

Table S1. Examples of checkpoint inhibitors approved by the FDA for clinical use as a monotherapy. ORR, objective response rate; OS, overall survival; NSCLC, non-small cell lung cancer; HNSCC, head and neck squamous cell carcinoma; SCLC, small cell lung cancer; MSI, microsatellite instability; MMR, mismatch repair. HPV, human papilloma virus.

Target	Drug name	Trade name	Tumour type	Year approved	Pivotal trial	Key findings	References
CTLA-4	Ipilimumab	Yervoy	Melanoma	2011	MDX010-020	Improved the median OS by 3.7 months and 2-year survival by 9.7% compared to gp100 vaccine alone.	[1, 2]
PD-1	Nivolumab	Opdivo	Melanoma	2014	CheckMate-037	Improved ORR (31.7% vs. 10.6%) with fewer toxicities compared to dacarbazine group.	[3]
			NSCLC	2015	CheckMate-017	Improved median OS (9.2 months vs. 6 months) and ORR (20% vs. 9%) compared to docetaxel group.	[4]
			Renal cell carcinoma	2015	CheckMate-025	Improved OS (25 months vs. 19.6 months) and ORR (25% vs. 5%) compared to everolimus group.	[5]
			HNSCC	2016	CheckMate-141	Improved median OS (7.5 months vs. 5.1 months) and ORR (13.3% vs. 5.8%) compared to standard therapy.	[6]
			Urothelial carcinoma	2017	CheckMate-275	Improved objective response and OS benefit of 7 months observed, irrespective of PD-L1 expression in patients with recurrent or progressed tumours	[7]
			MSI-high, MMR-deficient colorectal cancer	2017	CheckMate-142	Patients who progressed after previous treatments showed good ORR (31.1%) and 51/74 patients had disease control > 12 weeks	[8]
			Hepatocellular carcinoma	2017	CheckMate-040	Manageable safety profile and durable objective response (ORR 20%) in patients.	[9]
			SCLC	2018	CheckMate-032	Increased overall response rate and response duration in patients after failure of platinum-based therapy	[10]
			Oesophageal squamous cell carcinoma	2020	ATTRACTON-3	Improved OS (10.9 months vs. 8.4 months) compared to chemotherapy group.	[11]
Pembrolizumab	Keytruda	Keytruda	Melanoma	2014	NCT01295827	ORR of 26% in anti-CTLA-4 refractory patients.	[12]
			NSCLC	2015	KEYNOTE-010	Improved median OS (12.7 months vs. 8.5 months) and ORR (29% vs. 8%) compared to docetaxel group.	[13]
			HNSCC	2016	KEYNOTE-012	Overall ORR of 18% regardless of HPV status in patients who progressed on platinum-based therapy	[14]
			Urothelial carcinoma	2017	KEYNOTE-045	Improved median OS (10.3 months vs. 7.4 months), ORR (21.1% vs. 11.4%) and lower toxicities compared	[15]

						to chemotherapy in patients with progressed or recurred tumours after platinum-based therapy	
			MSI-high, MMR-deficient solid tumours of any histology	2017	KEYNOTE-012, -016, -028, -158 and -164	Overall response rate of approximately 40% across multiple trials involving patients with MSI-high and MMR-deficient solid tumours.	[16, 17]
			Gastric and gastroesophageal carcinoma	2017	KEYNOTE-059	ORR of 11.6% with complete response observed in 2.3% patients. Median response duration of 8.4 months in previously treated patients.	[18]
			Cervical cancer	2018	KEYNOTE-158	ORR of 12.2% with manageable safety in previously treated patients.	[19]
			Merkel cell carcinoma	2018	KEYNOTE-017	Improved ORR of 56% and 24-months overall survival rate of 68.7% in patients compared to historical chemotherapy data.	[20]
			Non-muscle invasive bladder cancer	2020	KEYNOTE-057	Complete response observed in 41% of patients with a median duration of response of 16.2 months.	[21, 22]
	Cemiplimab	Libtayo	Squamous cell carcinoma	2018	NCT02383212 NCT02760498	Response observed in 50% (phase I expansion cohorts) and 47% (phase II metastatic-disease cohorts) of patients.	[23]
			NSCLC	2021	NCT03088540	Improved OS and progression-free survival.	[24]
PD-L1	Atezolizumab	Tecentriq	Urothelial carcinoma	2016	IMvigor210	Improved OS (8.6 months) and overall ORR of 15% in patients. Patients with increased expression of PD-L1 on tumour infiltrating immune cells were more responsive to treatment (26% in PD-L1+ vs. 9.5% in PD-L1- patients)	[25, 26]
			NSCLC	2016	POPLAR OAK	Improved OS (12.6 months vs. 9.7 months) and fewer grade 3-4 adverse events (11% vs. 39%) compared to docetaxel group. Improved median OS (13.8 months vs. 9.6 months) compared to docetaxel group.	[27, 28]
	Avelumab	Bavencio	Merkel cell carcinoma	2017	JAVELIN Merkel 200	ORR of 31.8% with 8 complete responses and was well-tolerated without any grade 4 events.	[29]
			Urothelial carcinoma	2017	JAVELIN Solid Tumor	ORR of 16.5%, median duration of response of 20.5 months and median OS of 7 months were observed in	[30]

						patients with progressed tumour after platinum-based therapy	
Durvalumab	Imfinizi	Urothelial carcinoma	2017	NCT01693562	ORR of 17.8% with 7 complete response. ORR higher in PD-L1 ⁺ patients (27.6% vs. 5.1%). Grade 3-4 adverse events in 6.8% patients.	[31]	
		NSCLC	2018	PACIFIC	Improved median progression-free survival (17.2 months vs. 5.6 months) and ORR (30% vs. 17.8%) compared to placebo group.	[32]	

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