

Supplement to: Cohen AD, Raje N, Fowler JA, Mezzi K, Scott EC, Dhodapkar MV. How to Train Your T Cells: Overcoming Immune Dysfunction in Multiple Myeloma

Supplementary Table S1. Ongoing vaccine trials with unpublished data for MM disease stages with lower tumor burden/immunosuppression^a

Target(s)	Immuno-oncology agent	Clinical trial identifier (phase)	N	Patient population	Regimen(s)
PD-L1	PD-L1 peptide vaccine	NCT03042793 (Phase 1)	10 (est.)	Patients with MM newly treated with HDT and no signs of relapse	PD-L1 peptide vaccine with Montanide ISA-51
	PD-L1 peptide vaccine	NCT03850522 (Phase 2a)	20 (est.)	High-risk SMM	Single agent
DKK1	DC DKK1 vaccine	NCT03591614 (Early Phase 1)	18 (est.)	MGUS, SMM, or MM	Single agent
Survivin	SVN53-67/M57-KLH peptide vaccine (SurVaxM)	NCT02334865 (Phase 1)	18 (est.)	NDMM patients receiving Len maintenance therapy	SurVaxM + Len maintenance
Neoantigen	Personalized neoantigen peptide vaccine	NCT03631043 (Early Phase 1)	30 (est.)	SMM	Single agent
CT7, MAGE-A3, and WT1	mRNA-electroporated DCs	NCT01995708 (Phase 1)	28	MM patients undergoing autoSCT	mRNA-electroporated autologous Langerhans-type DCs after autoSCT versus standard supportive care after autoSCT
XBP1, CD138, and SLAMF7/CS1	Multi-peptide vaccine (PVX-410)	NCT02886065 (Phase 1)	20 (est.)	SMM	PVX-410 and Citarinostat ± Len
Whole tumor antigens	Allogeneic GM-CSF vaccine (GVAX)	NCT03376477 (Phase 2)	54 (est.)	MM patients in complete or near complete remission	Len-GVAX-Prevnar13 versus Len-GVAX versus Len
	DC/MM fusion vaccine	NCT00458653 (Phase 1)	45	Transplant-eligible MM	DC/MM fusion vaccine after autoSCT DC/MM fusion vaccine before and after autoSCT
		NCT02728102 (Phase 2)	203	Transplant-eligible MM	Vaccine with Len and GM-CSF versus Len with GM-CSF versus Len maintenance

Abbreviations: AutoSCT, autologous stem cell transplant; DC, dendritic cell; DC/MM, dendritic cell/multiple myeloma hybridoma; est., estimated; GM-CSF, granulocyte macrophage colony stimulating factor; HDT, high-dose therapy; Len, lenalidomide; MGUS, monoclonal gammopathy of undetermined significance; MM, multiple myeloma; SMM, smoldering multiple myeloma.

Based on www.clinicaltrials.gov search conducted on February 20, 2019.

^aStudies in relapsed and/or refractory MM are not shown, as the focus of more recent vaccine therapy trials has been for disease stages with lower tumor burden/immunosuppression.

Supplementary Table S2. CPI-based trials in patients with relapsed and/or refractory MM with unpublished data

Target	Immuno-oncology agent	Clinical Trial Identifier (phase, study name)	N	Patient population	Regimen(s)
PD-1	Pembrolizumab	NCT02636010 (Phase 2)	20	MM patients with residual disease after treatment	Single agent
		NCT03267888 (Phase 1)	24 (est.)	Relapsed or refractory MM	Pembro-radiation therapy
		NCT02362035 (Phase 1b/2, KEYNOTE 145)	159	Hematologic malignancies	Pembro-acalabrutinib
	Nivolumab	NCT02681302 (Phase 1b/2a, CPIT001)	42 (est.)	MM patients at high risk for posttransplant recurrence ^a	Nivo-ipilimumab after autoSCT
		NCT03588936 (Phase 1)	12 (est.)	Relapsed hematologic malignancies after alloSCT	Nivo-tocilizumab after alloSCT
		NCT03782064 (Phase 2)	25 (est.)	Relapsed MM	Nivo-DC/MM vaccine
		NCT03184194 (Phase 2)	60 (est.)	Relapsed or refractory MM	Nivo-dara±cyclophosphamide
		NCT03605719 (Phase 1)	62 (est.)	Relapsed/refractory MM	Nivo-Kd ± reovirus
		NCT03634800 (Phase 2, RISE-M)	30 (est.)	Refractory or relapsed and refractory MM	Nivo-radiation therapy
		NCT02726581 (Phase 3, CheckMate 602)	406 (est.)	Refractory or relapsed and refractory MM	Nivo-Elo-Pom-Dex Pom-Dex ± Nivo
	Pidilizumab (CT-011)	NCT01067287 (Phase 2)	35 (est.)	Transplant-eligible MM	Pidilizumab-DC/MM vaccine following SCT
NCT02077959 (Phase 1/2)		20	Relapsed or refractory MM	Pidilizumab-Len	
JNJ-63723283	NCT03357952 (Phase 2/3)	10	Relapsed or refractory MM	Dara ± JNJ-63723283	
Cemiplimab (REGN2810)	NCT03194867 (Phase 1/2)	105 (est.)	Relapsed/Refractory MM	Isa ± cemiplimab	
PD-L1	Atezolizumab	NCT02431208 (Phase 1b)	300 (est.)	Relapsed or Refractory MM and post auto-SCT	Atezo ± Len Atezo-Dara ± Len Atezo-Dara-Pom Dara-Pom-Dex
	TTI-622	NCT03530683 (Phase 1, TTI-622-01)	156 (est.)	Advanced relapsed or refractory MM ^a	Single agent TTI-622-Rituximab TTI-622-Pembro/Nivo TTI-622-Bort-Dex TTI-622-Kd

Abbreviations: AlloSCT, allogeneic stem cell transplantation; Atezo, atezolizumab; autoSCT, autologous stem cell transplantation; Bort, bortezomib; CPI, checkpoint inhibitor; Dara, daratumumab; DC/MM, dendritic cell/multiple myeloma hybridoma; Dex, dexamethasone; Durva, durvalumab; Elo, elotuzumab; est., estimated; Isa, isatuximab; Kd, carfilzomib-dexamethasone; Len, lenalidomide; MM, multiple myeloma; Nivo, nivolumab; Pembro, pembrolizumab; Pom, pomalidomide; SCT, stem cell transplantation.

^aTrials also include lymphoma patients.

Based on www.clinicaltrials.gov search conducted on February 20, 2019.