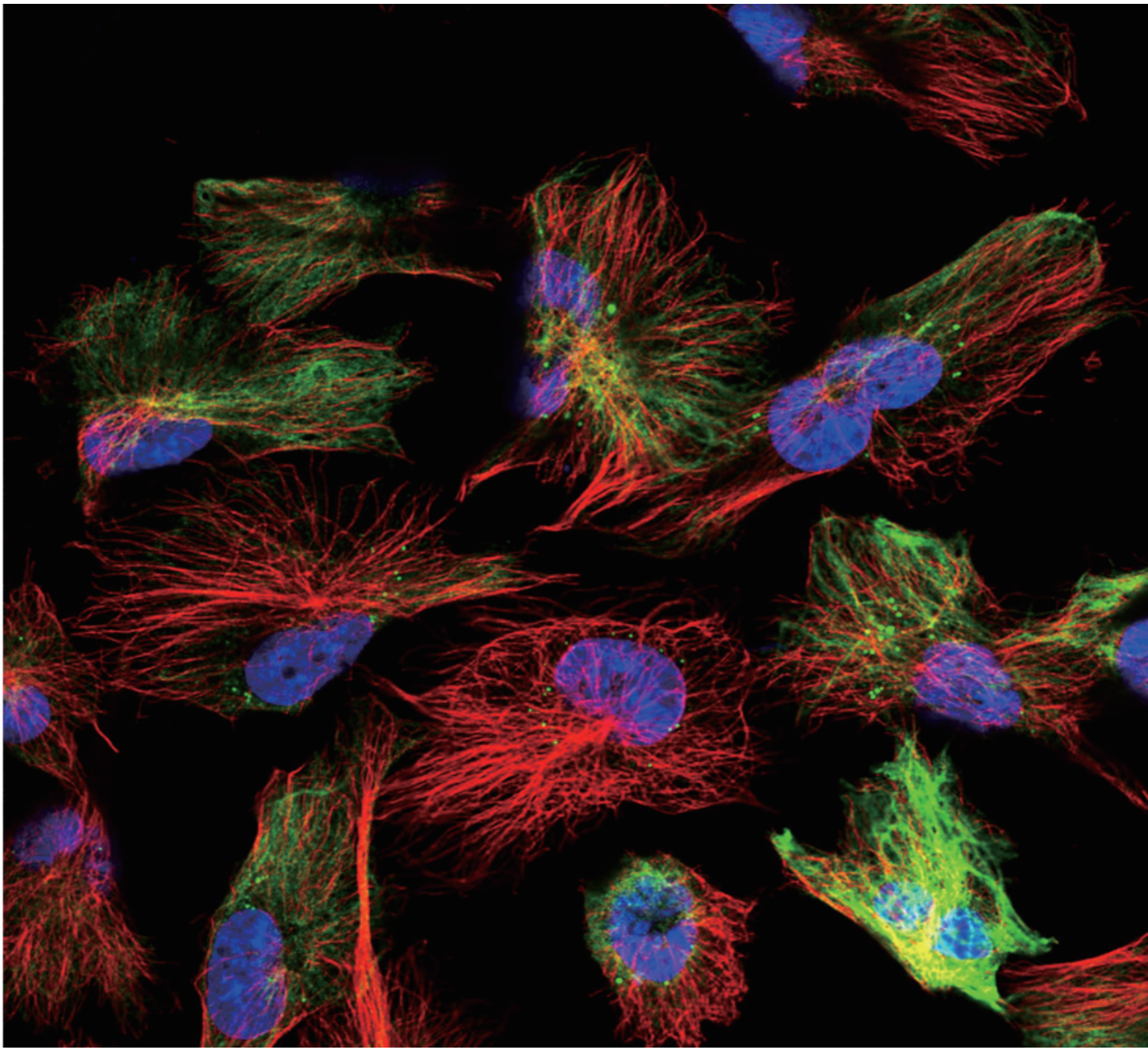
ATLAS ANTIBODIES



CANCER STEM CELL MARKERS

癌症幹細胞(Cancer Stem Cells, CSC)是少數細胞，通常佔腫瘤中所有細胞的1%至3%，它們起始腫瘤的發生、生長和轉移，並可能導致復發。由於它們的重要性，目前已經確定了幾種CSC的生物標記物，可以進行診斷、治療和預後預測。因此，用各種藥物選擇性針對CSCs有望提高癌症患者的存活率，是一種很有前景的癌症治療策略。

本篇概述了最著名的CSC生物標記物，重點關注固態癌(Solid Cancers)（肺癌、胃癌、肝癌、乳癌和結腸直腸癌）和血液癌(Hematological cancers)（急性和慢性骨髓性白血病）。

在所有癌細胞類型中，有一些會像幹細胞，自我複製並維持腫瘤，就像幹細胞通常會自我更新和維持我們的器官和組織一樣。癌症幹細胞(CSC)是由正常幹細胞或前驅/先驅細胞的DNA突變、表觀遺傳事件和組織微環境因素組合產生的，癌症幹細胞與幹細胞密切相關，並具有許多相似的行為和特徵[1]。

CSCs的一項重要能力是在少量細胞數的情況下形成腫瘤。因此，針對CSCs至關重要。許多新的抗癌療法是根據它們縮小腫瘤的能力來評估的。然而，如果這些療法不破壞CSC，腫瘤很快就會重新生長，而對治療產生很高的抵抗力[2]。此外，CSC可能會引起轉移、扮演癌細胞的儲存庫、導致手術後復發等。

上世紀90年代末，科學家們在急性骨髓性白血病等血液癌症中首次發現了CSC，當時科學家們分離出表現表面標記物CD34但不表現CD38的白血病細胞群。作者確定這種 $CD34^+/CD38^-$細胞群能夠引發腫瘤[3]。

血液組織中幹細胞的存在推進了對其他組織癌症類型的研究。自2003年以來，已在多種固態瘤中發現了CSC，包括腦[4]、乳房[5]、結腸[6]、卵巢[7,8]、胰腺[9]、前列腺[10,11]、黑色素瘤[12,13]、多發性骨髓瘤[14]和非黑色素瘤皮膚癌[15,16]。

然而CSCs一詞是在2001年才提出的[17]。最常用於分離CSCs的標記物包括細胞表面標記物，例如CD133(PROM1)、CD44、ALDH1A1、CD34、CD24和EpCAM (ESA)。

此外，Stemness基因/蛋白質的表現也可用於鑑定CSC，例如大多數研究中會分析的轉錄因子:OCT4、SOX2和NANOG。它們通常在多潛能胚胎幹細胞(pluripotent embryonic stem cells)、生殖細胞、某些委任的前驅細胞(committed progenitors)、以及癌細胞[18]中表現。然而，根據產生腫瘤的組織，可以使用不同的標記。例如，在乳癌中分離的CSC富含$CD44^+CD24^-$、SP和$ALDH^+$細胞群[19]。在神經膠質瘤和膠質母細胞瘤等腦瘤中，CSCs使用細胞表面標記物（包括SSEA-1[20]、EGFR[21]和CD44[22]）來鑑定。

使用CD133(PROM1)鑑定膠質瘤中的CSC仍然存在問題，因為在一些膠質瘤的$CD133^+$和$CD133^-$細胞中同樣發現了致瘤(tumorigenic)細胞，而一些$CD133^+$腦瘤細胞可能不具備腫瘤起始能力[23]。

使用CD133(PROM1)作為結腸CSC的陽性標記物也產生了相互矛盾的結果[24]。

對於肺癌來說，CSC標記物包括CD44和CD133(PROM1)，但也包括CD117(KIT)、CD90(或THY1)、CD166、非小細胞肺癌(NSCLC)的EpCAM，以及PODXL-1、PTCH和CD87用於小細胞肺癌(SCLC)[25]。

在本篇中，Atlas選擇了固態(Table1)和血液(Table2)腫瘤的CSC標記物。及細胞外CSC/CD標記(Table3)、細胞外CSC/非CD標記(Table4)和細胞內CSC標記(Table5)的列表。

Cover image: Immunofluorescence staining of human U-251MG cells derived from a malignant glioblastoma using the polyclonal anti-NES antibody (HPA026111), in green. Microtubule- and nuclear probes are visualized in red and blue, respectively.

Table 1. CSC antibody markers for solid tumors

Target Cancer	Marker Location/CD	Product Name	Product Numbers
Colorectal	Extracellular/Surface/CD	Anti-CD24	HPA045879
	Extracellular/Surface/CD	Anti-CD44	HPA005785
	Extracellular/Surface/CD	Anti-ITGA6/CD49	AMAb91450, HPA012696, HPA027582
	Extracellular/Surface/CD	Anti-THY1/CD90	AMAb90844, AMAb90846, HPA003733
	Extracellular/Surface/CD	Anti-PROM1/CD133	AMAb91494, HPA004922, HPA031053
	Extracellular/Surface/CD	Anti-ALCAM/CD166	HPA010926
	Extracellular/Surface/CD	Anti-EPCAM/CD326	AMAb91411, AMAb91413, HPA026761, HPA067463
	Extracellular/Surface	Anti-LGR5	HPA012530
	Extracellular/Surface	Anti-EGFR	AMAb90816, AMAb90819, HPA001200, HPA018530
	Intracellular	Anti-ALDH1A1	HPA002123
	Intracellular	Anti-LETM1	HPA011029, HPA011100
	Intracellular	Anti-NANOG	AMAb91391, AMAb91393
	Intracellular	Anti-POU5F1	AMAb91477
	Intracellular	Anti-SALL4	HPA015291, HPA015791
	Intracellular	Anti-SOX2	AMAb91307, HPA045725
Gastric	Extracellular/Surface/CD	Anti-CD24	HPA045879
	Extracellular/Surface/CD	Anti-CD44	HPA005785
	Extracellular/Surface/CD	Anti-THY1/CD90	AMAb90844, AMAb90846, HPA003733
	Extracellular/Surface/CD	Anti-PROM1/CD133	AMAb91494, HPA004922, HPA031053
	Extracellular/Surface/CD	Anti-EPCAM/CD326	AMAb91411, AMAb91413, HPA026761, HPA067463
	Extracellular/Surface	Anti-LGR5	HPA012530
	Extracellular/Surface	Anti-LINGO2	HPA016633
	Intracellular	Anti-ALDH1A1	HPA002123
	Intracellular	Anti-LETM1	HPA011029, HPA011100
	Intracellular	Anti-NANOG	AMAb91391, AMAb91393
	Intracellular	Anti-POU5F1	AMAb91477
	Intracellular	Anti-SOX2	AMAb91307, HPA045725
Liver	Extracellular/Surface/CD	Anti-CD24	HPA045879
	Extracellular/Surface/CD	Anti-CD44	HPA005785
	Extracellular/Surface/CD	Anti-THY1/CD90	AMAb90844, AMAb90846, HPA003733
	Extracellular/Surface/CD	Anti-PROM1/CD133	AMAb91494, HPA004922, HPA031053
	Extracellular/Surface/CD	Anti-EPCAM/CD326	AMAb91411, AMAb91413, HPA026761, HPA067463
	Intracellular	Anti-AFP	AMAb91610, AMAb91611, HPA010607, HPA023600
	Intracellular	Anti-NANOG	AMAb91391, AMAb91393
	Intracellular	Anti-NOTCH1	HPA067168
	Intracellular	Anti-NOTCH2	HPA048743
	Intracellular	Anti-NOTCH3	HPA044392
	Intracellular	Anti-POU5F1	AMAb91477
	Intracellular	Anti-SOX2	AMAb91307, HPA045725
	Intracellular	Anti-CTNNBL1	HPA027907

Table 1. (cont.)

Target Cancer	Marker Location/CD	Product Name	Product Numbers
Breast	Extracellular/Surface/CD	Anti-CD44	HPA005785
	Extracellular/Surface/CD	Anti-EPCAM/CD326	AMAb91411, AMAb91413, HPA026761, HPA067463
	Extracellular/Surface/CD	Anti-ITGB1/CD29	HPA059297, HPA069003
	Extracellular/Surface/CD	Anti-IL2RA/CD25	HPA054622
	Extracellular/Surface/CD	Anti-ITGA6/CD49	AMAb91450, HPA012696, HPA027582
	Extracellular/Surface/CD	Anti-ITGB3/CD61	AMAb91470, HPA027852
	Extracellular/Surface/CD	Anti-PROM1/CD133	AMAb91494, HPA004922, HPA031053
	Extracellular/Surface/CD	Anti-THY1/CD90	AMAb90844, AMAb90846, HPA003733
	Extracellular/Surface	Anti-LGR5	HPA012530
	Extracellular/Surface	Anti-PROCR	HPA039461
	Extracellular/Surface	Anti-TSPAN8	HPA044337
	Intracellular	Anti-ALDH1A1	HPA002123
	Intracellular	Anti-BMI1	HPA030471, HPA030472
	Intracellular	Anti-CTNNBL1	HPA027907
	Intracellular	Anti-FOXO3	HPA063104
	Intracellular	Anti-NANOG	AMAb91391, AMAb91393
	Intracellular	Anti-NOTCH1	HPA067168
	Intracellular	Anti-NOTCH2	HPA048743
	Intracellular	Anti-NOTCH3	HPA044392
	Intracellular	Anti-POU5F1	AMAb91477
	Intracellular	Anti-SOX2	AMAb91307, HPA045725
Glioblastoma	Extracellular/Surface/CD	Anti-CD44	HPA005785
	Extracellular/Surface/CD	Anti-IL2RA/CD25	HPA054622
	Extracellular/Surface/CD	Anti-FUT4/CD15	AMAb91414, AMAb91416
	Extracellular/Surface/CD	Anti-THY1/CD90	AMAb90844, AMAb90846, HPA003733
	Extracellular/Surface/CD	Anti-PROM1/CD133	AMAb91494, HPA004922, HPA031053
	Extracellular/Surface	Anti-CHL1	HPA003345, HPA005830
	Intracellular	Anti-ALDH1A1	HPA002123
	Intracellular	Anti-KLF4	AMAb91389, AMAb91388, HPA002926
	Intracellular	Anti-NANOG	AMAb91391, AMAb91393
	Intracellular	Anti-NES	AMAb90556, HPA006286, HPA007007, HPA026111
	Intracellular	Anti-POU5F1	HPA015291, HPA015791
	Intracellular	Anti-SALL4	AMAb91307, HPA045725
	Intracellular	Anti-SOX2	HPA027907
Prostate	Extracellular/Surface/CD	Anti-ALCAM/CD166	HPA010926
	Extracellular/Surface/CD	Anti-CD44	HPA005785
	Extracellular/Surface/CD	Anti-EPCAM/CD326	AMAb91411, AMAb91413, HPA026761, HPA067463
	Extracellular/Surface/CD	Anti-KIT/CD117	AMAb90900, AMAb90901, AMAb90904, HPA004471, HPA073252
	Extracellular/Surface/CD	Anti-PROM1/CD133	AMAb91494, HPA004922, HPA031053
	Extracellular/Surface	Anti-TACSTD2	HPA043104, HPA055067

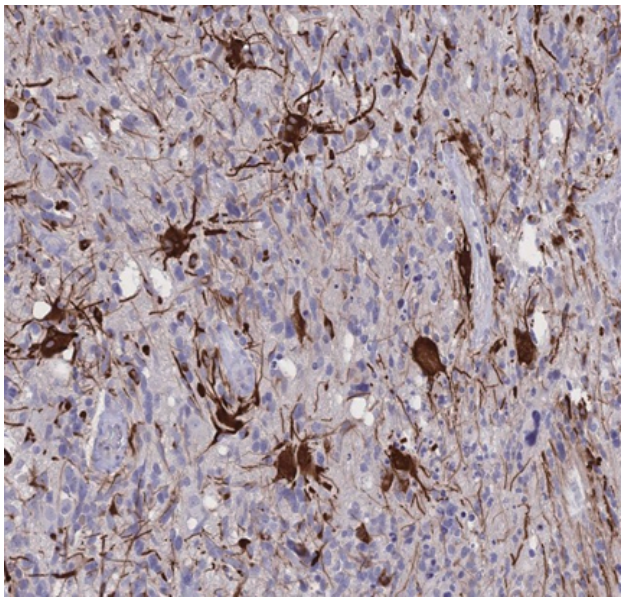


Figure 1.Immunohistochemical staining of high grade glioma tissue using the anti-IL2RA polyclonal antibody (HPA054622) shows strong cytoplasmic/membranous intensity, in brown.

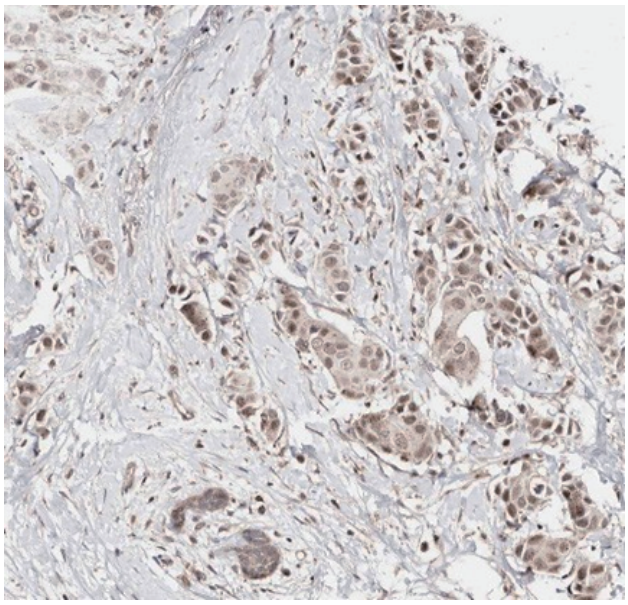


Figure 2. Immunohistochemistry on breast duct carcinoma using the anti-CTNNBL1 polyclonal antibody (HPA027907) shows a moderate cytoplasmic/membranous and nuclear staining, in brown.

Table 2. CSC antibody markers for hematological tumors

Target Cancer	Marker Location/CD	Product Name	Product Numbers
CML leukemia	Extracellular/Surface/CD	Anti-IL2RA/CD25	HPA054622
	Extracellular/Surface/CD	Anti-CD33	HPA035832
	Extracellular/Surface/CD	Anti-CD34	HPA036722, HPA036723
	Extracellular/Surface/CD	Anti-CD36	HPA071026, HPA002018
	Extracellular/Surface/CD	Anti-KIT/CD117	AMAb90900, AMAb90901, AMAb90904, HPA004471, HPA073252
	Extracellular/Surface/CD	Anti-IL3RA/CD123	HPA003539
	Extracellular/Surface	Anti-IL1RAP	HPA035293
	Intracellular	Anti-FOXO1	HPA001252
	Intracellular	Anti-FOXO3	HPA063104
	Intracellular	Anti-FOXO4	HPA039560, HPA040232
	Intracellular	Anti-GLI2	HPA074275
	Intracellular	Anti-CTNNBL1	HPA027907
	Intracellular	Anti-TET2	AMAb91439
AML leukemia	Extracellular/Surface/CD	Anti-CD33	HPA035832
	Extracellular/Surface/CD	Anti-CD34	HPA036722, HPA036723
	Extracellular/Surface/CD	Anti-IL3RA/CD123	HPA003539
	Intracellular	Anti-ALDH1A1	HPA002123
	Intracellular	Anti-DNMT3A	HPA026588
	Intracellular	Anti-KRAS	HPA049830
	Intracellular	Anti-LDHB	HPA019007
	Intracellular	Anti-LDHC	HPA045442
	Intracellular	Anti-LDHD	HPA041766
	Intracellular	Anti-NANOG	AMAb91391, AMAb91393
	Intracellular	Anti-NPM1	HPA011384
	Intracellular	Anti-POU5F1	AMAb91477
	Intracellular	Anti-SOX2	AMAb91307, HPA045725

Tumors of the hematopoietic and lymphoid tissues

血癌發生在造血組織中，例如骨髓、淋巴結和淋巴系統。血癌包含白血病、淋巴瘤和多發性骨髓瘤。

由於這些造血組織都透過循環系統和免疫系統緊密相連，因此影響一個系統的疾病通常也會影響另一個系統，從而使骨髓增生（白血病）和淋巴增生（淋巴瘤）密切相關並且經常重疊。

急性(AML)和慢性(CML)骨髓性白血病是骨髓血球細胞的癌症，其特徵是在骨髓和血液中積聚的異常細胞快速生長並干擾正常的血球細胞生成。如果不及時治療，AML會在數週或數月內迅速發展為CML，進而致死。

CSC markers in leukemia

與固態瘤不同，血癌的常見原因是染色體易位。有趣的是，研究表明在白血病發生過程中獲得突變是有順序的：a) 調節胞嘧啶甲基化的表觀遺傳修飾因子發生體細胞突變，如DNMT3A、IDH1/2[26]和TET2[27]，是發生在白血病前造血幹細胞(pre-leukemic hematopoietic stem cells)的早期；b)調控增生的訊息傳遞路徑因子發生突變，例如NPM1、FLT3-ITD和KRAS/NRAS，是轉變成AML的後期事件[28,29]。

在為白血病選擇標記物時，通常使用組合方法。白血病中常見的CSCs標記物包括CD34、CD38、CD123、TIM3、CD25、CD32和CD96。

Figure 3

Left: Western blot analysis in human cell lines A-549 and A-431 using the anti-ALDH1A1 antibody(HPA002123).- Loading control: Anti-PPIB.

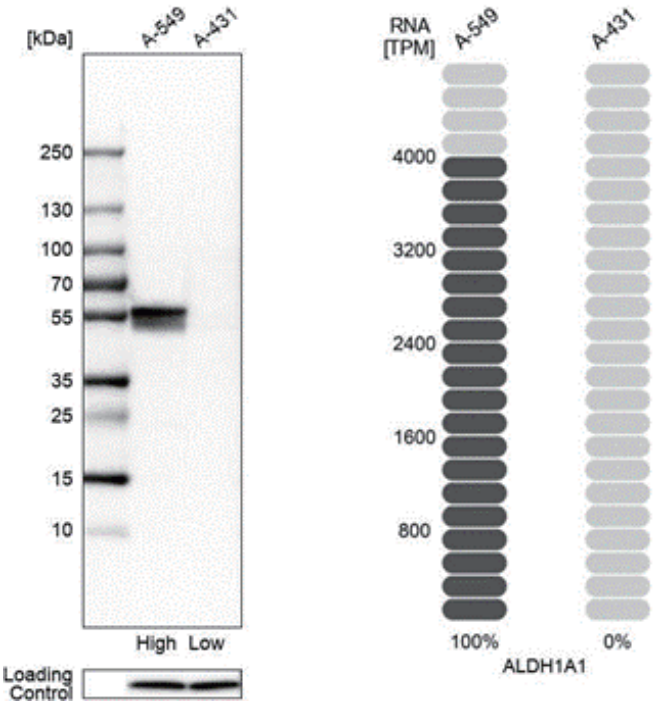
Right: orthogonal validation of protein expression by comparison to RNA-seq data of corresponding ALDH1A1 RNA-seq data for the same cell lines.

CSC markers in lymphomas

淋巴瘤是一種異質的淋巴惡性腫瘤，具有不同的臨床行為和對治療的反應。淋巴瘤的兩大類分別為非何杰金氏淋巴瘤(non-Hodgkin lymphoma)和何杰金氏淋巴瘤(Hodgkin lymphoma)。非何杰金氏淋巴瘤（約90%的病例）進一步細分為不同的類型，例如：被套細胞淋巴瘤(Mantle cell lymphoma,MCL)和瀰漫性大型B細胞淋巴瘤(diffuse large B cell lymphoma, DLBCL)。

被套細胞淋巴瘤是一種罕見但獨特的B細胞非何杰金氏淋巴瘤。2014年，MCL患者的骨髓抽取物中首次證實存在$CD45^+/CD19^-$細胞群。這些$CD45^+/CD19^-$細胞對治療產生抗性，可能與治療失敗有關[30,31]。

瀰漫性大型B細胞淋巴瘤(DLBCL)約佔非何杰金氏淋巴瘤(NHL)病例的40%。由於$CD45^+CD19^-$是MCL中CSCs的標記物，最近的一項研究探討了$CD45^+CD19^-$作為DLBCL CSCs在體內和體外的潛在標記物的可能性。然而，結果表明，在DLBCL中，CSC主要出現在高度表現ALDH的細胞而非$CD45^+CD19^-$細胞群[32]。



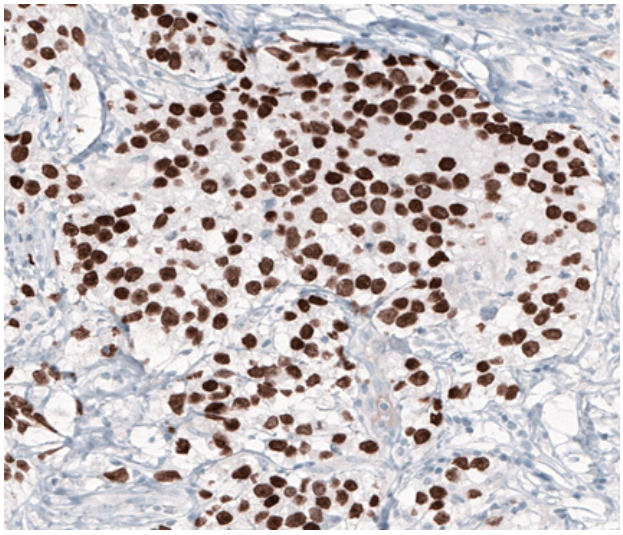


Figure 4. Immunohistochemical staining of human testis cancer with the intracellular marker anti-NANOG monoclonal antibody (AMAb91393) shows strong nuclear immunoreactivity in tumor cells, in brown.

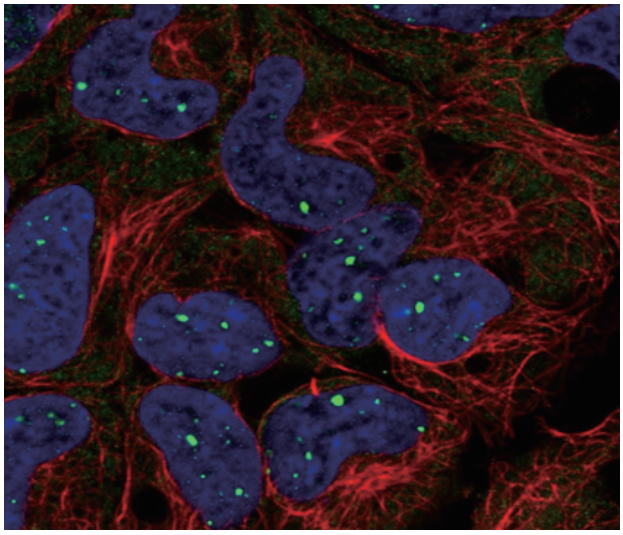


Figure 5. Immunofluorescent staining of human cell line HEK 293 with the intracellular marker anti-BMI1 polyclonal antibody (HPA030471) shows strong localization to nuclear bodies, in green. Microtubule- and nuclear probes are visualized in red and blue, respectively.

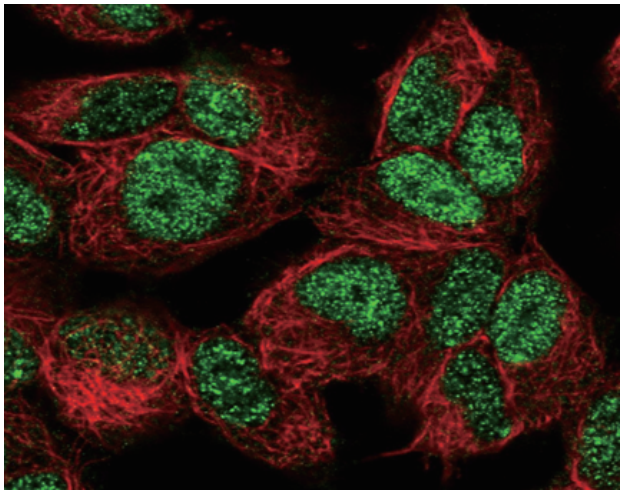


Figure 6. Immunofluorescent staining of human cell line SH-SY5Y (derived from neuroblastoma) with the intracellular marker anti-FOXO3 polyclonal antibody (HPA063104) shows localization to nucleoplasm, in green. Microtubules are shown in red.

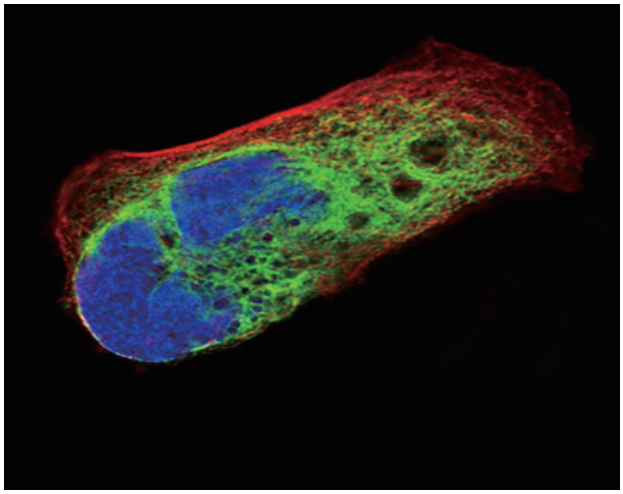


Figure 7. Immunofluorescence staining of RH-30 cells (derived from rhabdomyosarcoma) with the intracellular marker anti-NES monoclonal antibody (AMAb90556), showing specific staining in intermediate filaments in green. Microtubule- and nuclear probes are visualized in red and blue, respectively.

Table 3. Extracellular CSC markers (CD)

Product Name	Alternative Gene Names	Product Number	Clonality	Validated Applications	Antigen sequence identity to mouse / rat
Anti-ALCAM	CD166, MEMD	HPA010926	Polyclonal	IHC*	94% / 93%
Anti-CD24	CD24A	HPA045879	Polyclonal	ICC-IF	49% / 45%
Anti-CD33	FLJ00391, p67, SIGLEC-3, SIGLEC3	HPA035832	Polyclonal	IHC	36% / 35%
Anti-CD36	FAT, GP3B, GP4, GPIV, SCARB3	HPA071026	Polyclonal	ICC-IF	86% / 91%
Anti-CD36	FAT, GP3B, GP4, GPIV, SCARB3	HPA002018	Polyclonal	IHC*, ICC-IF	84% / 84%
Anti-CD44	CD44R, CSPG8, MDU2, MDU3, MIC4	HPA005785	Polyclonal	IHC*, WB*, ICC-IF	51% / 47%
Anti-EPCAM	CD326, CO-17A, EGP-2, EGP34, EGP40	AMAb91411	Monoclonal	IHC*, WB*	n.d.
Anti-EPCAM	CD326, CO-17A, EGP-2, EGP34, EGP40	AMAb91413	Monoclonal	IHC*, WB	n.d.
Anti-EPCAM	CD326, CO-17A, EGP-2, EGP34, EGP40	HPA026761	Polyclonal	IHC*, WB*	83% / 82%
Anti-EPCAM	CD326, CO-17A, EGP-2, EGP34, EGP40	HPA067463	Polyclonal	ICC-IF	71% / 72%
Anti-FUT4	CD15, ELFT, FCT3A, FUC-TIV	AMAb91414	Monoclonal	WB	n.d.
Anti-FUT4	CD15, ELFT, FCT3A, FUC-TIV	AMAb91416	Monoclonal	WB	n.d.
Anti-IL2RA	CD25, IDDM10, IL2R	HPA054622	Polyclonal	IHC*	57% / 57%
Anti-IL3RA	CD123	HPA003539	Polyclonal	IHC	32% / 35%
Anti-ITGA6	CD49f	AMAb91450	Monoclonal	IHC*	88% / 86%
Anti-ITGA6	CD49f	HPA012696	Polyclonal	IHC*, WB*	88% / 86%
Anti-ITGA6	CD49f	HPA027582	Polyclonal	IHC*	85% / 86%
Anti-ITGB1	CD29, FNRB, GPIIA, MDF2, MSK12	HPA059297	Polyclonal	IHC*, WB	91% / 91%
Anti-ITGB1	CD29, FNRB, GPIIA, MDF2, MSK12	HPA069003	Polyclonal	IHC*	90% / 88%
Anti-ITGB3	CD61, GP3A, GPIIIa	AMAb91470	Monoclonal	IHC*, WB	92% / 90%
Anti-ITGB3	CD61, GP3A, GPIIIa	HPA027852	Polyclonal	IHC	92% / 90%
Anti-L1CAM	CD171, HSAS1, MASA, MIC5, S10, SPG1	HPA005830	Polyclonal	IHC*	75% / 75%
Anti-KIT	C-Kit, CD117, PBT, SCFR	AMAb90900	Monoclonal	WB	66% / 72%
Anti-KIT	C-Kit, CD117, PBT, SCFR	AMAb90901	Monoclonal	IHC, WB	66% / 72%
Anti-KIT	C-Kit, CD117, PBT, SCFR	AMAb90904	Monoclonal	IHC, WB	66% / 72%
Anti-KIT	C-Kit, CD117, PBT, SCFR	HPA004471	Polyclonal	IHC	66% / 72%
Anti-KIT	C-Kit, CD117, PBT, SCFR	HPA073252	Polyclonal	ICC-IF	88% / 89%
Anti-PLAUR	CD87, UPAR, URKR	HPA050843	Polyclonal	IHC	54% / 56%
Anti-PROCR	CCD41, CD201, EPCR	HPA039461	Polyclonal	IHC	65% / 63%
Anti-PROM1	AC133, CD133, CORD12, PROML1	AMAb91494	Monoclonal	IHC, WB	57% / 60%
Anti-PROM1	AC133, CD133, CORD12, PROML1	HPA004922	Polyclonal	IHC*, WB*	57% / 60%
Anti-PROM1	AC133, CD133, CORD12, PROML1	HPA031053	Polyclonal	IHC*, WB	55% / 55%
Anti-THY1	CD90	AMAb90844	Monoclonal	IHC, WB	64% / 68%
Anti-THY1	CD90	AMAb90846	Monoclonal	IHC, WB	64% / 68%
Anti-THY1	CD90	HPA003733	Polyclonal	IHC*, ICC-IF	64% / 68%
Anti-TSPAN8	CO-029, TM4SF3	HPA044337	Polyclonal	IHC, ICC-IF	60% / 59%

Table 4. Extracellular CSC markers (not CD)

Product Name	Alternative Gene Names	Product Number	Clonality	Validated Applications	Antigen sequence identity to mouse / rat
Anti-CHL1	CALL, FLJ44930, L1CAM2, MGC132578	HPA003345	Polyclonal	IHC	79% / 74%
Anti-EGFR	ERBB, ERBB1	AMAb90816	Monoclonal	IHC, WB	90% / 91%
Anti-EGFR	ERBB, ERBB1	AMAb90819	Monoclonal	WB	90% / 91%
Anti-EGFR	ERBB, ERBB1	HPA001200	Polyclonal	IHC*	90% / 91%
Anti-EGFR	ERBB, ERBB1	HPA018530	Polyclonal	IHC*, WB, ICC-IF	84% / 82%
Anti-IL1RAP	C3orf13, IL-1RAcP, IL1R3	HPA035293	Polyclonal	IHC	85% / 85%
Anti-LGR5	FEX, GPR49, GPR67, HG38	HPA012530	Polyclonal	IHC	88% / 87%
Anti-LINGO2	LERN3, LRRN6C	HPA016633	Polyclonal	IHC	98% / 98%

* Products with enhanced validation for indicated application

Table 5. Intracellular CSC markers

Product Name	Alternative Gene Names	Product Number	Clonality	Validated Applications	Antigen sequence identity to mouse / rat
Anti-AFP	FETA, HPAFP	AMAb91610	Monoclonal	IHC, WB	59% / 57%
Anti-AFP	FETA, HPAFP	AMAb91611	Monoclonal	IHC, WB	59% / 57%
Anti-AFP	FETA, HPAFP	HPA010607	Polyclonal	IHC, WB*	59% / 57%
Anti-AFP	FETA, HPAFP	HPA023600	Polyclonal	IHC, WB	66% / 69%
Anti-ALDH1A1	ALDH1, PUMB1, RALDH1	HPA002123	Polyclonal	IHC, WB*, ICC-IF	91% / 90%
Anti-BMI1	PCGF4, RNF51	HPA030472	Polyclonal	IHC, WB*	95% / 95%
Anti-BMI1	PCGF4, RNF51	HPA030471	Polyclonal	ICC-IF	94% / 86%
Anti-CTNNBL1	C20orf33, FLJ21108, NAP	HPA027907	Polyclonal	IHC, WB	99% / 99%
Anti-DNMT3A	-	HPA026588	Polyclonal	IHC, ICC-IF	91% / 91%
Anti-FOXO1	FKH1, FKHR, FOXO1A	HPA001252	Polyclonal	IHC, WB*	91% / 90%
Anti-FOXO3	AF6q21, FKHRL1, FOXO2	HPA063104	Polyclonal	ICC-IF	95% / 95%
Anti-FOXO4	AFX1, MLLT7	HPA039560	Polyclonal	WB, ICC-IF	87% / 85%
Anti-FOXO4	AFX1, MLLT7	HPA040232	Polyclonal	IHC	84% / 85%
Anti-GLI2	HPE9, THP1, THP2	HPA074275	Polyclonal	ICC-IF	90% / 95%
Anti-KLF4	EZF, GKLF	AMAb91389	Monoclonal	IHC, WB, ICC-IF	n.d.
Anti-KLF4	EZF, GKLF	AMAb91388	Monoclonal	IHC, WB, ICC-IF	n.d.
Anti-KLF4	EZF, GKLF	HPA002926	Polyclonal	IHC*, WB*, ICC-IF	89% / 89%
Anti-LETM1	SLC55A1	HPA011029	Polyclonal	IHC*, WB, ICC-IF	78% / 79%
Anti-LETM1	SLC55A1	HPA011100	Polyclonal	IHC*	56% / 53%
Anti-LDHB	-	HPA019007	Polyclonal	IHC, WB, ICC-IF	98% / 98%
Anti-LDHC	CT32	HPA045442	Polyclonal	IHC*	66% / 66%
Anti-LDHD	-	HPA041766	Polyclonal	IHC*, WB	78% / 79%
Anti-NANOG	FLJ12581, FLJ40451	AMAb91393	Monoclonal	IHC, WB, ICC-IF	n.d.
Anti-NANOG	FLJ12581, FLJ40451	AMAb91391	Monoclonal	IHC, ICC-IF	n.d.
Anti-NES	FLJ21841	AMAb90556	Monoclonal	IHC, WB*, ICC-IF	47% / 42%
Anti-NES	FLJ21841	HPA006286	Polyclonal	ICC-IF	47% / 42%
Anti-NES	FLJ21841	HPA007007	Polyclonal	IHC*, WB*	47% / 42%
Anti-NES	FLJ21841	HPA026111	Polyclonal	IHC*, WB, ICC-IF	49% / 55%
Anti-NOTCH1	TAN1	HPA067168	Polyclonal	ICC-IF	75% / 75%
Anti-NOTCH2	-	HPA048743	Polyclonal	IHC, ICC-IF	87% / 86%
Anti-NOTCH3	CADASIL, CASIL	HPA044392	Polyclonal	ICC-IF	83% / 83%
Anti-POU5F1	MGC22487, OCT3, OCT4, OTF3	AMAb91477	Monoclonal	WB, ICC-IF	n.d.
Anti-SALL4	dJ1112F19.1, ZNF797	HPA015291	Polyclonal	IHC*, WB*, ICC-IF	72% / 71%
Anti-SOX2	SRY	AMAb91307	Monoclonal	IHC, WB*, ICC-IF	99% / 99%
Anti-SOX2	SRY	HPA045725	Polyclonal	WB*, ICC-IF	99% / 99%
Anti-TET2	FLJ20032, KIAA1546	AMAb91439	Monoclonal	IHC*, WB, ICC-IF	n.d.

* Products with enhanced validation for indicated application

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