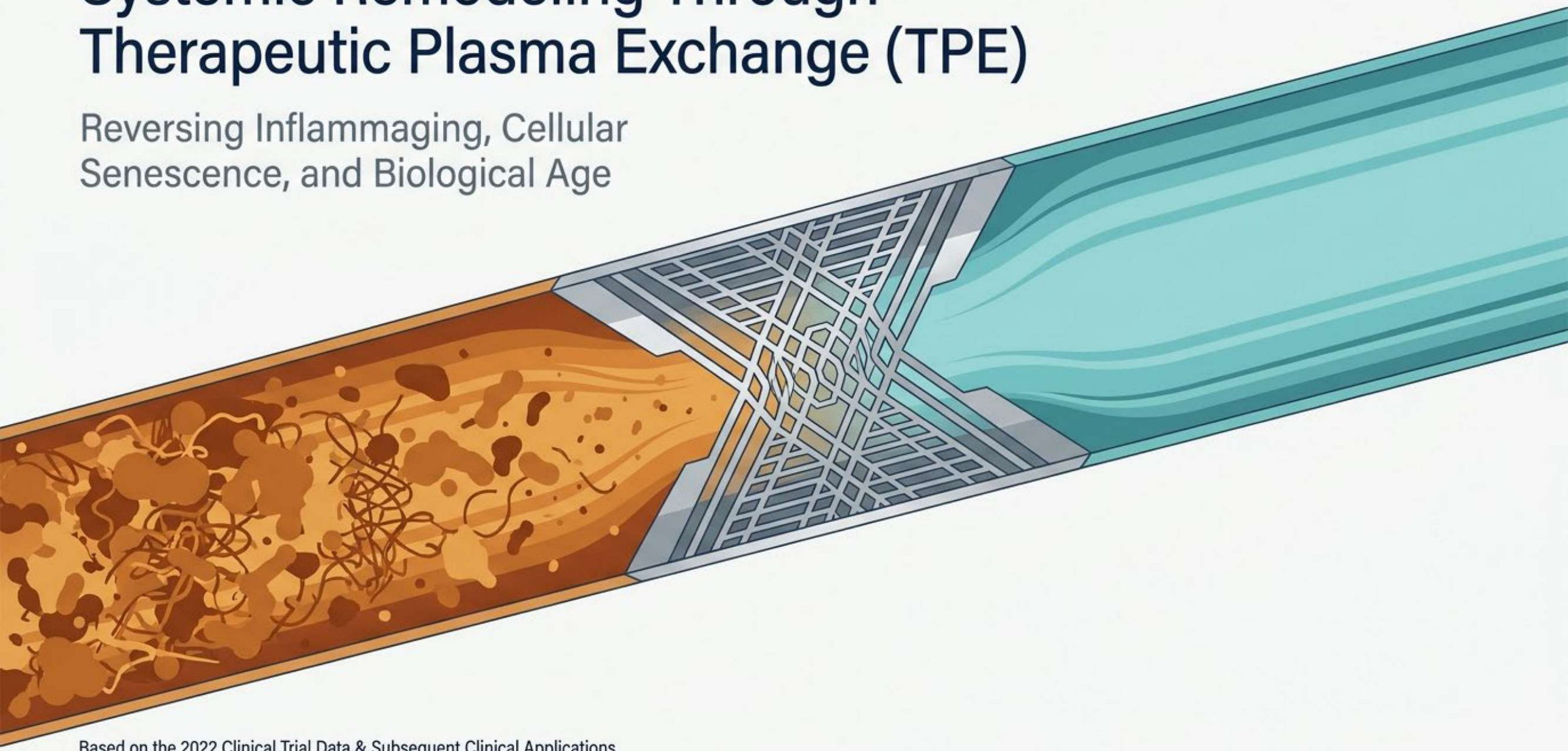
Systemic Remodeling Through Therapeutic Plasma Exchange (TPE)

Reversing Inflammaging, Cellular Senescence, and Biological Age



Based on the 2022 Clinical Trial Data & Subsequent Clinical Applications.

The Intervention

The Outcome

- Clears systemic biological noise
- Reduces cellular senescence

Rapid decrease in Biological Age

- Reduces cellular senescence
- Initiates active immune remodeling

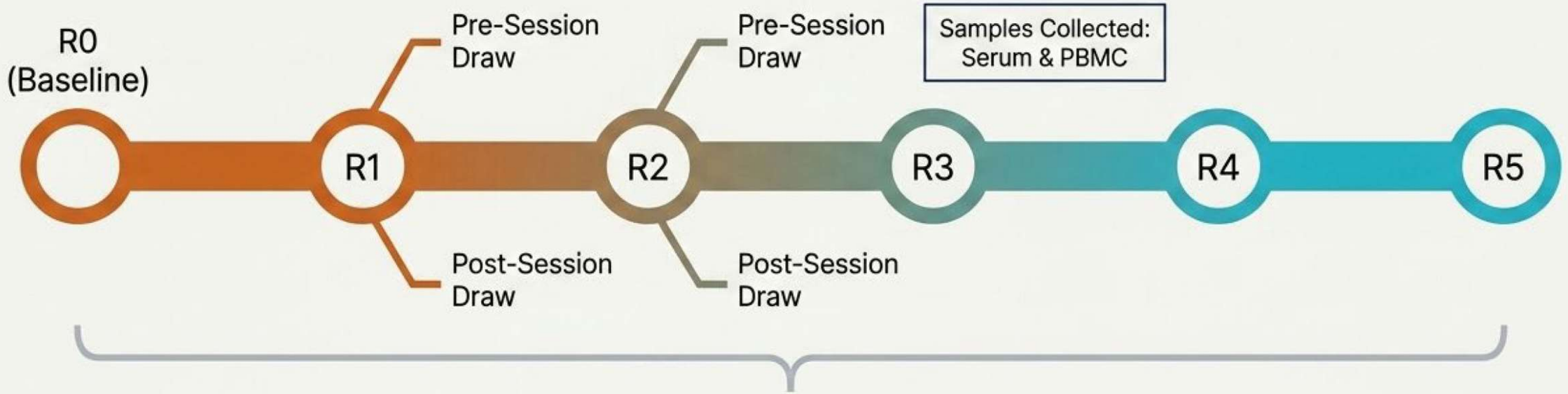
Study Design: Bridging the Generational Biological Gap

Young Cohort	Old Cohort	TPE Cohort
Demographic: Ages 20-29 (n=5)	**Demographic:** Ages 65-75 (n=5)	**Demographic:** n=8 (Undergoing active intervention)
Profile: Baseline for peak biological function and low systemic inflammation.	**Profile:** Elevated inflammaging markers, higher senescence, and accumulated biological noise.	**Objective:** Shift the biological profile of the Old Cohort to mirror the Young Cohort baseline.

The goal of the trial is not just symptom management, but mapping the quantifiable shift of the Old proteome back to a Young baseline.

The Protocol Flow: 1 Month to Systemic Remodeling

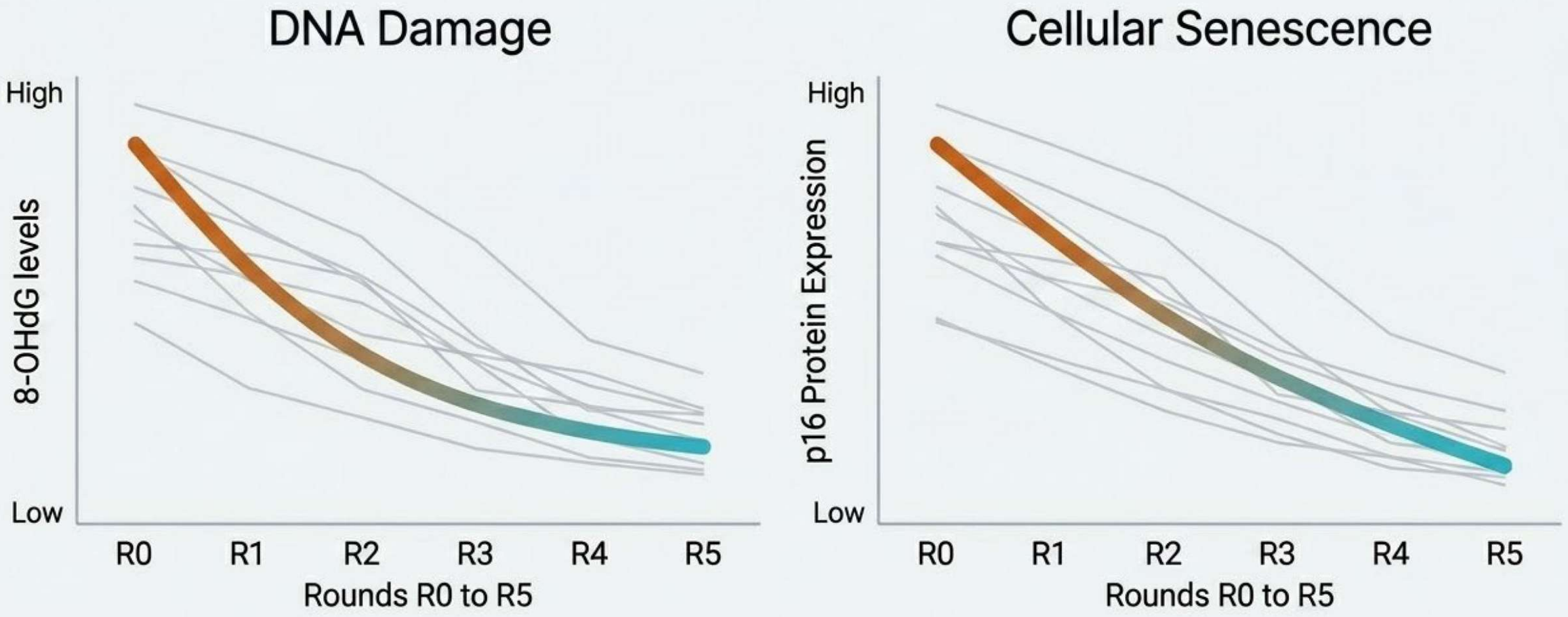
Pulse Timeline



1 Month Period (Twice-Weekly Procedures, 8-10 Total Sessions)

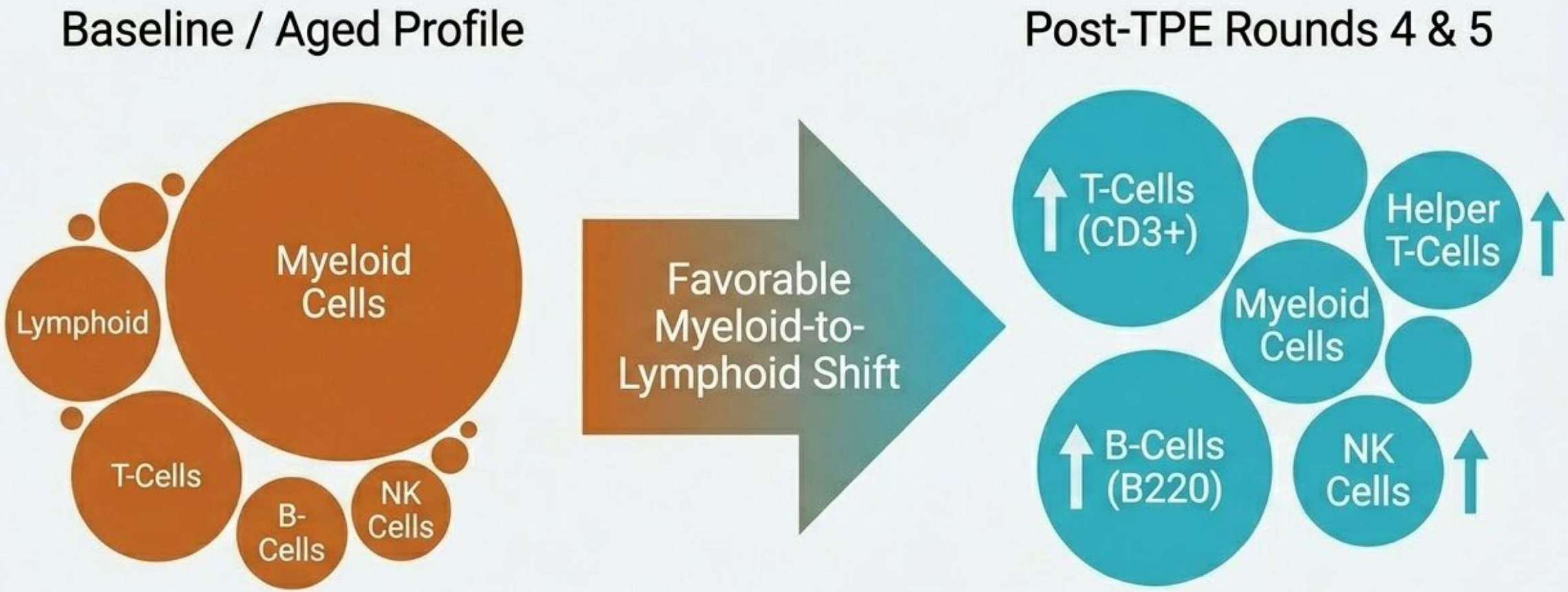
Over 1 month, patients undergo intensive plasma cycling, providing high-resolution data on how rapidly the body's internal state resets.

Intracellular Rejuvenation: DNA Repair in PBMCs



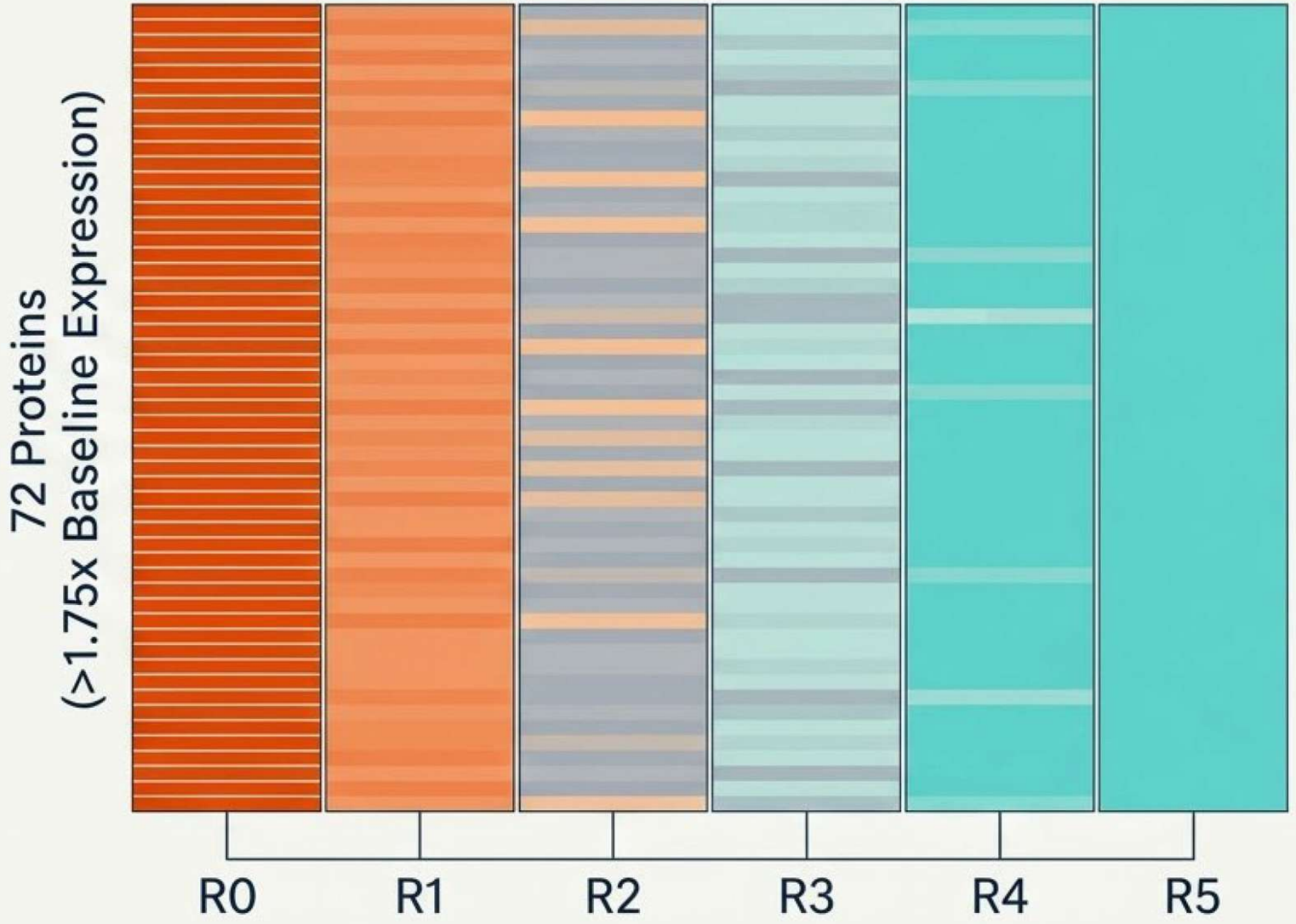
TPE alters the fundamental health of Peripheral Blood Mononuclear Cells (PBMCs).
It actively reduces systemic intracellular damage—not just extracellular circulating proteins.

Immune Composition: Restructuring the Defense Network



By Rounds 4 and 5, TPE triggers active immune remodeling, reversing age-related immune exhaustion and boosting adaptive and innate cellular populations.

The Proteomic Reset: Erasing 72 Markers of Aging

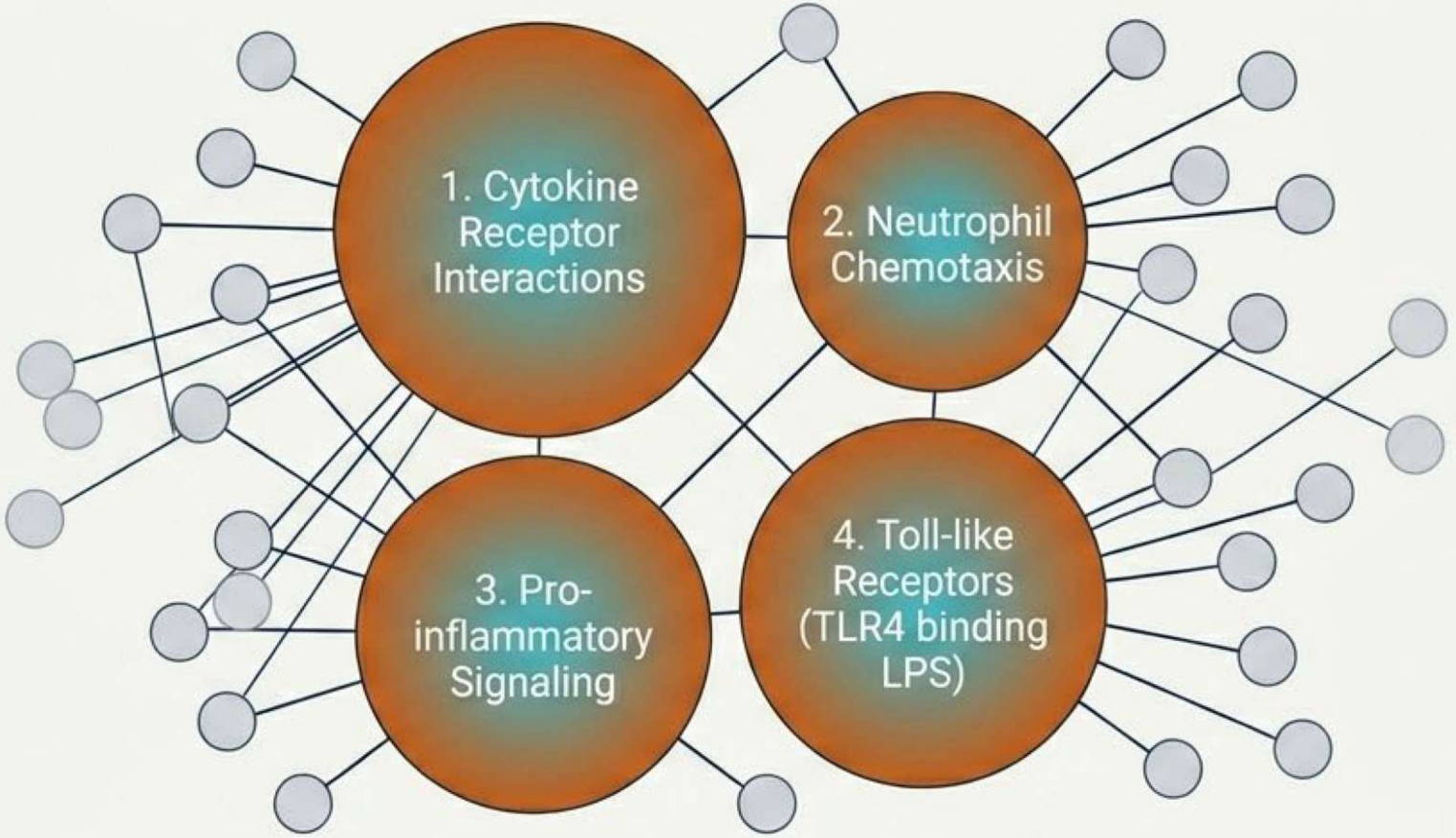


Takeaway

By Round 2, the old-age proteomic profile begins to normalize.

By Rounds 4 and 5, there is near-total clearance of age-elevated proteins, mirroring the Young Cohort baseline.

Pathway Synthesis: Dismantling Inflammaging



Key Insight: GO enrichment analysis reveals that the vast majority of proteins suppressed by TPE act as drivers for chronic systemic inflammation. The central hub dismantled by the procedure is the inflammatory response pathway.

Impact Beyond General Aging: Disease-Specific Markers

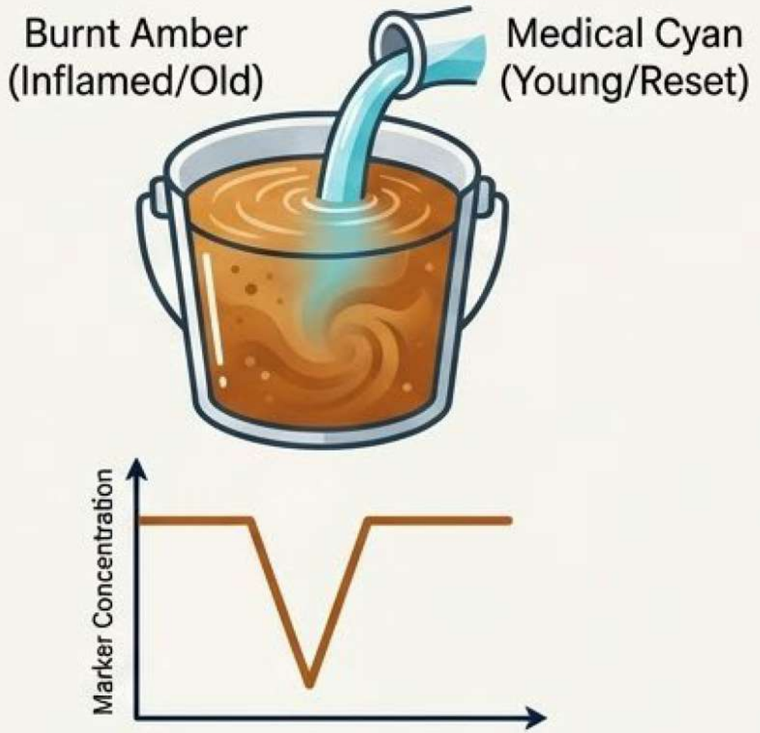
A Cancer Associated Proteins

B Neurodegeneration (TDP-43)

TPE aggressively downregulates specific pathological markers, notably TDP-43 (associated with neural decay), maintaining a sustained drop weeks after the initial intervention.

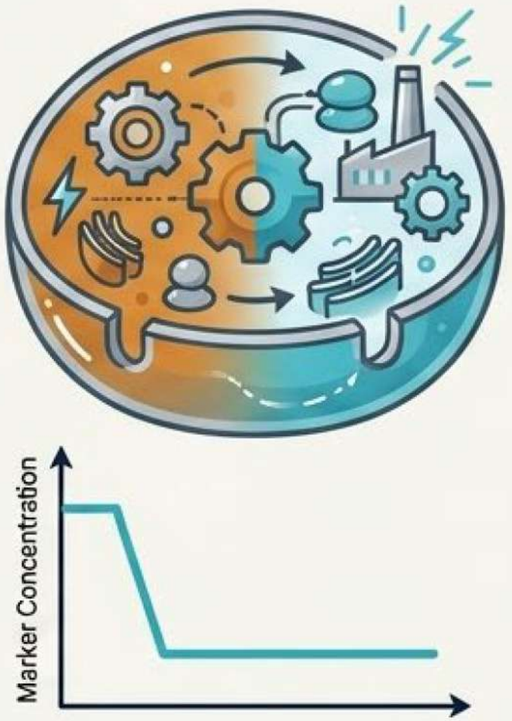
The Clinical Debate: Mechanical Dilution vs. Systemic Remodeling

Model A: The Dilution Effect (Discarded Theory)



Temporary drop; fluids quickly re-saturate with inflammatory markers.

Model B: Systemic Remodeling (Proven Reality)



Sustained drop; cells fundamentally alter their signaling and expression profiles.

The sustained suppression of markers (like TDP-43) and the repair of PBMC DNA (8-OHdG) prove TPE triggers deep systemic remodeling. It does not just water down bad blood; it changes how the body behave

Clinical Translation: Proposed Biomarker Tracking Panel

Logistical Constraints

- Goal: Avoid $50k omics testing.
- Maximize speed and actionability.
- Turnaround: 3-5 days.
- Panel size: 4-6 key markers.

The In-House Panel

Cellular Damage & Senescence

8-OHdG (DNA oxidation) | p16 (Senescence burden)

Neurodegeneration Baseline

TDP-43

Inflammatory Drivers

High-sensitivity Cytokines (Targeted selection)

This targeted 4-marker panel allows modern longevity clinics to rapidly validate the efficacy of TPE interventions in real-time, bridging the gap between rigorous omics trials and everyday practice.

Executive Summary

1. The Intervention

Replacing plasma with 5% Albumin aggressively clears biological noise and resets the aging environment.

2. The Mechanism

Triggers deep systemic remodeling—repairing PBMC DNA, shifting immune compositions, and completely dismantling inflammaging pathways.

3. The Clinical Future

Efficacy can be mapped and managed in everyday clinical practice using a targeted, cost-effective biomarker tracking panel (8-OHdG, OHdG, p16, TDP-43).