A Platform Approach to Biologic Stabilization for Supply Chain Resilience and Distributed Medical Operations

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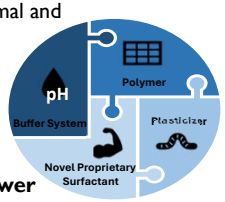
Background

Biologic medical countermeasures require cold-chain storage, creating logistical in contested, distributed, and resource-limited environments. Jurata's tunable polymer platform is designed to stabilize diverse biologics by preserving functional integrity under thermal and mechanical stress.

Technology Platform

Tunable amphiphilic polymer formulations stabilize biologics by reducing aggregation and preserving functional integrity under thermal and mechanical stress.



Formulation Components

- ✓Buffer- pH
- ✓Polymer-film forming
- ✓Plasticizer-flexibility, strength
- ✓**Surfactant- stabilizing power**
- ✓Additional Excipients (sugar, AA)

Tunable Presentations for Delivery

Liquid

Liquid presentation can be packaged in vials/any standard administration device (e.g, syringe). ROA: IV, IM, SC and Oral.

Film

Thin films are light weight, and a small footprint enable cost savings in shipping and storage.
ROA: SL, BU, and Oral

Methods

Jurata liquid formulations were evaluated across multiple biologic modalities including monoclonal antibodies (mAbs), red blood cells (RBCs) and cellular products (PBMCs and CEF cells). Samples were stored under modality-specific stress conditions and compared to fresh or process controls to assess stability and functional preservation.

Monoclonal Antibody

- Stored for 44 days at 25°C (40°C ongoing)
- Evaluated by ELISA and SEC

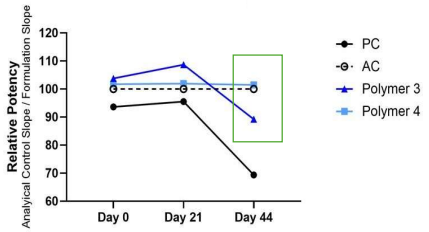
Red Blood Cells (RBCs)

- Stored for 11 days at 2–8°C and assessed by hemolysis
- Shear protection evaluated by repeated pipetting (>40 cycles) across a concentration series

Cellular Products (PBMCs & CEF Cells)

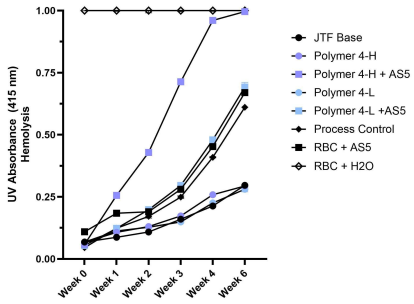
- Stored for 6 days at 2–8°C
- Viability assessed using ATP-based assays

Monoclonal Antibody

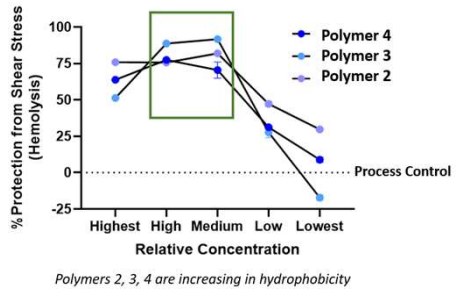


Red Blood Cells

RBC Integrity - 6 weeks at 2-8°C



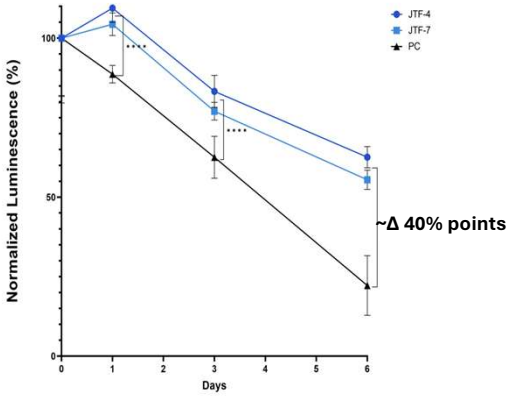
Shear Stress Induced by Pipetting >40 cycles



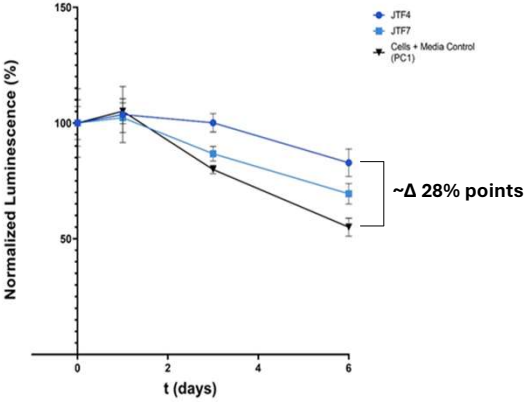
Polymers 2, 3, 4 are increasing in hydrophobicity

Cellular Products

PBMC Stability – 6 days at 2-8°C

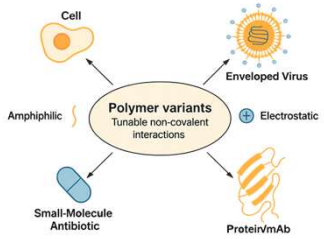


CEF Stability – 6 days at 2-8°C



CEF are among the most fragile primary cells typically stored in liquid nitrogen (-150˚C).

Mechanistic Basis for Improved Stability Across Modalities



One Platform. Multiple Modalities

Jurata's tunable amphiphilic polymer variants transiently associate with stress-sensitive interfaces through **non-covalent amphiphilic and electrostatic interactions**. These interactions reduce interfacial stress, aggregation, and hydrolytic degradation while preserving biologic function. **By tuning polymer hydrophobicity**, the platform can be **optimized across diverse modalities**, including proteins, blood products, viruses, and cellular therapies.

Results

Monoclonal Antibody (mAb)

- Preserved activity for 44 days at 25°C
- Improved monomer retention versus control formulations (ELISA/SEC)

Red Blood Cells (RBCs)

- Prevented hemolysis during 6 weeks at 2–8°C
- Shear protection increased with polymer concentration
- Greater protection observed with increasing polymer hydrophobicity

Cellular Products (PBMCs & CEF Cells)

- Maintained 80% viability for 6 days at 2–8°C
- Outperformed untreated controls under refrigerated storage

Operational Impact

Thermal and Mechanical Stress

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Jurata Polymer Platform

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🧊 **Reduced Cold-Chain Dependence**
Extends biologic stability during storage and transport, reducing reliance on continuous refrigeration and increasing logistical flexibility.

📦 **Supply Chain Resilience**
Maintains biologic function throughout handling, shipping, and storage to improve reliability of medical countermeasure distribution and last-mile delivery.

🚑 **Distributed Medical Operations**
Supports storage, transport, and administration of biologics across fixed facilities, forward-deployed settings, and prolonged field care environments.

💉 **Cross-Modality Platform**
A single tunable polymer platform stabilizes antibodies, blood products, cellular therapies, and vaccines through a shared mechanism of action.

A resilient biologic stabilization platform that reduces logistical constraints, strengthens medical countermeasure readiness, and enables reliable delivery of life-saving therapeutics across the full spectrum of military medical operations.