

Vago and Gojo, Immune Escape and Immunotherapy of AML
Supplementary Table 1 and 2

Supplementary Table 1. Antibodies in clinical testing in AML				
Type of antibody	Target	Antibody Target(s)	Clinical Outcome/ Status	
Naked mAb	CD33	Lintuzumab - multiple studies, phase I-III, single agent and in combination with HMA, LDAC or intensive chemotherapy, clinical development stopped BI 836858 NCT01690624-single agent, phase I, completed; R/R or high risk for relapse AML; NCT02632721 -plus decitabine, phase I/II, active, not recruiting; untreated ≥65 yr and R/R AML NCT03207191-plus F16IL2, phase I; recruiting, relapsed AML after alloHSCT NCT03013998, BAML-16-001-S2- plus azacitidine- phase I//II, recruiting; untreated AML ≥60 yr	Limited activity, toxicity Data not reported Study ongoing Study ongoing Study ongoing	
	CD123	CSL360 –single agent, phase I, completed; R/T and high risk AML CSL-362 (talacotuzumab) -single agent, phase I, AML in remission; plus decitabine, phase II/III, untreated AML ≥65 yrs, clinical development stopped KHK2823 - single agent, phase I, terminated; untreated AML, R/R AML and high risk MDS	Limited activity Limited activity Limited activity	
	CD44	RG7356 NCT01641250-single agent, phase I, completed; R/R AML; untreated, unfit AML	Limited activity	
	CD47	Hu5F9-G4 NCT02678338-single agent, phase I, completed; R/R AML and high-risk AML NCT03248479-single agent and plus azacitidine, phase I, recruiting; untreated and R/R AML NCT03922477-plus atezolizumab (anti-PD-L1), phase IB, recruiting; R/R AML CC-90002 -single agent, phase I, terminated; R/R AML and high-risk MDS	Data not reported Study ongoing Study ongoing Limited activity	
	CD38	Daratumumab NCT03067571-single agent, phase II, recruiting; R/R AML and high-risk MDS NCT02807558-plus SY-1425 (temibarotene), phase II, recruiting; R/R AML and high-risk MDS	Study ongoing Study ongoing	
	CD70	ARGX-110 (cusatuzumab) NCT03030612-plus azacitidine, phase I/II, active, not recruiting; untreated AML / high-risk MDS	Study ongoing; Promising early activity	
	CD157 (BST-1)	MEN1112 NCT02353143- single agent, phase I, recruiting; R/R AML	Study ongoing	
	CD184 (CXCR4)	BMS-936564 (ulocuplumab) NCT02300563 – plus LDAC, phase I, terminated; untreated AML NCT01120457- plus MEC, phase I, completed; R/R AML	Slow accrual, terminated Promising activity	
	ADC	CD25	ADCT 301 (camidanlumab tesirine) (PBD conjugated) NCT02588092-single agent, phase I, completed; CD25+ R/R AML and ALL	Limited activity
		CD33	Gemtuzumab ozogamycin (GO; Mylotarg) (calicheamicin conjugated) NCT03737955- single agent, phase II, recruiting; AML MRD NCT02473146-plus 7+3, phase II/III (ALFA1401), recruiting; untreated AML ≥60-80 yr NCT03904251-plus CPX-351, phase I, recruiting; relapsed AML NCT03839446-plus ME (MEGO), phase II, recruiting; primary refractory AML NCT02221310-plus Bu/CY pre-Allo-HSCT, phase II, recruiting; high risk CD33+ AML/MDS NCT03727750-single agent, phase IV, recruiting; R/R CD33+ AML (QTc, PK, safety) SGN-CD33A (vadastuximab talirine) (PBD conjugated)-several studies, phase I-III, single agent and in combination with HMA or induction chemotherapy, clinical development stopped – higher rate of deaths and fatal infections in the SGN33A versus the control arm (NCT02785900) IMGN779 (indolino-benzodiazepine conjugated) NCT02674763-single agent, phase I, completed; R/R CD33+ AML	FDA approved Study ongoing Study ongoing Study ongoing Study ongoing Study ongoing Study ongoing Liver (SOS/VOD) and other toxicities Limited activity
CD123		SGN-CD123A (PBD conjugated) NCT02848248-single agent, phase I, terminated; R/R AML IMGN632 (indolino-benzodiazepine conjugated) NCT03386513-single agent, phase I, recruiting; R/R CD123+ AML, BPDEN, ALL	Data not reported Study ongoing, early activity	
CD135 (FLT3)		ASP1235 (AGS62P1) (microtubule targeting agent- AGL-0182-30) NCT02864290 – single agent, phase I, recruiting; R/R AML	Study ongoing	
ATC		CD33	HuM195/rGel NCT00038051-single agent, phase I, completed; R/R AML, high-risk MDS, CMML or CML	Limited activity
	CD123	SL-401 (tagraxofusp) -FDA approved for BPDEN NCT03113643-plus azacitidine+/-venetoclax, phase I, recruiting; R/R AML and untreated unfit AML/high risk MDS NCT02270463-single agent, phase I/II, active, not recruiting; adverse-risk AML in CR1	Study ongoing Study ongoing	
RIC	CD33	Lintuzumab-Ac225 NCT03441048–plus CLAG-M, phase I, recruiting; R/R AML NCT03867682-plus venetoclax, phase I/II, not yet recruiting; R/R AML	Study ongoing Planned	

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	CD45	<p><i>Iomab-B</i> (¹³¹I; <i>apamistamab</i>) NCT0266565 (SIERRA)-plus Flu/2Gy-TBI, phase III, recruiting; active AML pre-alloHSCT NCT00589316 –plus Cy/Flu/2 Gy-TBI, posttransplant Cy-haploidentical transplant; phase I, active not recruiting; AML and high-risk MDS 211A+BC8-B10 NCT03670966- plus Cy/Flu/2 Gy-TBI, posttransplant Cy-haploidentical transplant; phase I/II, recruiting; AML, high-risk MDS, and ALL NCT03128034-plus Flu/2-3Gy-TBI, phase I/II, recruiting; advanced AML, MDS, ALL, MPAL</p>	<p>Study ongoing Study ongoing</p> <p>Study ongoing</p> <p>Study ongoing</p>
T or NK cell engager antibodies	CD33	<p>AMG 330 (Bi-specific Ab; CD33 x CD3) NCT02520427-single agent, phase I, recruiting; R/R AML AMV-564 (Tandem diabody; CD33 x CD3) NCT03144245-single agent, phase I, recruiting; R/R AML AMG 673 (Bi-specific Ab; CD33 x CD3) NCT03224819- single agent, phase I, recruiting; R/R AML</p>	<p>Study ongoing</p> <p>Study ongoing</p> <p>Study ongoing</p>
	CD123	<p>JNJ-63709178 (Duobody; CD123 x CD3) NCT02715011-single agent, phase I, recruiting; R/R AML MGD006 (flotetuzumab) (DART; CD123 X CD3) NCT02152956- single agent, phase I/II, recruiting; R/R AML and intermediate / high risk MDS XmAb14045 (Bispecific Ab; CD123 X CD3) NCT02730312-single agent, phase I, recruiting; CD123+ AML, ALL, CML, BPDCN</p>	<p>Study ongoing</p> <p>Study ongoing, activity in refractory AML</p> <p>Study ongoing</p>
	CLL-1	<p>MCLA-117 (Duobody; CLEC12A (CLL-1) x CD3) NCT03038230-single agent, phase I, recruiting; R/R AML, untreated poor risk older AML</p>	<p>Study ongoing</p>
	CD33	<p>CD16/IL-15/CD33 (TriKE) NCT03214666-single agent, phase I/II, recruiting; R/R AML, high risk MDS, advanced systemic mastocytosis</p>	<p>Study ongoing</p>

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Supplementary table 2. Checkpoint inhibitor studies in AML				
Study ID	Ph	Treatment	Patients	Clinical outcome /Status
Monotherapy trials				
	I	CT-011 (anti-PD1)	Advanced heme malignancies, including AML	Completed
NCT02275533	II	Nivolumab (anti-PD1)	AML in CR1/CRi1 with MRD excluding favorable AML in < 60 yrs old	Recruiting
NCT02532231	II	Nivolumab	AML in CR or < 10% blasts at high-risk for relapse	Recruiting
NCT02708641	II	Pembroluzimab (anti-PD1)	AML in CR1 (≥60 yrs), not candidate for alloHSCt	Recruiting
NCT03286114	I	Pembroluzimab	Relapsed AML, MDS, ALL post alloHSCt	Recruiting
NCT02981914	I	Pembroluzimab	Relapsed AML, MDS, lymphoma post alloHSCt	Recruiting
NCT03291353	0	Pembroluzimab	Primary refractory AML	Withdrawn (slow accrual)
NCT01757639	I	Ipilimumab (anti-CTLA4)	R/R high risk MDS and AML	Completed
NCT00060372	I	Ipilimumab	R/R AML plus other malignancies post alloHSCt	Completed
Combination of checkpoint inhibitors trials				
NCT01822509	I/IB	Ipilimumab or Nivolumab	Relapsed heme malignancy post alloHSCt	Active, non recruiting
NCT03600155	I	Ipilimumab, Nivolumab, or both	High-risk R/R AML/MDS after alloHSCt	Recruiting
NCT02846376	I	Ipilimumab, Nivolumab or both	Post alloHSCt for int-2/high risk MDS/AML	Recruiting
Combination of checkpoint inhibitors with hypomethylating agents				
NCT02397720	II	Nivolumab +/- Ipilimumab plus Azacitidine	R/R including post alloHSCt and untreated/unfit (≥65) AML	Recruiting
NCT03092674 SWOG 1612	II/III	Nivolumab plus Azacitidine and other arms	Older (≥60), untreated AML and high risk MDS	Suspended
NCT03825367	I/II	Nivolumab plus Azacitidine	Pediatric R/R AML	Recruiting
NCT02845297	II	Pembroluzimab plus Azacitidine	R/R and untreated/unfit (≥65) AML	Recruiting
NCT03769532	II	Pembroluzimab plus Azacitidine	NPM1mut AML in MRD+ CR	Planned
NCT02996474	I/II	Pembroluzimab plus Decitabine	R/R AML	Completed
NCT03969446	I	Pembroluzimab plus Decitabine	R/R and untreated/unfit (≥60) AML	Planned
NCT02892318	I	Atezolizumab (anti-PD-L1) plus Guadecitabine	R/R and untreated/unfit (≥65) AML	Active, not recruiting
NCT02953561	IB/II	Avelumab (anti-PD-L1) plus Azacitidine	R/R AML	Active, not recruiting
NCT02775903	II	Durvalumab (anti-PD-L1) plus Azacitidine	Untreated (≥65) AML/high risk MDS	Active, not recruiting
NCT02890329	I	Ipilimumab plus Decitabine	R/R including post alloHSCt and untreated (≥75) AML /R/R high risk MDS	Recruiting
NCT03066648	I	PDR001 (anti-PD1) and MBG453 (anti-TIM3) alone, or plus decitabine	R/R and untreated, unfit AML /R/R and unfit high risk MDS	Recruiting
Combination of checkpoint inhibitor with chemotherapy				
NCT02464657	I/II	Nivolumab plus cytarabine and idarubicin	Untreated AML and high-risk MDS	Active, not recruiting
NCT02768792	II	Pembroluzimab plus HiDAC	R/R AML	Active, not recruiting
NCT03417154	II	Nivolumab plus oral cyclophosphamide	R/R AML and high-risk MDS	Recruiting
Combination of checkpoint inhibitors with other therapeutics and immunotherapeutics				
NCT04044209	II	Nivolumab plus Ivosidenib (IDH1 inhibitor)	R/R IDH1mut AML/high risk MDS	Planned
NCT03730012	I/II	Atezolizumab plus Gilteritinib (FLT3 inhibitor)	R/R FLT3mut AML	Recruiting
NCT03922477	I	Atezolizumab plus Hu5F9-G4 (anti-CD47)	R/R AML	Recruiting
NCT03154827	IB/II	Atezolizumab plus BL-8040 (CXCR4 inhibitor)	AML-MRD+ CR1 p induction ≥60 yrs	Recruiting
NCT03940352	I	HDM201 (HDM2 inhibitor) plus MBG453 or venetoclax	R/R or unfit AML/R/R high risk MDS	Recruiting
NCT03390296	IB/II	Anti-OX40 alone or plus avelumab plus azacitidine and other arms	R/R AML	Recruiting
NCT03761914	I/II	Pembroluzimab plus galinpepimut-S (WT1 vaccine)	AML with PR on HMA (including induction chemo failure on HMA)	Recruiting
NCT01096602	II	Pidilizumab plus dendritic cell vaccine	AML patient in CR	Active, not recruiting
NCT02771197	II	Pembroluzimab plus autologous SCT	Non-favorable AML in ≥ CR1	Recruiting
NCT03912064	I	Ipilimumab + CD25/Treg-depleted DLI	Post-alloHSCt relapse AML/MDS/MPN	Recruiting