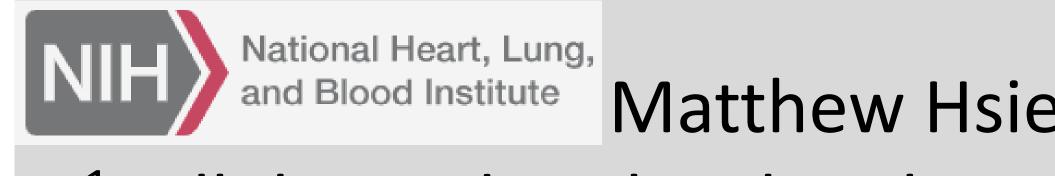
# Adding CD117 antibody to alemtuzumab, low dose total body irradiation (TBI), and sirolimus for matched related donor (MRD) hematopoietic cell transplant (HCT) in sickle cell disease (SCD): initial results

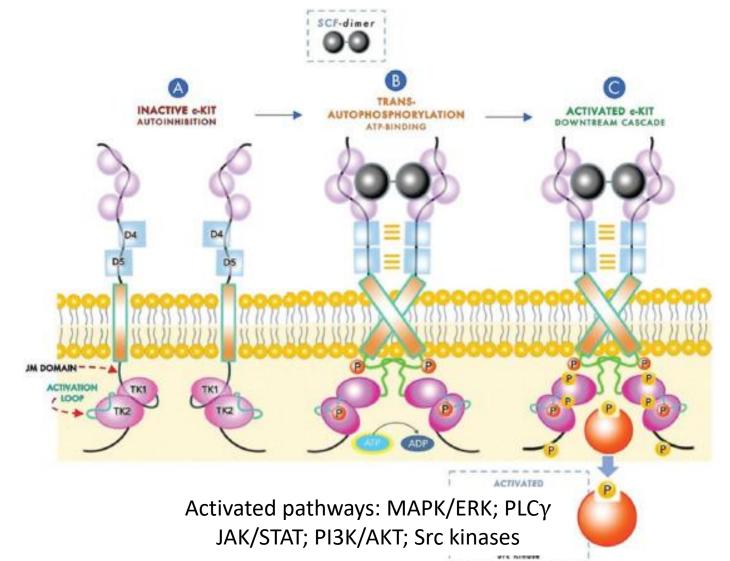


# <sup>and Blood Institute</sup> Matthew Hsieh<sup>1</sup>, Priscilla Pollack<sup>1</sup>, Elizabeth Harvey<sup>1</sup>, Triscia Martin<sup>1</sup>, Neal Jeffries<sup>2</sup>, Wendy Pang<sup>3</sup>, and John Tisdale<sup>1</sup> <sup>1</sup>Cellular and Molecular Therapeutics Branch, NHLBI, Bethesda, MD; <sup>2</sup>Office of Biostatistics Research, NHLBI; <sup>3</sup>Jasper Therapeutics, Redwood City, CA

# Introduction

proliferation of HSC.

- C-kit (CD117) is a transmembrane tyrosine kinase, type 3, receptor. It is expressed on normal and pathologic tissues/cells.
- Normal: hematopoietic progenitor, mast, lymphoid, smooth muscle, vascular endothelium, skin, melanocyte, sweat gland, salivary gland, breast ductal epithelium, cerebellum, thyroid, spermatocyte, oocyte
- Pathologic: myeloid leukemia, GIST, sarcoma, melanoma, germ cell tumors • Stem cell factor (SCF) binds to CD117, and is a key cytokine important for survival, maintenance, and



- Briquilimab (JSP191) is a <u>naked</u>, high affinity, monoclonal antibody that blocks SCF from binding to CD117.
- Preclinical data in murine transplant models showed CD117 antibody may synergize the cytotoxic effect of TBI and achieve more clearance of recipient hematopoietic niche. • Briquilimab has been tested in two phase 1 and 2 studies: in severe combined immunodeficiency
- (NCT02963064, n=3) and in elderly MDS or AML (NCT04429191, n=28).
- Recent pharmacokinetic analyses of the single dose of 0.6 mg/kg was reported (Jung D, Long-Boyle JR et al, TCT 2024). The simulations predict that the number of days for 50% of individuals to reach <500, <1000, or <2000 ng/mL is 9.7, 8.3, and 6.2 respectively. These simulated window formed the basis for the briquilimab infusion schedule in the design of this conditioning regimen.
- We hypothesize that adding briquilimab to 300 cGy TBI would intensify this HCT regimen without additional host toxicity. Alomtuzumah Unmanipulated G-CSF TDI

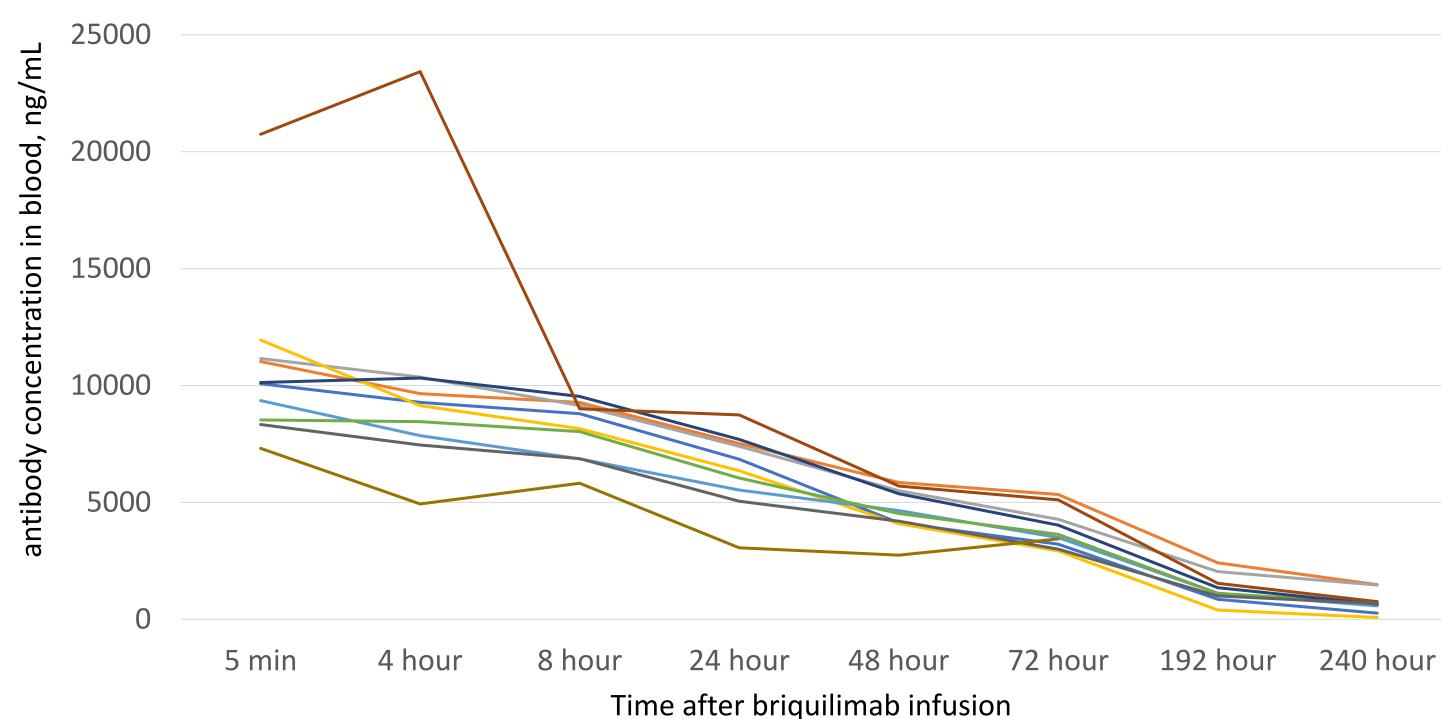
0.6 mg/kg	(1 mg/kg total)	181 300 cGy	mobilized PBSC ir
✓     ✓       -11     -10       -9     -8       -7	-6 -5 -4 -3	• -2 -1	•

Sirolimus (target 10-12 ng/dL)

N=18	Baseline patient characteristics
Age, sex	5-38 years, 9M/9F
Sickle type	17 HbSS, 1 HbS/b0
Indication for transplant	Freq VOC, ACS (+multi-organ failure), sickle liver pressure (RVSP or TRV) on echo, priapism, or AVI
Co-morbidities	Hep C (treated), proteinuria, HTN, P A fib, 2° AV k pred, iron overload
wbc, plt	5-9k, 300-620k
hgb, retic count	8-10 g/dL, 150-700k
AST/ALT/t bili	Up to 2x ULN for AST and bilirubin
ferritin	126-3900
Cr	0.4-0.9

#### Results

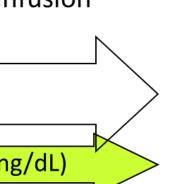
- Donors were related family members, fully HLA-matched at A, B, C, DRB loci. Half of them have sickle trait.
- Donor HSC were collected by apheresis and cryopreserved, then thawed and infused on the day of infusion.
- 4 patients had grade 1 reaction possibly related to briquilimab infusion: two with headache, one with acne like rash, and one with fever.
- 13 patients had briquilimab level assayed. All were below the 1500 ng/mL threshold to proceed with HSC infusion as scheduled.
- The level of briquilimab at day -1 ranged from 20.6 to 1464 ng/mL.



- Lymphocyte counts decrease to undetectable level within 2 days of subcutaneous alemtuzumab administration.
- Reticulocyte counts declined and nadired first, at median day 8 (range 1 to 17).
- Neutrophil counts nadired at median day 13 (range 12 to 17). Filgrastim was used to boost neutrophil
- recovery starting near day 10. • Platelet counts nadired at median day 17 (5 to 26). One-third of patients did not require platelet transfusion to keep counts >50 k/uL.
- All patients initially engrafted.
- All patients are alive. Median duration of follow-up is 310 days (range 8 to 771).

	Current HCT protocol	Prior alem-300 cGy TBI
Filgrastim mobilized periph blood HSC dose	10.8-20.4 x 10e6 CD34/kg 1.9-7.5 x 10e8 CD3/kg	7.14-41.2 x 10e6 CD34/kg 1.29-9.37 x 10e8 CD3/kg
Overall survival	18/18 (100%)	58/62 (94%)
Stopped immunosuppression	6/15 (40%)	52/54 (96%)
Neutrophil engraftment, median day	Median 13 (12 to 17), filgrastim boosted	22, not filgrastim boosted
Platelet engraftment, median day	17 (5 to 26)	19
GVHD	1 gr 2 GI aGVH, no chronic	No acute or chronic
CMV and EBV reactivation requiring treatment	CMV: 2 (11%) EBV: 0	CMV: 8 (13%) EBV: 2 (3%)
Graft failure	3/18 (17%)	9/62 (15%)





disease, elev right heart

block, FEV1 or DLCO <66%

		merism					
month	1	2	3	6	12	18	24
539-1	100	100	100	99	98		99
539-1 539-2	100	100	100	100	100		9
						100	
539-3	100		100	100	100	100	
539-4	100		100	66	22	0	
539-5	100	33	0	0	100	100	
539-6	100		100	100	100	100	
539-7	100	100	100	100	100	100	
539-8	100		94	87	78		
539-9	100		100	100	100		
539-10	100	98	7	0			
539-11	100	100	100				
539-12	100	100	99	88			
539-13	100	100	99	97			
539-14	100	100	97				
539-15	100	100	100				
539-16	pending						
539-17	pending						
539-18	100						
539-19	200						
539-20							
CD3 chim	oriem						
CD3 chim	nerism						
	nerism 1	2	3	6	12	18	24
month	1					18	24
CD3 chim month 539-1	1	3	0	25	55	18	
month 539-1 539-2	1 2 na	3 10	0 26	25 63	55 86		
month 539-1 539-2 539-3	1 2 na na	3 10 24	0 26 39	25 63 69	55 86 74	72	
month 539-1 539-2 539-3 539-4	1 2 na na na na	3 10 24 na	0 26 39 1	25 63	55 86		
month 539-1 539-2 539-3 539-4 539-5	1 2 na na na na na	3 10 24 na na	0 26 39 1 0	25 63 69 34	55 86 74 17	72 0	
month 539-1 539-2 539-3 539-4 539-5 539-6	1 2 na na na na 15	3 10 24 na na 0	0 26 39 1 0 0	25 63 69 34 16	55 86 74 17 40	72 0 45	24 61
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7	1 2 na na na na 15 12	3 10 24 na na 0 3	0 26 39 1 0 0 7	25 63 69 34 16 36	55 86 74 17 40 70	72 0	
month 539-1 539-2 539-3 539-4 539-5 539-5 539-6 539-7 539-8	1 1 2 na na na 15 12 na	3 10 24 na na 0 3 2	0 26 39 1 0 0 7 5	25 63 69 34 16 36 26	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-9	1 1 2 na na na na 15 12 na 12 na	3 10 24 na na 0 3 2 22	0 26 39 1 0 0 7 5 6	25 63 69 34 16 36	55 86 74 17 40 70	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-8 539-9 539-10	1 1 2 1 2 1 2 1 2 1 2 1 2 12 12 12 12 12	3 10 24 na 0 3 2 22 22 15	0 26 39 1 0 0 7 5 5 6	25 63 69 34 16 36 26	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-9 539-9 539-10 539-11	1 1 2 na na na na 15 12 na 12 na	3 10 24 na 0 3 2 22 22 15 3	0 26 39 1 1 0 0 7 7 5 5 6 1 12	25 63 69 34 16 36 26 45	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-8 539-9 539-10 539-11 539-12	1 1 2 1 2 1 2 1 2 1 2 1 2 12 12 12 12 12	3 10 24 na 0 3 2 22 22 15	0 26 39 1 0 0 7 5 5 6 1 12 66	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-8 539-7 539-10 539-10 539-11 539-12 539-13	1 1 2 1 2 1 2 1 2 1 2 1 1 2 1 2 1 2 1 2	3 10 24 na 0 3 2 2 2 2 2 2 2 2 3 3 4 9 10	0 26 39 1 0 0 7 5 5 6 1 12 66 34	25 63 69 34 16 36 26 45	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-8 539-9 539-10 539-11 539-12	1 1 1 1 2 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1	3 10 24 na 0 3 2 2 2 2 2 2 2 2 1 5 3 3 49	0 26 39 1 0 0 7 5 5 6 1 12 66	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-8 539-7 539-10 539-10 539-11 539-12 539-13	1 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1	3 10 24 na 0 3 2 2 2 2 2 2 2 2 3 3 4 9 10	0 26 39 1 0 0 7 5 5 6 1 12 66 34	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-7 539-8 539-7 539-10 539-10 539-11 539-12 539-13 539-14	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 10 24 na 0 3 2 2 2 2 2 2 2 2 3 3 4 9 na 3	0 26 39 1 1 0 0 7 7 5 6 1 12 66 34 34 12	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-7 539-7 539-10 539-10 539-11 539-12 539-13 539-13 539-14 539-15 539-16	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 10 24 na 0 3 2 2 2 2 2 2 2 2 3 3 4 9 na 3	0 26 39 1 1 0 0 7 7 5 6 1 12 66 34 34 12	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-7 539-7 539-10 539-10 539-11 539-12 539-13 539-13 539-14 539-15	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 10 24 na 0 3 2 2 2 2 2 2 2 2 3 3 4 9 na 3	0 26 39 1 1 0 0 7 7 5 6 1 12 66 34 34 12	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
month 539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-7 539-8 539-7 539-10 539-10 539-11 539-12 539-13 539-13 539-14 539-15 539-16 539-17	I       1         1       1         1       2         1       12         1       15         12       12         1       12         1       12         1       13         1       14         1       15         1       12         1       13         1       14         1       14         1       15         1       15         1       15         1       15         1       15         1       16         1       17         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18         1       18	3 10 24 na 0 3 2 2 2 2 2 2 2 2 3 3 4 9 na 3	0 26 39 1 1 0 0 7 7 5 6 1 12 66 34 34 12	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	

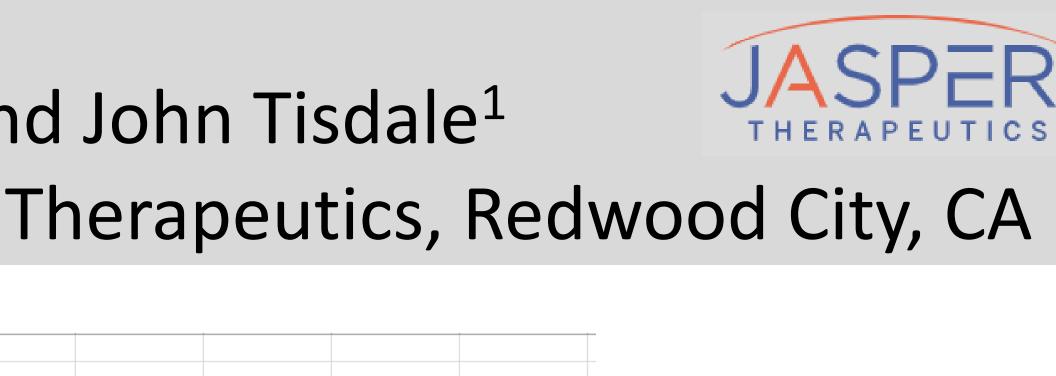
month	1	2	3	6	12	18	24
<b>FAA</b>	100	100	100				
539-1	100		100	99	98		99
539-2	100		100	100	100	100	
539-3	100		100	100	100	100	
539-4	100		100	66	22	0	
539-5	100		0	0			
539-6	100		100	100	100	100	
539-7	100		100	100	100	100	
539-8	100		94	87	78		
539-9	100		100	100	100		
539-10	100		7	0			
539-11	100		100				
539-12	100		99	88			
539-13	100		99	97			
539-14	100	100	97				
539-15	100	100	100				
539-16	pending						
539-17	pending						
539-18	100						
539-19							
539-20							
CD3 chim							
month	1	2	3	6	12	18	24
						18	
539-1	2	3	0	25	55	18	24 61
539-1 539-2	2 na	3 10	0 26	25 63	55 86		
539-1 539-2 539-3	2 na na	3 10 24	0 26 39	25 63 69	55 86 74	72	
539-1 539-2 539-3 539-4	2 na na na	3 10 24 na	0 26 39 1	25 63	55 86		
539-1 539-2 539-3 539-4 539-5	2 na na na na	3 10 24 na na	0 26 39 1 0	25 63 69 34	55 86 74 17	72 0	
539-1 539-2 539-3 539-4 539-5 539-6	2 na na na na 15	3 10 24 na na 0	0 26 39 1 0 0	25 63 69 34 16	55 86 74 17 40	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7	2 na na na na 15 12	3 10 24 na na 0 3	0 26 39 1 0 0 7	25 63 69 34 16 36	55 86 74 17 40 70	72 0	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8	2 na na na na 15 12 na	3 10 24 na na 0 3 2	0 26 39 1 0 0 7 5	25 63 69 34 16 36 26	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-9	2 na na na na 15 12 na na na	3 10 24 na 0 3 2 22	0 26 39 1 0 0 7 5 5	25 63 69 34 16 36	55 86 74 17 40 70	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-9 539-10	2 na na na na 15 12 na na na na na	3 10 24 na 0 3 2 22 22 15	0 26 39 1 0 0 7 7 5 6 1	25 63 69 34 16 36 26	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-9 539-10 539-11	2 na na na na na 15 12 na na na na na na na na na	3 10 24 na 0 3 2 22 22 15 3	0 26 39 1 0 0 0 7 5 5 6 1 12	25 63 69 34 16 36 26 45	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-9 539-10 539-11 539-12	2 na na na na na 15 12 na 12 na na na na na na na na na na na	3 10 24 na 0 3 2 22 22 15 3 49	0 26 39 1 0 0 7 7 5 6 1 12 66	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-7 539-8 539-9 539-10 539-11 539-12 539-13	2 na na na na 15 12 na 12 na na na na na na na na na na	3 10 24 na 0 3 2 22 22 15 3 49 na	0 26 39 1 0 0 0 7 5 6 5 6 1 12 66 34	25 63 69 34 16 36 26 45	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-7 539-8 539-9 539-10 539-10 539-11 539-12 539-13 539-14	2 na na na na 15 12 na 12 na na na na na na na na na na	3 10 24 na 0 3 2 22 22 15 3 49 na 3	0 26 39 1 0 0 7 7 5 6 1 12 66 34 12	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-7 539-8 539-7 539-10 539-10 539-11 539-12 539-12 539-13 539-14 539-15	2 na	3 10 24 na 0 3 2 22 22 15 3 49 na	0 26 39 1 0 0 0 7 5 6 5 6 1 12 66 34	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-7 539-10 539-10 539-11 539-12 539-12 539-13 539-14 539-15 539-16	2 na na na na 15 12 na 12 na na na na na na na na na na	3 10 24 na 0 3 2 22 22 15 3 49 na 3	0 26 39 1 0 0 7 7 5 6 1 12 66 34 12	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-7 539-10 539-10 539-11 539-12 539-12 539-13 539-14 539-15 539-16 539-17	2 na na na na 15 12 na 12 na na na na na na na na na na	3 10 24 na 0 3 2 22 22 15 3 49 na 3	0 26 39 1 0 0 7 7 5 6 1 12 66 34 12	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	
539-1 539-2 539-3 539-4 539-5 539-6 539-7 539-8 539-7 539-8 539-10 539-10 539-11 539-12 539-12 539-13 539-14 539-15 539-16	2 na na na na 15 12 na 12 na na na na na na na na na na	3 10 24 na 0 3 2 22 22 15 3 49 na 3	0 26 39 1 0 0 7 7 5 6 1 12 66 34 12	25 63 69 34 16 36 26 45 31	55 86 74 17 40 70 32	72 0 45	

### Conclusions

- Baseline patient characteristics

## Acknowledgement

- Patients and their families
- NIH-Clinical Center, nursing staff, and clinical services



Median myeloid chimerism at 3, 6, and 12 months were: 100%, 99.5%, and 100%

Median CD3 (T cell) chimerism at 3, 6, and 12 months were: 12%, 32.5%, and 47.5%

• Briquilimab infusions are well tolerated with few low grade side effects.

• Results of briquilimab at day -1 suggests there was detectable antibody in the majority of patients at the time of HSC infusion, which did not appear to impact initial donor cell engraftment.

• The level of briquilimab at day -1 also did not correlate with graft failure.

• Compared to the prior protocol of alem-300 cGy TBI, this regimen was similar in

• Average/median myeloid and T cell chimerism at 3, 6, and 12 months

• Transplant related viral reactivation or GVHD

• Age, sex, CD34 or CD3 cell dose, ABO compatibility, CMV serology, presence or absence of HLA antibody before HCT – all of which did not correlate with graft failure

• Additional strategies aimed at both myelosuppression (clearing more hematopoietic niche) and lymphocyte depletion are needed to target full myeloid engraftment.

Protocol navigators, research support staff, and research pharmacy staff