened matrix to deliver a lethal payload directly to Multidrug-Resistant (MDR) pathogens.

pH & Moisture Regulation

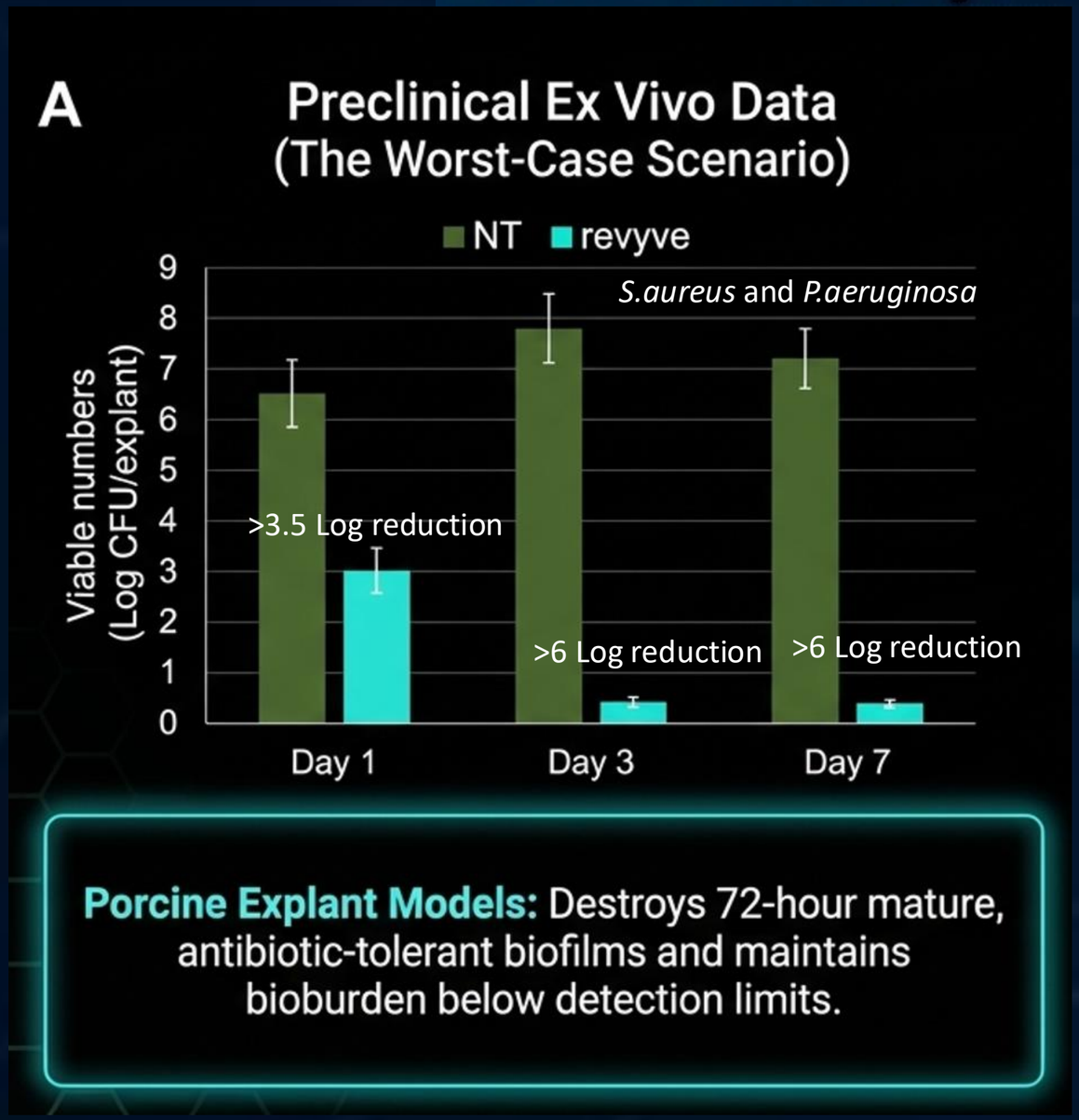
Maintains a slightly acidic environment (pH ~5.9) that actively supports host immune defenses and prevents tissue desiccation.

Sustained Protection for Prolonged Field Care



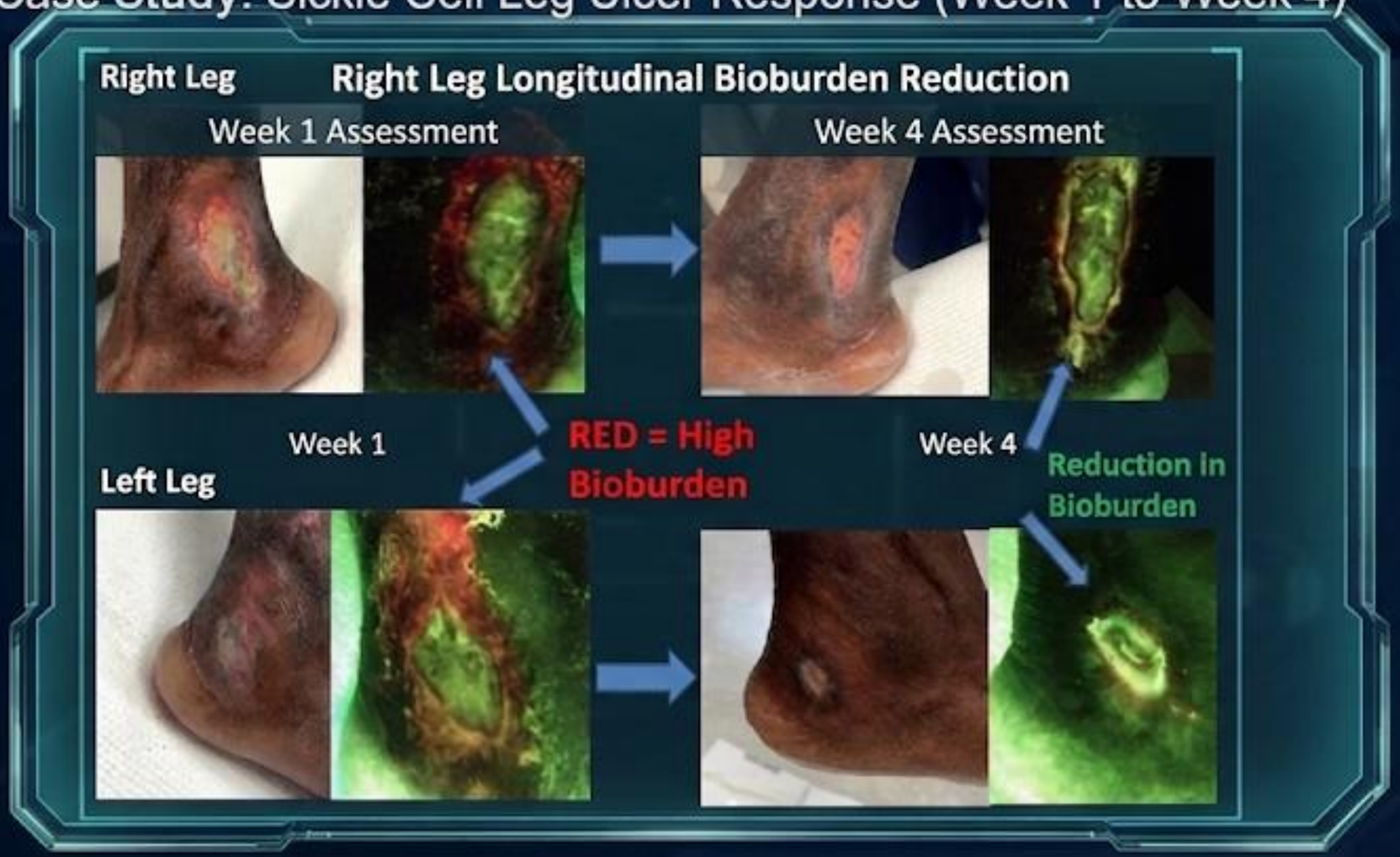
- **Sustained In-Vitro Performance**
  The gel maintains active antimicrobial and antibiofilm activity for ≥7 days.
- **Repeated Challenge Resilience**
  Survives repeated high-inoculum challenges (10^6-10^7 CFU/mL) in simulated wound fluid without losing efficacy.
- **The Tactical Buy-back**
  Provides a durable therapeutic effect that maintains tissue viability across the entire 72+ hour deterioration window of austere combat care.

Scientific Validation: Biofilm Disruption



Clinical bioburden reduction

Case Study: Sickle Cell Leg Ulcer Response (Week 1 to Week 4)



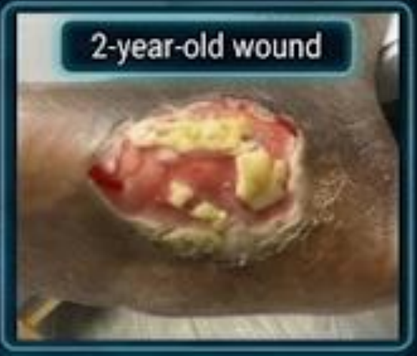
Reduction of bacterial bioburden as measured by fluorescence

Wound Healing

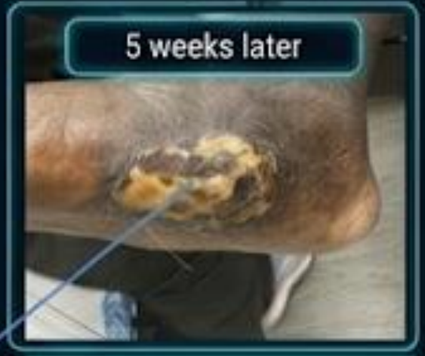
Rapid Clinical Healing in Chronic VLU (102-year-old Patient)

Clinical Case: 102-year-old patient with non-healing chronic VLU. Applied 3x/week, revyve achieved near-complete Percent Area Reduction (PAR) at Week 7 and elimination of pain.

Rapid Clinical Healing in Chronic VLU (48-year-old Diabetic Case)



5 weeks later



INITIAL ASSESSMENT

Wound Size:	6.7 x 5.5 x 0.2 cm
Area:	36.60 cm²
Tissue Type:	Epithelial
Appearance:	Pink, serous exudate, scant moisture
Pain:	2/10

Repigmentation

WEEK 5

Healing Status:	Healed
Tissue Type:	Epithelial
Appearance:	Pink, dry skin
Pain:	0/10

48-year old male with diabetes
3x/week revyve application

Rapid healing in chronic leg ulcers

Concept of Employment (ConEmp) for Role 1 & 2 Care

SPRAY
(Point of Injury / Role 1)

Contactless, geometry-independent delivery from a distance (3-4 inches). Takes <30 seconds. Integrates directly into the MARCH/MIST workflow after hemorrhage control.

STABILIZE
(Prolonged Field Care / En Route)

Gel solidifies instantly at body temperature. Provides sustained (>7 day) biofilm protection and moisture balance without requiring frequent, power-dependent Negative Pressure Wound Therapy (NPWT).

Compatible with any secondary cover dressing.

RE-ENTER
(Role 2 / Forward Surgical)

Medic or surgeon flushes with chilled saline. Gel instantly liquefies for atraumatic reassessment, minimizing tissue damage, eliminating stripping, and reducing systemic opioid requirements for pain.

Capability Comparison: Standard of Care vs. Thermoreversible Gel

Operational Dimension	Current Standard (Gauze + Systemic Antibiotics)	Thermoreversible Spray Gel
3D Cavity Coverage	Poor (leaves uncontacted dead space and tunnels)	Optimal (liquid penetration, in situ solid gelling)
Biofilm Disruption	Ineffective against mature EPS matrices	Highly active (synergistic matrix disruption)
Logistics / SWaP	High bulk, requires constant sterile repacking	Ultra-light, one-time application, completely cold-chain free
Pain on Re-entry	High (tissue adhesion requires mechanical stripping)	Zero (effortlessly liquefies with cold saline flush)

Strategic Impact: Preserving the Force in Austere Environments

Decreased MEDEVAC Demand

Decouples the biological deterioration of the casualty from tactical evacuation timelines. Commanders can safely delay MEDEVAC if airspace is contested without risking lethal casualty sepsis.

Reduced Surgical & Logistical Burden

Reduces reliance on bulky, power-heavy NPWT and systemic antibiotics. Delivers a stabilized, much cleaner wound bed to Role 3 surgical teams upon arrival.

Accelerated Return to Duty (RTD)

By preventing biofilm-driven necrosis in the vital first 72 hours, the gel aggressively preserves tissue viability, minimizes delayed amputation risks, and shortens rehabilitation pathways.

Providing geometry-independent, anti-biofilm stabilization at the point of injury is critical to maintaining combat power in the era of Prolonged Field Care.

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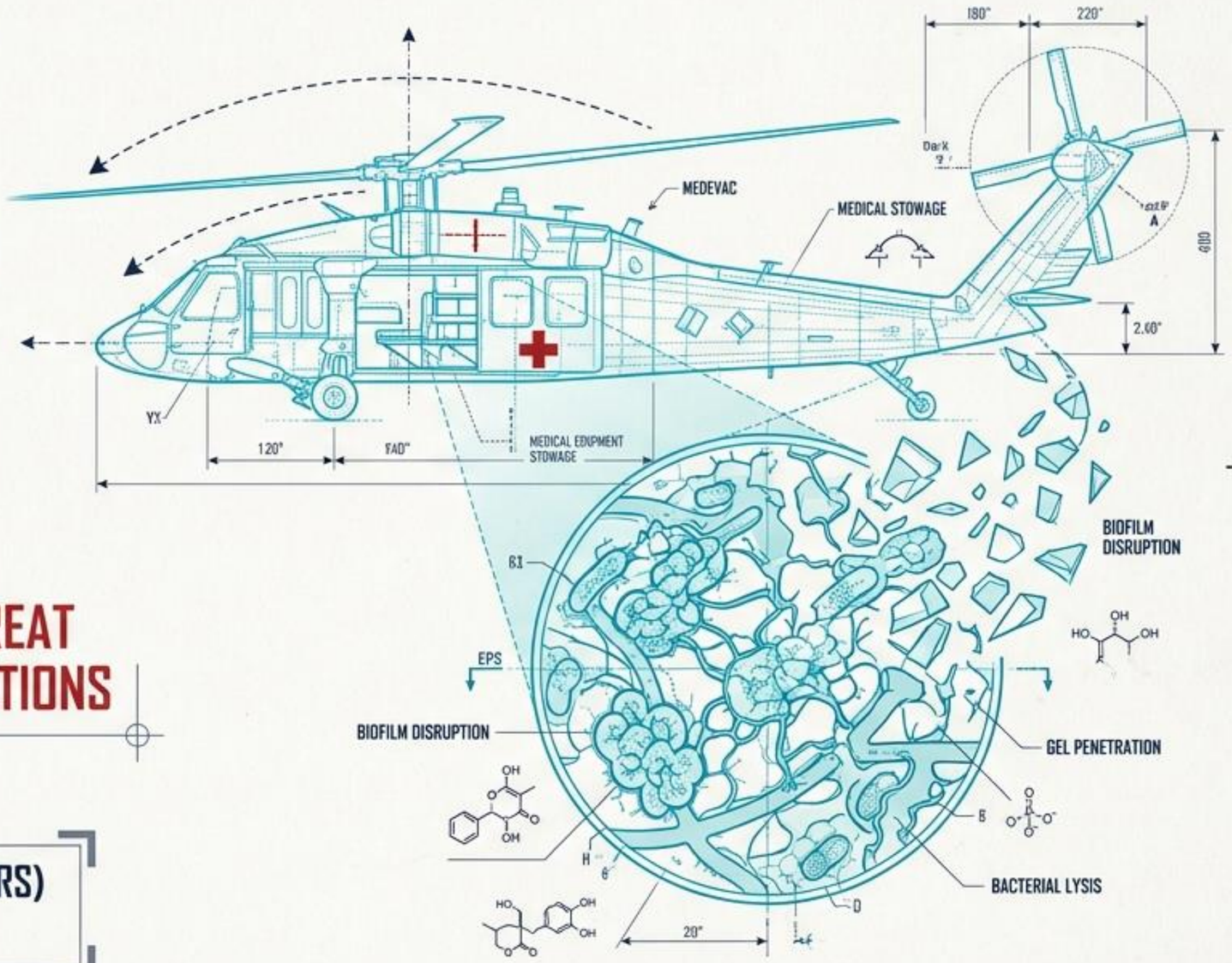

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