

Improving the Outcome of Stem Cell Transplants for Cancer Treatment Using Multivirus-Specific T Cells (Viralym-M)

Ann M. Leen, PhD

Co-Founder and Chief Scientific Officer

VIRAL INFECTIONS

Severe viral infections can threaten the lives of anyone with a weakened immune system

VIRAL INFECTION AND STEM CELL TRANSPLANTS



¹Slade et. al., Transplant Infect Dis, 2016

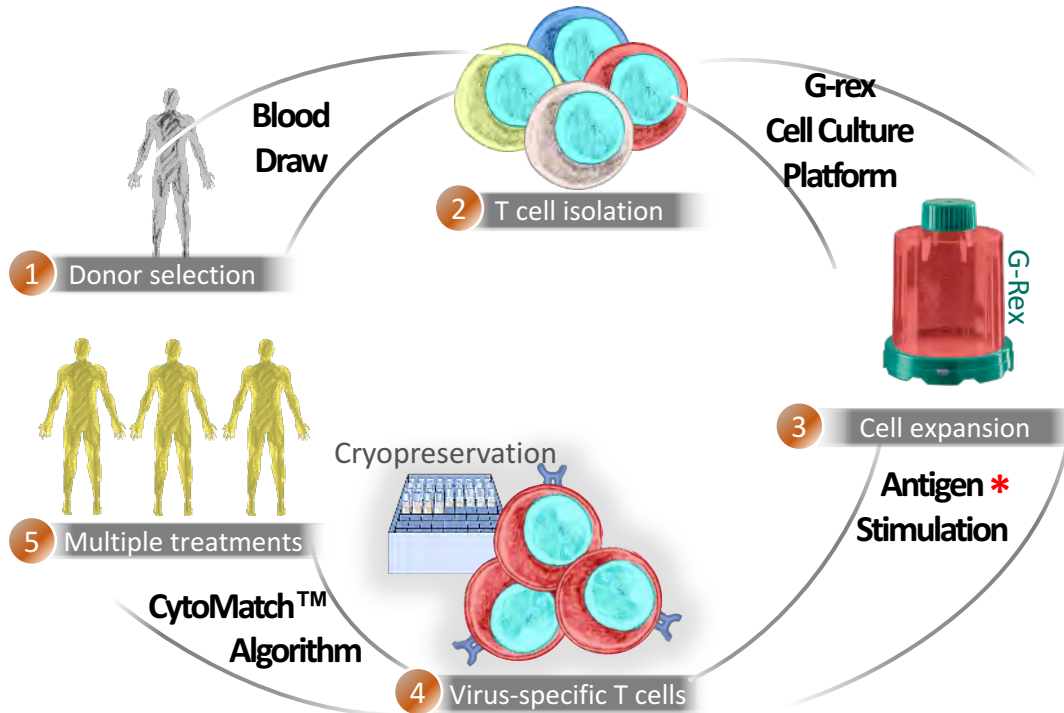
- Approximately **30,000 patients** received an allogeneic hematopoietic stem cell transplant (allo-HSCT) in 2017 (US and EU).
- **Up to 70%** of allo-HSCT patients suffer a severe viral infection following transplant.¹
- Viral infections cause pain, extended hospital stay, transplant failure, and organ failure.
- Viral infections are the **leading cause of non-relapse mortality** after allo-HSCT.
- There are **no FDA approved drugs** or effective experimental therapies for treating most infections.

BACKGROUND AND INTRODUCTION

- **ViraCyte was formed to commercialize novel T cell therapies developed at Baylor College of Medicine**
- **Why now?**
 - **Mature therapy:** >20 years of R&D and clinical experience at Center for Cell and Gene Therapy, BCM
 - **Unmet medical need** among cancer patients, and increasing demand from transplant centers
 - Demonstrated **safety and efficacy** in >100 patients treated (BCM and ViraCyte INDs)
 - Clinically validated **“off the shelf”** availability of therapy
 - Simple, robust, and **scalable manufacturing**



VIRACYTE: MANUFACTURING PLATFORM



* Exclusively Licensed from Baylor College of Medicine

- Validated, fully-GMP compliant manufacturing process
- One production (1 unit of blood) yields 300 adult T cell doses
- Depletion of alloreactive cells → minimal risk of GVHD
- Validated potency assay
- Product stability proven up to 5 years

VIRALYM-M PRODUCTION

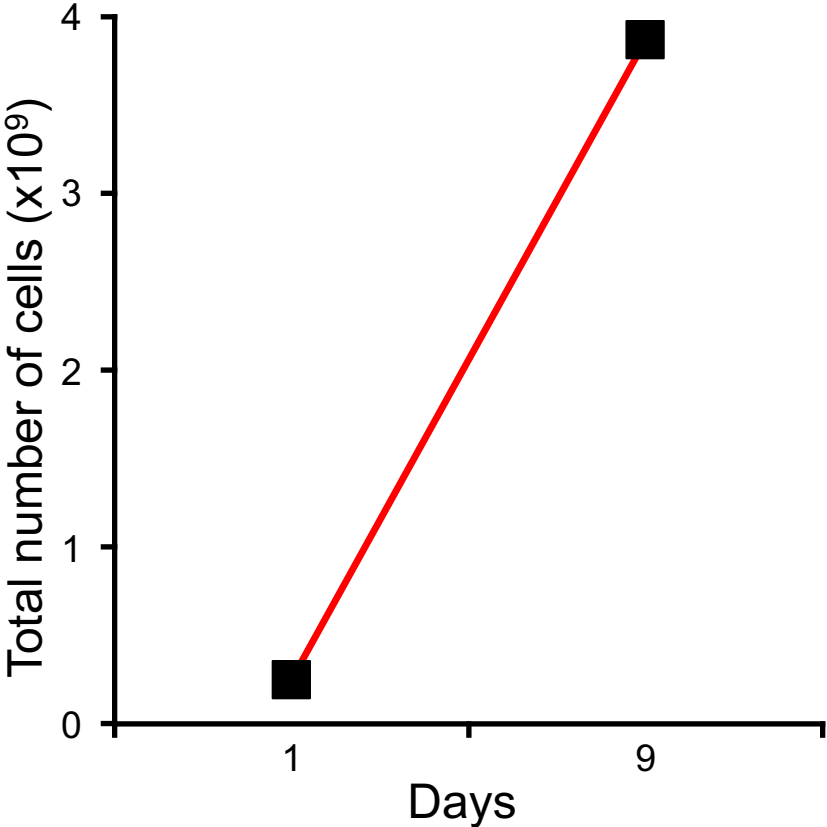


- 250×10^6 PBMCs
- Pepmix + cytokines
- 1 L of media

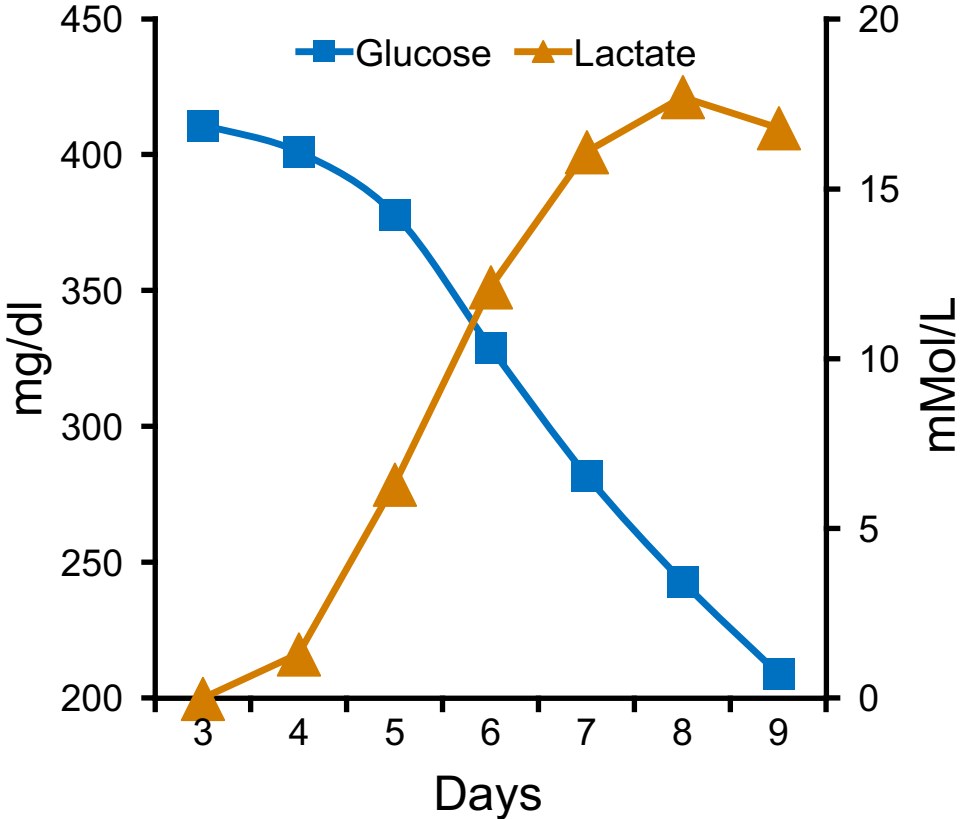
- 4×10^9 VSTs

VIRALYM-M EXPANSION

T Cell Number



Culture Monitoring



VIRACYTE'S VIRUS SPECIFIC T CELLS: VIRALYM-M

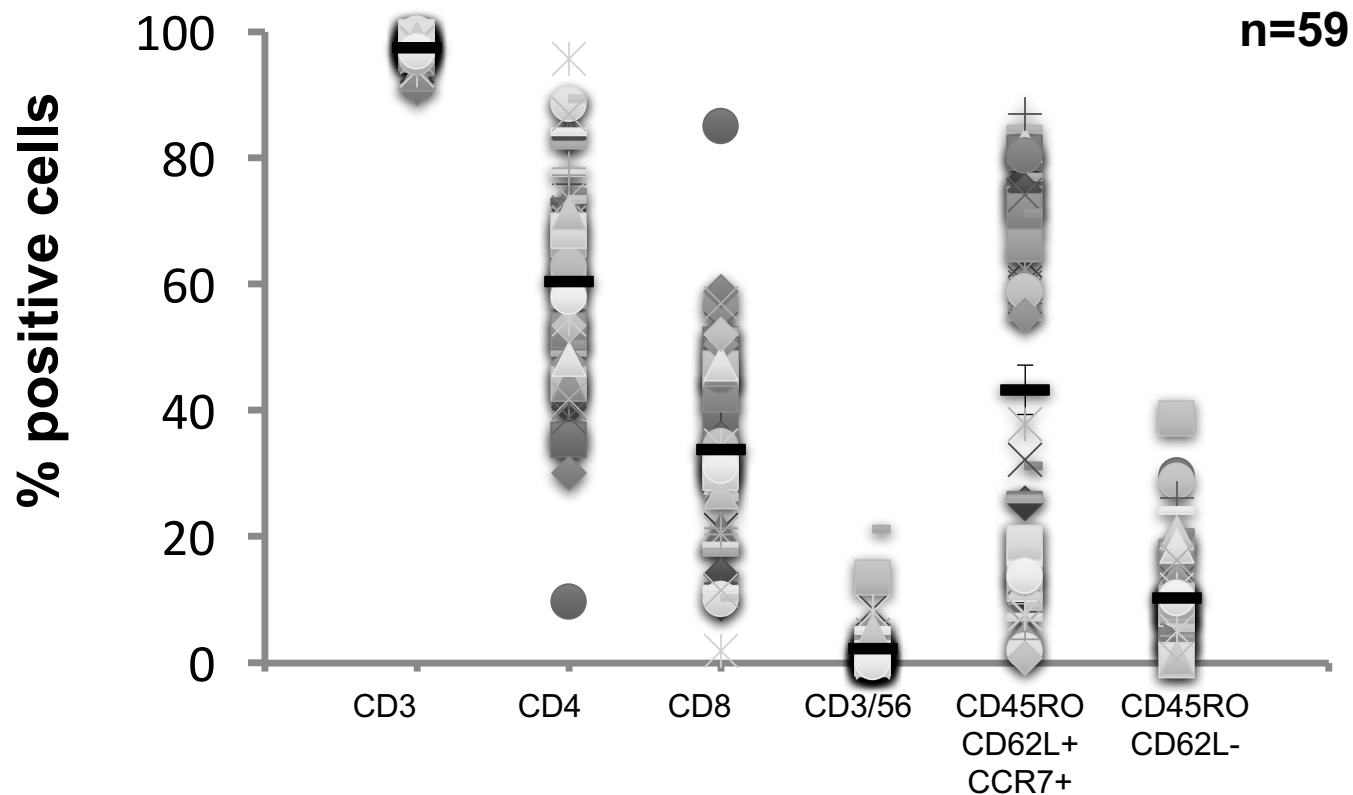
SCIENTIFIC AND CLINICAL FOUNDATION

- “Off the shelf” T cells
- Multivirus specificity: BK, CMV, AdV, HHV6, EBV
- Current cell bank from 59 healthy donors
- Single arm Phase I/IIA Trial (ongoing) for allo-HSCT patients with one or more **refractory** viral infections
- 46 patients with 53 refractory infections

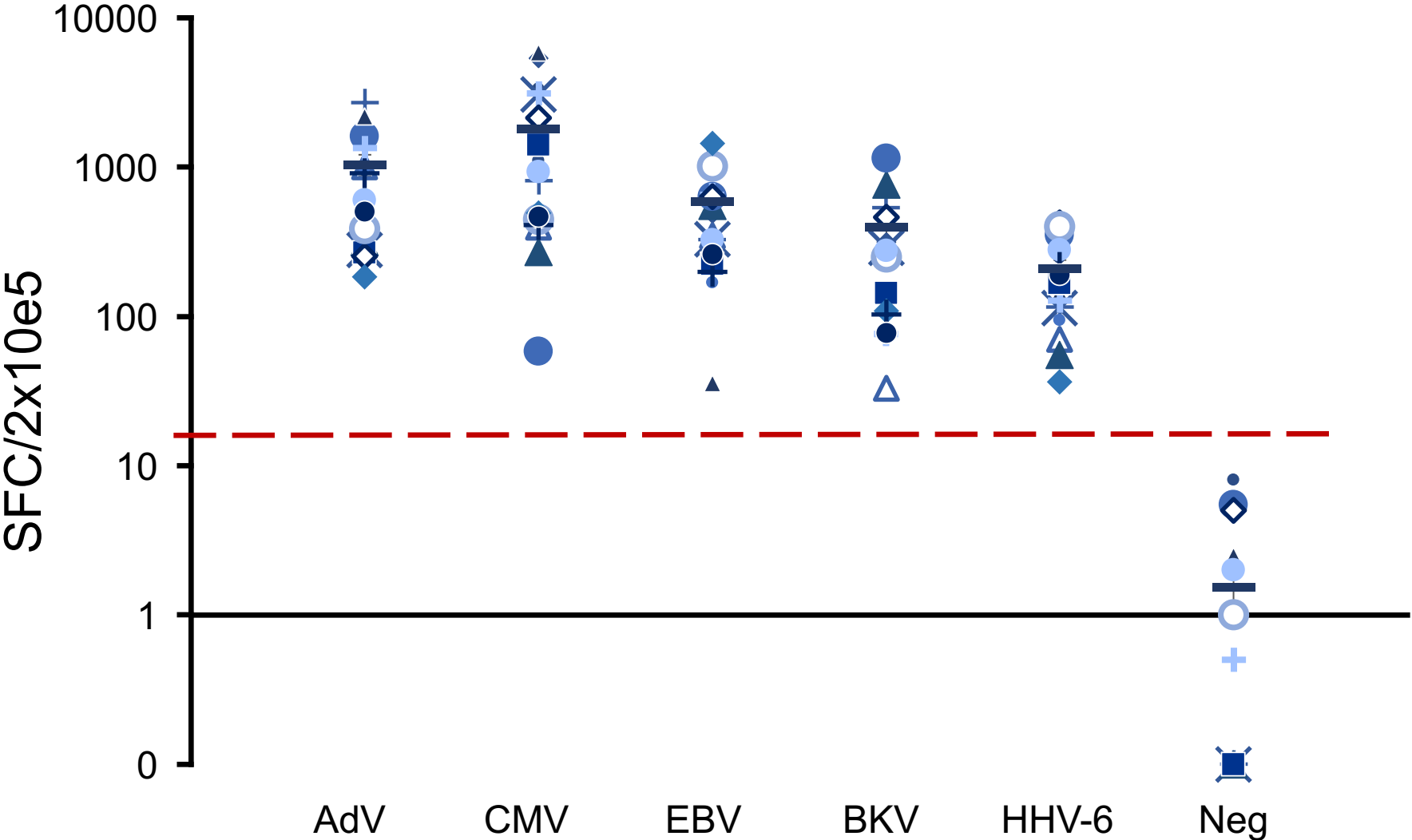
PHASE I/IIA CLINICAL PROTOCOL

- Patients receive 2×10^7 multi-virus specific T cells per square meter of body surface area intravenously
- If less than a complete response is achieved, patients may receive additional doses at 2 week intervals following the initial infusion

VIRALYM-M T CELL PHENOTYPE



VIRALYM-M SPECIFICITY



46 PATIENTS – 53 INFECTIONS

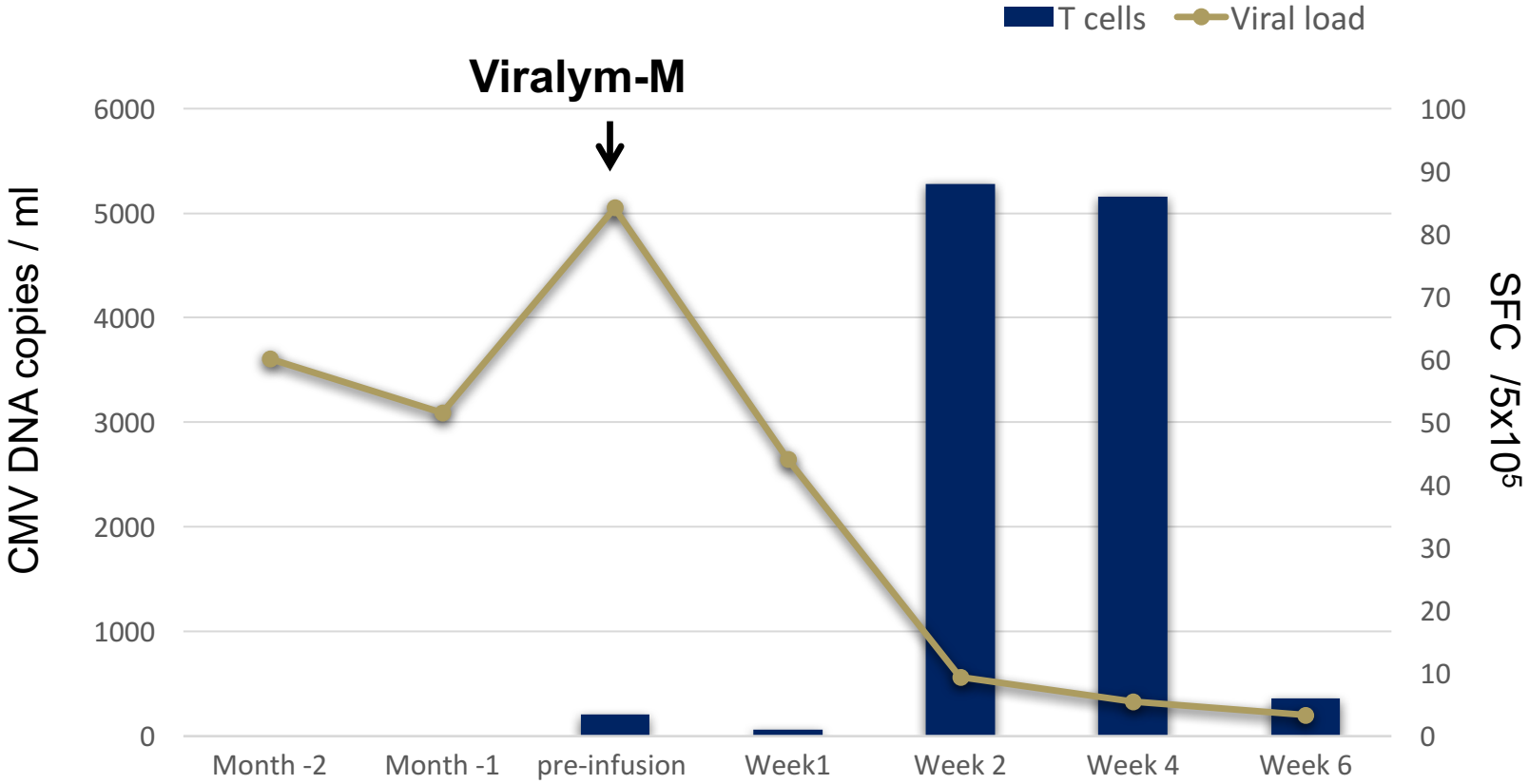
Viruses	CMV	EBV	Adv	BKV	HHV6
1 virus	x				
		x			
	x				
	x				
	x				
	x				
2 viruses					
		x			
	x				
	x				
	x				
	x				

VIRAYLM-M – OVERALL RR 94%

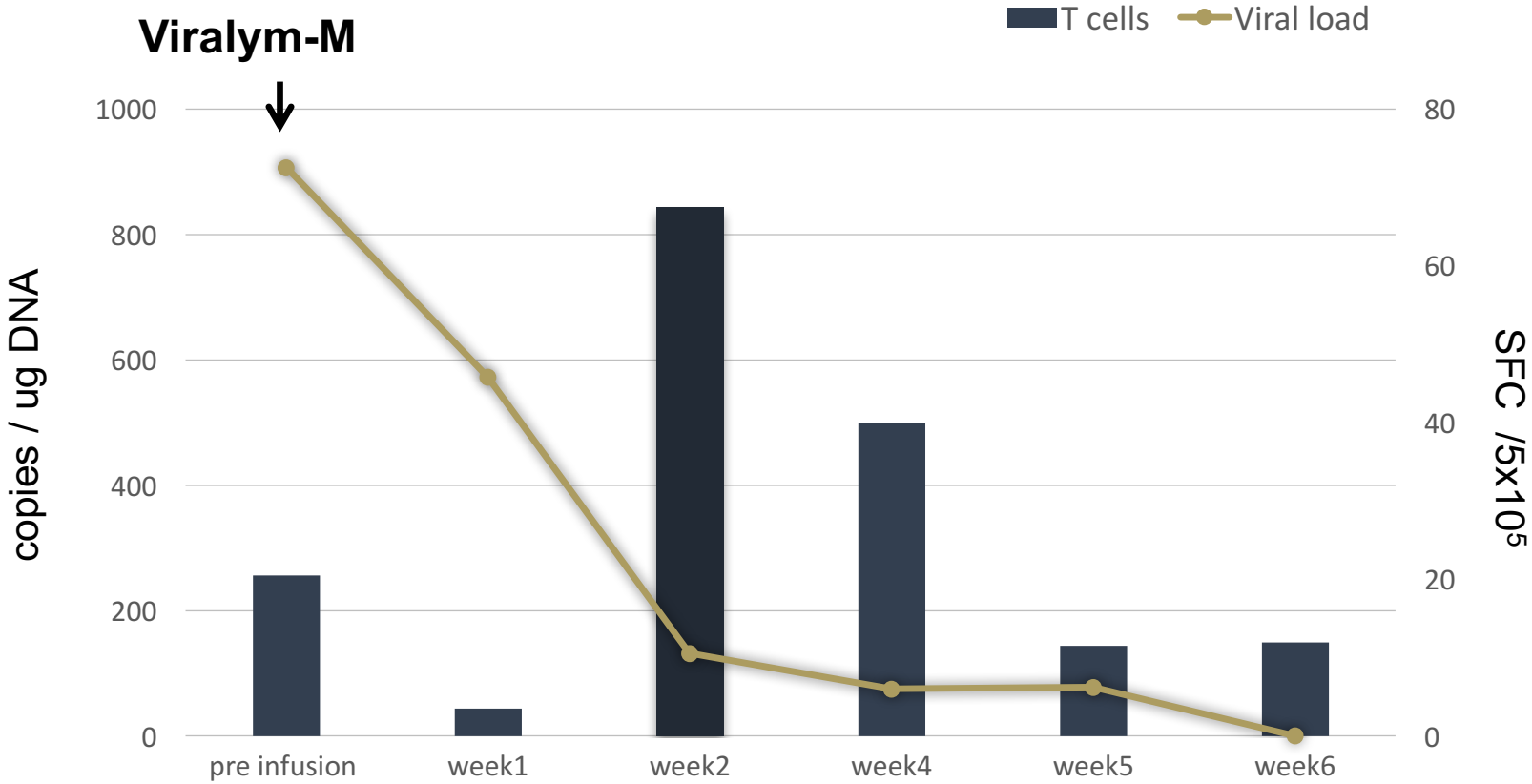
Viruses	CMV	EBV	Adv	BKV	HHV6
1 virus	✓				
		✓			
	✓				
	✓			PR	
	✓			✓	
	PR				
	X				NE
					✓
					✓
	PR		X		
				PR	
	✓				PR
				PR	
				PR	
				PR	
	PR				
	✓				
	PR				PR
	✓			X	
				✓	
	PR				
					PR
				✓	
			✓		
			✓		
				PR	
				PR	
				PR	
✓					
2 viruses		✓		PR	
	✓		✓		
	✓		✓		
	✓		✓	PR	PR
	✓		✓	PR	

Tzannou et al,
JCO, 2017

VIRALYM-M: CLINICAL RESPONSE FOR PATIENT WITH CMV



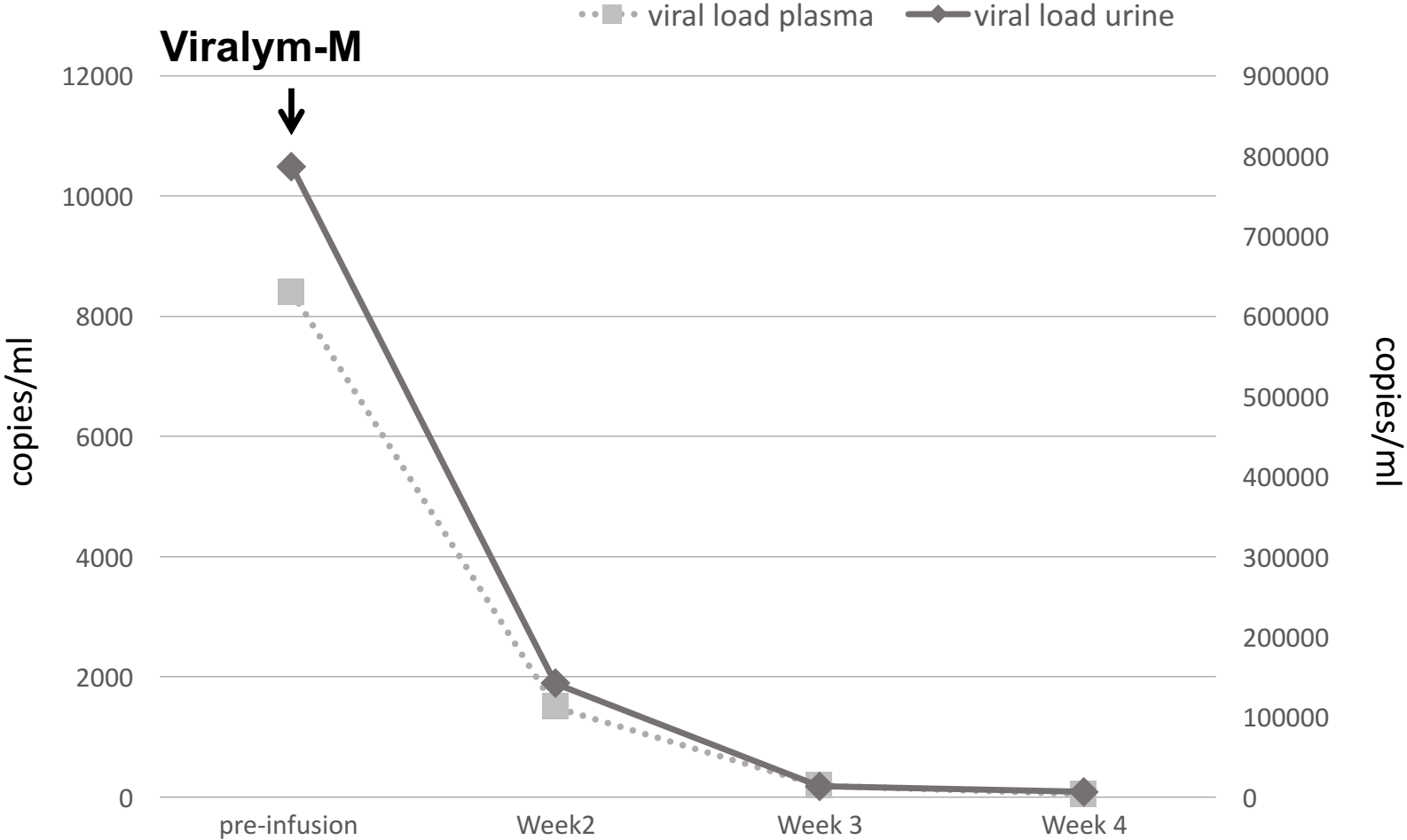
VIRALYM-M: CLINICAL RESPONSE FOR PATIENT WITH EBV



VIRALYM-M: HIGHLY EFFECTIVE TREATMENT FOR BK VIRUS

- 17 of 42 patients enrolled in Viralym-M protocol suffered from severe, refractory BK-associated disease
 - 15 BK Hemorrhagic Cystitis
 - 2 BK nephritis
- 17/17 patients with BK disease had complete clinical resolution of disease following Viralym-M treatment

VIRALYM-M: VIROLOGIC RESPONSE FOR PATIENT WITH BKV



Tzannou et al, JCO, 2017

BK VIRUS-ASSOCIATED HEMORRHAGIC CYSTITIS FOLLOWING HSCT

A Critical Unmet Clinical Need

- **BK virus** is a non-enveloped, DNA polyomavirus identified in the 1980s as a significant pathogen in HSCT patients
- **25% of allo-HSCT patients suffer BK hemorrhagic cystitis (HC)¹**
 - Severe, debilitating pain
 - Hemorrhage leading to 2X red blood cell transfusions; 3X platelet transfusions; average of 10 days extra hospital stay
 - BK-HC is strongly associated with the development of renal failure and increased non-relapse mortality
 - Each episode of BK-HC adds on average \$71,000 - \$231,000 in health care costs
- **Up to 65% of adult haplo-HSCT** on Post-Cy regimen develop BK-HC (Texas Transplant Institute, San Antonio, TX)
- There are **no FDA approved drugs to treat BK**; off-label or experimental drugs are ineffective, toxic, and generally avoided at major transplant centers

¹Abudayyeh et. al., Journal of Transplantation, 2016

VIRACYTE PIPELINE

PRODUCT CANDIDATE	INDICATION	PRE-CLINICAL	PHASE 1	PHASE 2	PIVOTAL	
THIRD PARTY						
Viralym-M™	Treatment and/or prevention of CMV, AdV, BK, HHV6, EBV	[Progress bar spanning Pre-clinical, Phase 1, and Phase 2]				
Viralym-C™	Treatment and/or prevention of CMV	[Progress bar spanning Pre-clinical and Phase 1]				
Viralym-A™	Treatment and/or prevention of Adenovirus	[Progress bar in Pre-clinical]				
Viralym-B™	Treatment and/or prevention of BK Virus	[Progress bar in Pre-clinical]				
Viralym-RV™	Treatment of Influenza, RSV, hMPV, PIV in Immunosuppressed Patients	[Progress bar in Pre-clinical]				
DONOR DERIVED						
Prelym™	Treatment or prevention of CMV, AdV, BK, HHV6, EBV following HSCT	[Progress bar spanning Pre-clinical, Phase 1, and Phase 2]				



CONTACT INFORMATION:

Ann M. Leen, Ph.D.

ViraCyte, LLC

2450 Holcombe Blvd, Suite J

Houston, TX 77021

832-824-4690 (office)

amleen@viracyte.com