



P3.119 Establishment Efficiency of Lung Cancer Organoids from Malignant Pleural Effusion and Potential as a Resource for Translational Research

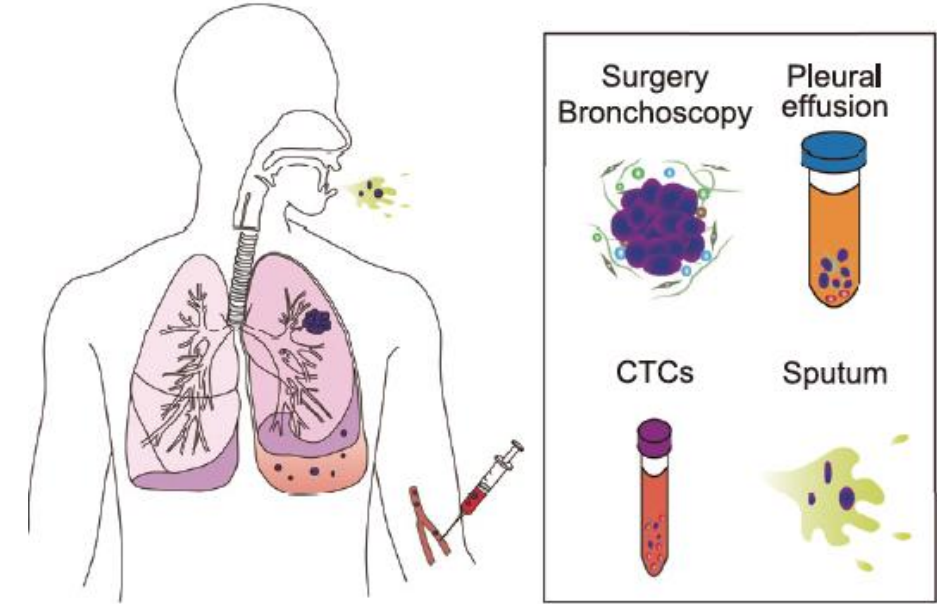
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Background

Patient-derived lung cancer organoids are promising tools for personalized medicine and disease modeling. However, their establishment efficiency remains relatively low, partly due to the overgrowth of normal airway epithelial cells.^{1,2} In contrast, relatively high establishment efficiency has been reported using malignant pleural effusion (MPE).³⁻⁵ From our previous study (Ref. 2).



	Surgery Bronchoscopy Pleural effusion	CTCs	Sputum
LUAD	19/137 (14%)	0/23 (0%)	2/11 (18%)
LUSC	6/48 (13%)	0/1 (0%)	1/7 (14%)
SCLC	7/9 (78%)	3/11 (27%)	2/7 (29%)
LCNEC	3/3 (100%)	0/1 (0%)	0/0

Purpose

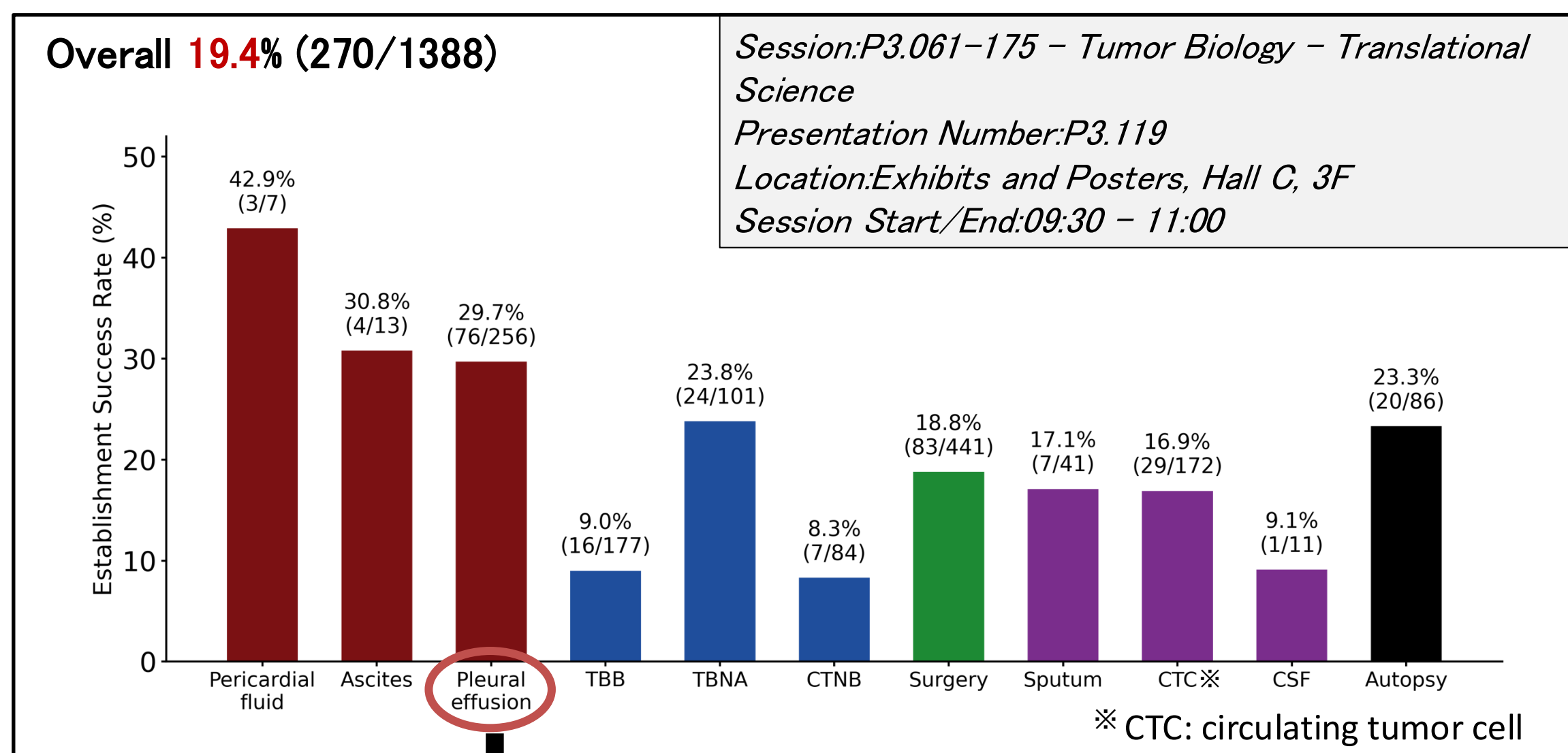
This study aimed to identify factors associated with successful lung cancer organoid establishment from MPE.

Methods

From September 2017 to September 2025, lung cancer organoid establishment was attempted using residual clinical specimens collected at our institution and collaborating institutions. Organoids were cultured as previously described.² Successful establishment was defined as long-term culture with confirmation of tumor origin by genomic and/or histopathological analyses.⁶

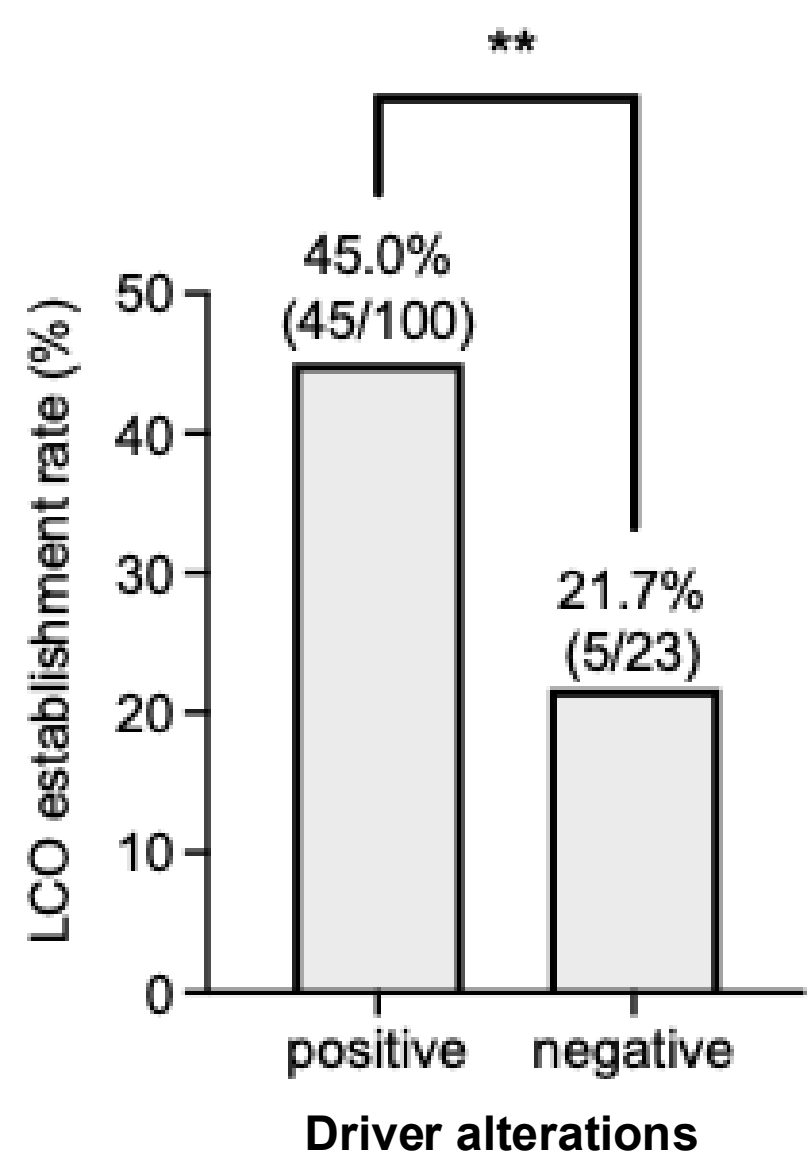
Basal medium	Niche/growth factors	Small-molecule inhibitors	Supplements
Advanced DMEM/F-12	Wnt3A R-Spondin EGF FGF2 IGF1 Noggin	A83-01 (TGF- β inhibitor), Y-27632 (ROCK inhibitor)	B27 N-acetyl-L-cysteine GlutaMAX

Results 1: LCO Establishment Efficiency by Specimen Type



Among 256 pleural effusion specimens, 146 were cytology-positive MPEs from patients with lung cancer. LCO establishment rates were 43.5% (57/131) for adenocarcinoma (LUAD), 42.9% (3/7) for squamous cell carcinoma (LUSC), and 100% (8/8) for small cell carcinoma (SCLC).

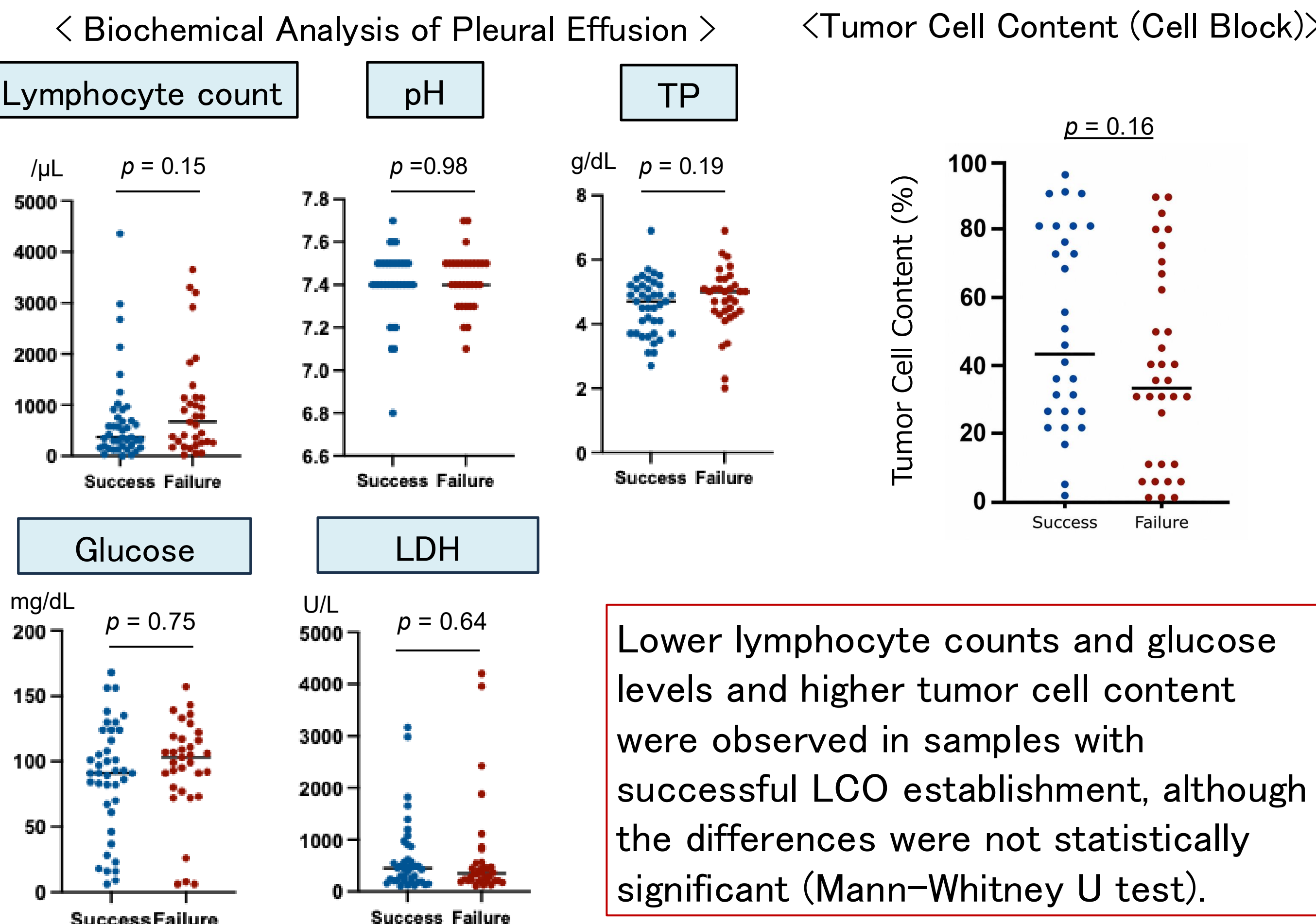
Results 2: LCO Establishment by Driver Alteration Status in LUAD



Driver-positive: Defined as the presence of alterations in EGFR, ALK, ROS1, RET, KRAS, ERBB2, MET exon 14 skipping, or BRAF. Eight cases with unknown driver status were excluded; the remaining 123 of 131 cytology-positive LUAD MPE cases were included.

The LCO establishment rate was significantly higher in driver-positive than in driver-negative LUAD. $**P < 0.01$, chi-square test.

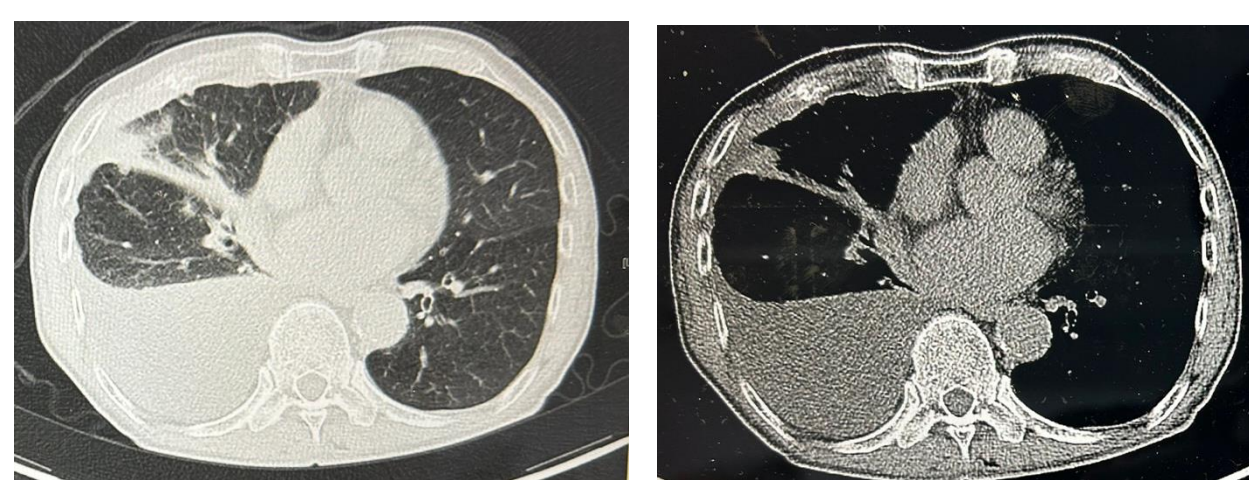
Results 3: Factors Associated with Successful LCO Establishment



Results 4: LCO Establishment from Cytologically Negative or Inconclusive Pleural Effusion

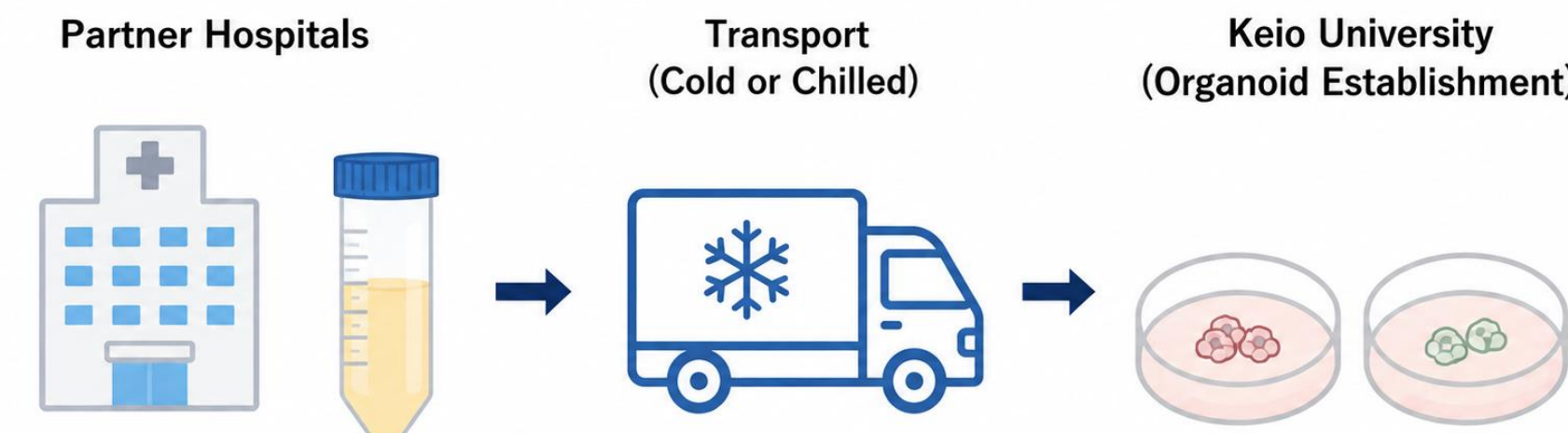
Case	Age	Sex	Diagnosis	TNM stage	Pleural fluid cytology	Genomic alteration	CT evidence of pleural dissemination
#1	80	F	LUAD	cT3N1M1c	Negative	MET	Present
#2	80	M	NSCLC	cT4N0M1b	Indeterminate	None detected	Present
#3	73	M	SCLC	cT4N3M1b	Indeterminate	None detected	Present

Case #2



Among 43 pleural effusion cases clinically suspected to be malignant but not confirmed by cytology, LCOs were successfully established in three cases (6.9%).

Results 5: LCO Establishment Efficiency by Transport Method



*Schematic illustration generated using OpenAI's image-generation tool and edited by the authors.

- Fresh samples transported on the day of collection: **51% (25/49)**
- Samples centrifuged and cryopreserved in CellBanker on the day of collection, then transported frozen: **40% (2/5)**

Pleural effusion samples can be collected from institutions without organoid culture facilities, enabling LCO establishment from clinically valuable cases, including rare histologic subtypes and acquired drug-resistant tumors.

Discussion

- LCOs were established from MPE with a relatively high success rate, possibly due to limited contamination by normal epithelial cells.
- LCO establishment rates were significantly higher in driver-positive than in driver-negative LUAD, warranting further investigation of factors associated with successful establishment.
- LCOs could be successfully established from transported MPE samples, supporting the feasibility of collecting clinically valuable samples from institutions without organoid culture facilities and facilitating multicenter studies.

Conclusion

LCOs could be established relatively efficiently from cytology-positive MPE. The feasibility of using transported MPE suggests that pleural effusion may serve as a useful resource for organoid research.

<References>

- Dijkstra, et al. Challenges in Establishing Pure Lung Cancer Organoids Limit Their Utility for Personalized Medicine. *Cell Reports* 2020.
- Ebisudani, et al. Genotype-phenotype mapping of a patient-derived lung cancer organoid biobank identifies NKX2-1-defined Wnt dependency in lung adenocarcinoma. *Cell Reports* 2020.
- Liu, et al. Modeling lung adenocarcinoma metastases using patient-derived organoids. *Cell Reports Medicine* 2024
- Wang HM, et al. Using patient-derived organoids to predict locally advanced or metastatic lung cancer tumor response: A real-world study *Cell Reports Medicine* 2023
- Kim SY, et al. Modeling Clinical Responses to Targeted Therapies by Patient-Derived Organoids of Advanced Lung Adenocarcinoma. *Clin Cancer Res* 2021
- Terai, et al. Organoid-based precision cancer modeling: New frontier in lung cancer research. *Cell Rep* 2025

This study was conducted in accordance with protocols approved by the Institutional Review Board of Keio University School of Medicine (approval numbers: 20110171 and 20231122).

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<Conflict of Interest> The authors declare no conflicts of interest.

AI Use Disclosure: ChatGPT (OpenAI) was used for English language editing and refinement and for the creation of schematic illustrations.

