

参考；抗体薬物複合体の分析；TSKgel カラムを用いた非変性状態での分析と引用文献

薬物（ペイロード）の作用	主な薬物名	HPLC分離モードおよびTSKgelカラム使用例		主な文献
		SEC(凝集体分析)	HIC(DAR分析)	
チュブリン阻害	モノメチルアリスタチンE (MMAE) モノメチルアリスタチンF (MMAF) ドラスタチン	TSKgel UP-SW3000* TSKgel G3000SWXL	TSKgel HIC-ADC Butyl** TSKgel Butyl-NPR	1-8
	メイタンシノイド；DM1、DM4	TSKgel G3000SWXL	TSKgel Butyl-NPR	
DNA切断、損傷、副溝結合など	カリケアマイシン、オゾガマイシン	(推定: TSKgel G3000SWXL)	TSKgel Phenyl-5PW***	5, 9-12
	デュオカルマイシン	TSKgel G3000SWXL	TSKgel Butyl-NPR	
	ピロロベンゾジアゼピン (PBD) ビリジノベンゾジアゼピン (PDD)	TSKgel G3000SWXL	TSKgel Butyl-NPR	
トポイソメラーゼI阻害	カンプトテシン；MF-6、095 デルクステカノ(Dxd)、イリノテカン ゴビテカノ、エキサテカノ；SN-38	TSKgel G3000SWXL	TSKgel Butyl-NPR	13-15
	STING作動薬；dSA3	TSKgel G3000SWXL	TSKgel Butyl-NPR	
その他	BETたんぱく質阻害剤；EBET-2113	TSKgel G3000SWXL	TSKgel Butyl-NPR	16-20
	PROTAC	TSKgel SuperSW mAb HR	TSKgel Butyl-NPR	

* 現行品のTSKgel UP-SW3000-LSを推奨、 ** TSKgel HIC-ADC Phenylも応用可能、 ***TSKgel Phenyl-5PWはADC調整時の未反応抗体の定量

STING; Stimulator of interferon genes, BET; Bromodomain and extra-terminal protein degrader, PROTAC; Proteolysis targeting chimeras

文献

1. A. Goyon et al., Streamlined characterization of an antibody-drug conjugate by two-dimensional and four-dimensional liquid chromatography/Mass Spectrometry, *Anal. Chem.*, 2019, 91, 14896–14903, <http://dx.doi.org/10.1021/acs.analchem.9b02454>
2. G. D. Healey et al., A RAGE-targeted antibody-drug conjugates: Surface plasmon resonance as a platform for accelerating effective ADC design and development *Antibodies*, 2019, 8, 7, <https://doi.org/10.3390/antib8010007>
3. Y. Wang et al., Antibody-drug conjugate using ionized Cys-linker MMAE as the potent payload shows optimal therapeutic safety, *Cancers*, 2020, 12, 744, <https://doi.org/10.3390/cancers12030744>
4. P. Probst et al., Broadening the therapeutic window of ADCs using site-specific bioconjugation showcased by an MMAE-containing peptide linker in a CD79b-targeting ADC, *Mol. Cancer Ther.*, 2025, 24(6), <https://doi.org/10.1158/1535-7163.MCT-24-0983>
5. Phenyl-5PW, R. Hendricks et al., Simplified strategy for developing purification processes for antibody-drug conjugates using cation-exchange chromatography in flow-through mode, *J. Chromatogr. A*, 2022, 1666, 462865, <https://doi.org/10.1016/j.chroma.2022.462865>
6. H. E. Mohamed et al., Stability assessment of Polatuzumab vedotin and Brentuximab vedotin using different analytical techniques, *J. Pharm. and Biomed. Anal.*, 2023, 228, 115249, <https://doi.org/10.1016/j.jpba.2023.115249>
7. X. Hu et al., Efficient and selective bioconjugation using surfactants, *Bioconjugate Chem.*, 2018, 29, 3667–3676, <http://dx.doi.org/10.1021/acs.bioconjchem.8b00594>
8. T. Kempen et al., Online native hydrophobic interaction chromatography-mass spectrometry of antibody-drug conjugates, *MABS*, 2025, 17, No.1, 2446304, <https://doi.org/10.1080/19420862.2024.2446304>
9. R. G. E. Coumans, et al., A platform for the generation of site-specific antibody-drug conjugates that allows for selective reduction of engineered cysteines, *Bioconjugate Chem.*, 2020, 31, 2136–2146, <https://dx.doi.org/10.1021/acs.bioconjchem.0c00337>
10. R. M. Hoffmann et al., A novel antibody-drug conjugate (ADC) delivering a DNA mono-alkylating payload to chondroitin sulfate proteoglycan (CSPG4)-expressing melanoma, *Cancers*, 2020, 12, 1029, <https://doi.org/10.3390/cancers12041029>
11. J. C. Cordova et al., Development of a single-step antibody-drug conjugate, *J. Clin. Med.*, 2021, 10, 552. <https://doi.org/10.3390/jcm10030552>
12. R. Hendricks et al., Simplified strategy for developing purification processes for antibody-drug conjugates using cation-exchange chromatography in flow-through mode, *J. Chromatogr. A*, 2022, 1666, 462865, <https://doi.org/10.1016/j.chroma.2022.462865>
13. C. Kong et al., MTX-13, a novel PTK7-directed antibody-drug conjugate with widened therapeutic index shows sustained tumor regressions for a broader spectrum of PTK7-positive tumors, *Mol Cancer Ther.*, 2023, 22:1128–43, <https://doi.org/10.1158/1535-7163.mct-23-0164>
14. T. Xiong et al., Design, synthesis, and evaluation of camptothecin-based antibody-drug conjugates with high hydrophilicity and structural stability, *Molecules*, 2025, 30, 1398, <https://doi.org/10.3390/molecules30071398>
15. R. Wang et al., Overcoming multidrug resistance in gastrointestinal cancers with a CDH17-targeted ADC conjugated to a DNA topoisomerase inhibitor, *Cell Reports Medicine*, 2025, July 15, 6, 102213, <https://doi.org/10.1016/j.xcrm.2025.102213>
16. A. D. Hobson et al., Discovery of ABBV-154, an anti-TNF glucocorticoid receptor modulator immunology antibody-drug conjugate (iADC), *J. Med. Chem.*, 2023, 66, 12544–12558, <https://doi.org/10.1021/acs.jmedchem.3c01174>
17. N. M. Cetinbas et al., Tumor cell-directed STING agonist antibody drug conjugates induce type III interferons and anti-tumor innate immune responses, *Nature Communications*, 2024, 15, 5842, <https://doi.org/10.1038/s41467-024-49932-4>
18. A. Cheung et al., Anti-EGFR antibody-drug conjugate carrying an inhibitor targeting CDK restricts triple-negative breast cancer growth, *Clin Cancer Res.*, 2024, 30, 3298–315, <https://doi.org/10.1158/1078-0432.ccr-23-3110>
19. S. Song et al., In silico-driven THIOMAB approach for stable PROTAC conjugates by docking payloads in antibody cavities, *Bioconjugate Chem.* 2025, 36, 960–970, <https://doi.org/10.1021/acs.bioconjchem.4c00588>
20. R. A. Bukhalid et al., XMT-2056, a HER2-directed STING agonist antibody-drug conjugate, induces innate antitumor immune responses by acting on cancer cells and tumor-resident immune cells, *Clin Cancer Res.*, 2025, 31, 1766–82, <https://doi.org/10.1158/1078-0432.ccr-24-2449>