

**Supplementary Table 1. Proposed Antigen targets of interest for CAR T-cell therapy investigation in solid tumors.** The antigen targets investigated for solid tumor CAR T-cell therapy were compiled by review of the published literature. Antigens are listed in alphabetical order and the relevant citations in chronological order.

Antigen targeted	Tumors investigated	References
<b>B7-H3</b>	Sarcoma and Neuroblastoma	(1)
<b>CD276</b>		
<b>B7-H6</b>	Ovarian and several solid cancers	(2-4)
<i>Nkp30</i>		
<b>CAIX</b>	Renal cell carcinoma	(5)
<i>Carbonic Anhydrase IX</i>		
<b>CEA</b> <i>Carcinoembryonic Antigen</i>	Liver metastasis from Colon cancer, Colon, Pancreas, Gastric and Lung cancers	(6-20)
<b>CSPG4</b> <i>Chondroitin sulfate proteoglycan-4</i>	Melanoma, Mesothelioma, Glioblastoma, Osteosarcoma, Breast, Head and Neck cancers	(21-24)
<b>DNAM-1</b> <i>DNAX Accessory Molecule</i>	Melanoma	(25)
<b>EpHA2</b> <i>Ephrin type A Receptor 2</i>	Glioblastoma and Lung cancer	(26, 27)
<b>EpCAM</b> <i>Epithelial Cell Adhesion Molecule</i>	Prostate cancer	(28, 29)
<b>ERBB family</b>	Head and Neck and Breast cancers	(30, 31)
<b>ERBB2</b>	Prostate, Breast, Ovarian and Pancreatic cancers, Glioblastoma, Medulloblastoma, Osteosarcoma, Ewing sarcoma, Neuroectodermal tumor, Desmoplastic small round cell tumor and Fibrosarcoma	(32-48)
<b>EGFRvIII</b> <i>Epidermal Growth Factor Receptor vIII</i>	Glioma/Glioblastoma	(49-56)
<b>FAP</b> <i>Fibroblast Associated Protein</i>	Tumor associated fibroblast in Lung cancer, Mesothelioma, Breast and Pancreatic cancers	(27, 57-59)
<b>FRα and β</b> <i>Folate Receptor</i>	Ovarian cancer	(60-64)
<b>GD2</b> <i>Disialoganglioside</i>	Neuroblastoma, Edwing sarcoma, Melanoma	(65-71)
<b>GD3</b>	Melanoma and other Neuroectodermal tumors	(72, 73)
<b>Gp100/HLA-A2</b>	Melanoma	(74, 75)
<b>GPC3</b> <i>Glypican 3</i>	Hepatocellular carcinoma	(76)
<b>HERK-V</b>	Melanoma	(77)
<b>MAGE-1/HLA-A1</b> <i>Melanoma Antigen E</i>	Melanoma	(78, 79)
<b>IL-11Ra</b>	Osteosarcoma	(80)
<b>IL-13Ra2</b>	Glioma/Glioblastoma Medulloblastoma	(81-87)
<b>Lewis-Y</b>	Ovarian	(88) (89, 90)
<b>LMP1</b> <i>Latent Membrane Protein 1</i>	Nasopharyngeal cancer	(91)
<b>L1-CAM</b> <i>CD271 L1-Cellular Adhesion Molecule</i>	Glioblastoma, Neuroblastoma, Ovarian, Lung and Renal carcinoma	(92, 93)
<b>Muc-1</b> <i>Mucin-1</i>	Prostate and Breast cancers	(43, 94-96)
<b>Muc-16</b> <i>Mucin-16</i>	Ovarian cancer	(97, 98)
<b>MSLN</b> <i>Mesothelin</i>	Ovarian, Mesothelioma, Lung cancers	(99-107)
<b>N-cam</b>	Neuroblastoma	(108)
<b>CD56 Neural cell-adhesion molecule1</b>		
<b>NKG2DL</b> <i>NKG2D Ligands</i>	Ovarian	(109, 110)
<b>PSCA</b> <i>Prostate Stem cell Antigen</i>	Prostate cancer	(111-113)
<b>PSMA</b> <i>Prostate Specific Membrane Antigen</i>	Prostate	(114-117)
<b>ROR1</b> <i>Receptor tyrosine kinase-like Orphan Receptor</i>	Epithelial solid tumors	(117, 118)

<b>Antigen targeted</b>	<b>Tumors investigated</b>	<b>References</b>
<b>TAG72</b> <i>Tumor Associated Glycoprotein 72</i>	Gastrointestinal, Colon and Breast cancers	(119-122)
<b>TRAIL R</b> <i>Trail Receptor</i>	Various type of cancer	(123)
<b>VEGFR2</b> <i>Vascular Endothelial Growth Factor Receptor-2</i>	Tumor associated vasculature	(124-127)

**Supplementary Table 2. Publications characterizing MSLN expression in solid tumors.**

Following literature search, publications investigating MSLN expression by immunohistochemistry were compiled. The total number of tumors (Total #) and the number of MSLN positive tumors (MSLN+ #) were derived according to the claim from each publication. The final percentage of MSLN positivity refers to the percentage of MSLN positive tumors among the total number of tumors investigated. For further details, readers are encouraged to refer to each publication.

(128)

**(1) Esophageal cancer**

Author	Histological subtype	Total #	MSLN+ #	MSLN+ %	Ref
Ordonez et al., 2003	Esophageal adenocarcinoma and squamous carcinoma	8	4	50	(128)
Dennis et al., 2005	Esophageal adenocarcinoma and squamous carcinoma	28	4	16	(129)
Alvarez et al., 2008	Barrett associated dysplasia and adenocarcinoma	84	24	28	(130)
Rizk et al., 2012	Esophageal adenocarcinoma	125	57	46	(131)
<b>Range: 16-50%</b>					
<b>Calculated MSLN+</b>		<b>245</b>	<b>89</b>	<b>Average: 35-40%</b>	

**(2) Breast Cancer**

Author	Histological subtype	Total #	MSLN+ #	MSLN+ %	Ref
Ordonez et al., 2003	Unspecified	12	0	0	(132)
Ordonez et al., 2003	Unspecified	35	1	3	(128)
Frierson et al., 2003	Unspecified	71	10	14	(133)
Dennis et al., 2005	Unspecified	35	1	3	(129)
Tchou et al., 2012	Triple negative	43	29	67	(134)
Tchou et al., 2012	ER positive	29	1	3	(134)
Tchou et al., 2012	HER positive	27	1	4	(134)
Parinianitkul et al., 2013	Triple negative	109	37	34	(135)
Wang et al., 2012	All subtypes	182	54	30	(136)
Li et al., 2014	All subtypes	141	50	35	(137)
Ordonez et al., 2014	Triple negative	40	21	53	(138)
Ordonez et al., 2014	Estrogen positive	40	1	3	(138)
Tozbikian et al., 2014	Triple negative	226	82	36	(139)
Tozbikian et al., 2014	Non Triple negative	88	14	16	(139)
Bayoglu et al., 2015	Triple negative	71	30	42	(140)
Bayoglu et al., 2015	HER positive	50	2	4	(140)
<b>Range: 0-67%</b>					
<b>Calculated MSLN+</b>		<b>1199</b>	<b>334</b>	<b>Average: 25-30%</b>	

**(3) Stomach cancer**

Author	Total #	MSLN+ #	MSLN+ %	Ref
Ordonez et al., 2003	4	2	50	(132)
Ordonez et al., 2003	7	2	29	(128)

Dennis et al., 2005	34	7	21	(129)
Einama et al., 2012	110	49	45	(141)
Baba et al., 2012	212	124	58	(142)
Ito et al., 2014	50	29	58	(143)
<b>Range: 21-58%</b>				
<b>Calculated MSLN+</b>	<b>417</b>	<b>213</b>	<b>Average: 50-55%</b>	

#### (4) Cholangiocarcinoma

Author	Histological Subtype	Total #	MSLN+ #	MSLN+ %	Ref
Ordonez et al., 2003	Cholangiocarcinoma and Ampulla de Vater	22	10	45	(128)
Dennis et al., 2005	Cholangiocarcinoma	10	7	70	(129)
Hassan et al., 2005	Common Bile Duct and Ampulla de Vater	21	20	95	(144)
Yu et al., 2010	Cholangiocarcinoma	9	3	33	(145)
Kawamata et al., 2012	Extrahepatic Bile Duct cancer	61	44	72	(146)
Nomura et al., 2013	Cholangiocarcinoma	25	8	32	(147)
<b>Range: 32-95%</b>					
<b>Calculated MSLN+</b>	<b>148</b>	<b>92</b>	<b>Average: 60-65%</b>		

#### (5) Pancreatic cancer

Author	Histological Subtype	Total #	MSLN+ #	MSLN+ %	Ref
Argani et al., 2001	Pancreatic ductal adenocarcinoma	60	60	100	(148)
Frierson et al., 2003	Unspecified	14	14	100	(133)
Ordonez et al., 2003	Pancreatic ductal adenocarcinoma	11	10	91	(132)
Ordonez et al., 2003	Pancreatic ductal adenocarcinoma	14	12	86	(128)
Swierczynski et al., 2004	Pancreatic adenocarcinoma	68	61	90	(149)
Hassan et al., 2005	Pancreaticobiliary adenocarcinoma	18	18	100	(144)
Dennis et al., 2005	Pancreatic ductal adenocarcinoma	53	25	47	(129)
Inami et al., 2008	Pancreatic ductal carcinoma	19	14	74	(150)
Einama et al., 2011	Pancreatic ductal adenocarcinoma	66	57	86	(141)
Frank et al., 2014	Pancreatic adenocarcinoma	35	30	86	(151)
Scales et al., 2014	Pancreatic ductal adenocarcinoma	196	147	75	(152)
<b>Range: 47-100%</b>					
<b>Calculated MSLN+</b>	<b>554</b>	<b>448</b>	<b>Average: 80-85%</b>		

#### (6) Colon cancer

Author	Histological Subtype	Total #	MSLN+ #	MSLN+ %	Ref
Ordonez et al., 2003	Adenocarcinoma	16	5	31	(132)
Ordonez et al., 2003	Adenocarcinoma	18	5	28	(128)
Frierson et al., 2003	Adenocarcinoma	56	17	30	(133)
Liebig et al., 2005	Carcinoma	46	28	61	(153)

Kawamata et al., 2014	Unspecified	91	45	49	(154)
<b>Range: 31-61%</b>					
	<b>Calculated MSLN+</b>	<b>227</b>	<b>100</b>	<b>Average: 40-45%</b>	

### (7) Lung cancer

Author	Histological Subtype	Total #	MSLN+ #	MSLN+ %	Ref
Miettinen et al., 2003	Lung adenocarcinoma	386	163	42	(155)
	Squamous cell carcinoma				
Ordonez et al., 2003	Lung Adenocarcinoma	50	19	38	(156)
Ordonez et al., 2003	Lung Adenocarcinoma	34	14	41	(128, 138)
Dennis et al., 2005	Lung Adenocarcinoma	53	19	36	(129)
Ordóñez et al., 2006	Squamous cell carcinoma	30	8	27	(157)
Kushitani et al., 2007	Lung Adenocarcinoma	51	35	69	(158)
Pu et al., 2008	Lung Adenocarcinoma	10	10	100	(159)
Pu et al., 2008	Squamous cell carcinoma	15	9	60	(159)
Kachala et al., 2014	Lung Adenocarcinoma	1209	834	69	(160)
Thomas et al., 2015	Advanced lung adenocarcinoma	93	77	83	(161)
<b>Range: 27-100%</b>					
	<b>Calculated MSLN+</b>	<b>1931</b>	<b>1188</b>	<b>Average: 60-65%</b>	

### (8) Thymic carcinoma

Author	Histological Subtype	Total #	MSLN+ #	MSLN+ %	Ref
Pan et al., 2003	Thymic carcinoma	22	8	36	(162)
Yuanbin et al., 2014	Thymic carcinoma	42	19	45	(163)
<b>Range: 36-45%</b>					
	<b>Calculated MSLN+</b>	<b>64</b>	<b>27</b>	<b>Average: 40-45%</b>	

### (9) Mesothelioma

Author	Histological Subtype	Total #	MSLN+ #	MSLN+ %	Ref
Ordonez et al., 2003	Epithelioid mesothelioma	44	44	100	(132)
Ordonez et al., 2003	Biphasic mesothelioma	3	3	100	(132)
Ordonez et al., 2003	Sarcomatous	8	0	0	(132)
Ordonez et al., 2003	Unspecified	60	60	100	(156)
Miettinen et al., 2003	Epithelioid mesothelioma	28	25	89	(155)
Ordonez et al., 2004	Epithelioid mesothelioma	40	40	100	(164)
Ordonez et al., 2004	Sarcomatoid	8	0	0	(164)
Ordonez et al., 2006	Epithelioid mesothelioma	30	30	100	(157)
Galloway et al., 2006	Biphasic mesothelioma	8	8	100	(165)
Galloway et al., 2006	Epithelioid mesothelioma	39	39	100	(165)
Galloway et al., 2006	Other mesothelioma	15	6	40	(165)
Kushitani et al., 2007	Epithelioid mesothelioma	66	56	85	(158)
Kushitani et al., 2007	Biphasic mesothelioma	18	9	50	(158)

Roe et al., 2008	Unspecified	47	36	77	(166)
Tan et al., 2010	Epithelioid mesothelioma	24	24	100	(167)
Tan et al., 2010	Sarcomatoid	15	0	0	(167)
Servais et al., 2012	Epithelioid mesothelioma	139	125	90	(168)
Ordonez et al., 2014	Epithelioid mesothelioma	60	60	100	(138)
Range: 0-100%					
<b>Calculated MSLN+</b>		<b>652</b>	<b>565</b>	<b>Average: 85-90%</b>	

#### (10) Ovarian cancer

Author	Histological Subtype	Total #	MSLN+ #	MSLN+ %	Ref
Frierson et al., 2003	Serous papillary borderline	42	36	86	(133)
Frierson et al., 2003	Mucinous	8	1	13	(133)
Ordonez et al., 2003	Ovarian Adenocarcinoma	14	14	100	(132)
Ordonez et al., 2003	Epithelial ovarian cancer	40	35	88	(128)
Drapkin et al., 2004	Papillary serous	16	12	75	(169)
Dennis et al., 2005	Serous adenocarcinoma	18	17	94	(129)
Dennis et al., 2005	Mucinous adenocarcinoma	10	3	30	(129)
Rosen et al., 2005	Epithelial Ovarian cancer	60	20	33	(170)
Hassan et al., 2005	Epithelial Ovarian cancer	48	34	71	(171)
Cao et al., 2005	Primary Mucinous	35	6	17	(172)
Yen et al., 2006	Serous carcinoma	198	110	56	(173)
Scales et al., 2014	Unspecified adenocarcinomas	86	73	85	(152)
Scales et al., 2014	Serous adenocarcinoma	43	42	98	(152)
Scales et al., 2014	Mucinous ovarian tumor	10	1	10	(152)
Scales et al., 2014	Clear cell	13	5	38	(152)
Range 10-100%					
<b>Calculated MSLN+</b>		<b>641</b>	<b>409</b>	<b>Average: 60-65%</b>	

#### (11) Endometrial cancer

Author	Total #	MSLN+ #	MSLN+ %	Ref	
Frierson et al., 2003	22	13	59	(133)	
Ordonez et al., 2003	6	4	67	(132)	
Ordonez et al., 2003	11	7	64	(128)	
Dennis et al., 2005	10	5	50	(129)	
Dainty et al., 2007	360	66	18	(174)	
Obulhasim et al., 2010	16	8	50	(175)	
Range: 18-67%					
<b>Calculated MSLN+</b>		<b>425</b>	<b>103</b>	<b>Average: 20-25%</b>	

**Supplementary Table 3. Incidence estimated for patients with solid tumors expressing MSLN.**

Cancer Subtype	Annual cancer incidence in US (2014)	MSLN expression (%)	Estimated number of MSLN+ patients
Esophageal Adenocarcinoma	9,085 (NCI)	37	3,361
Breast Cancer	232,670 (SEER)	28	65,148
Stomach Cancer	22,220 (SEER)	51	11,332
Cholangiocarcinoma	2,500 (NCI)	62	1,550
Pancreatic Ductal Adenocarcinoma	41,778 (NCI)	81	33,840
Colon Cancer	136,830 (NCI)	44	60,205
Lung Cancer	224,210 (NCI)	62	139,010
Thymic carcinoma	1,000 (NCI)	42	420
Mesothelioma	2,500 (NCI)	86	2,150
Ovarian Cancer	21,980 (SEER)	64	14,067
Endometrial Cancer	52,630 (SEER)	24	12,631
<b>Total of patients</b>	<b>747,403</b>	<b>46%</b>	<b>343,714</b>

Cancer subtype incidence obtained from NCI and SEER database.

**Supplementary Table 4. Prevalence estimated for patients with solid tumors expressing MSLN.**

Cancer subtype prevalence obtained from NCI and SEER database.

Cancer Subtype	Annual cancer prevalence in US (2011)	MSLN expression (%)	Estimated number of MSLN+ patients
Esophageal Adenocarcinoma	24,148 (SEER)	37	8,935
Breast Cancer	2,899,726 (SEER)	28	811,923
Stomach Cancer	74,035 (SEER)	51	37,758
Cholangiocarcinoma	4,861 (NCI)	62	3,013
Pancreatic Ductal Adenocarcinoma	39,184 (SEER)	81	31,739
Colon Cancer	1,162,426 (SEER)	44	511,467
Lung Cancer	402,326 (SEER)	62	249,442
Thymic carcinoma	957 (NCI)	42	402
Mesothelioma	5,735 (NCI)	86	4,932
Ovarian Cancer	188,867 (SEER)	64	120,875
Endometrial Cancer	610,804 (SEER)	24	146,593
<b>Total of patients</b>	<b>5,413,069</b>	<b>36%</b>	<b>1,927,079</b>

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