Research Update from the MCM Team (March 2025)

As part of our ongoing research updates, we continue to explore the top-scoring genes linked to lung cancer identified by the Mapping Cancer Markers (MCM) project. Following our previous focus on GCM1, this update examines **DYNLT1 (Dynein Light Chain Tctex-Type 1)**, a gene with pivotal roles in intracellular transport and cancer pathophysiology.

Terminology

- **Dynein motor complex**: A group of proteins responsible for transporting cellular cargo along microtubules in the cell.
- **Primary cilia**: Sensory organelles on the cell surface that play a role in signal transduction and cell cycle regulation.
- **Oncogenic nucleoporins**: Mutated or abnormally expressed proteins from the nuclear pore complex that drive cancer progression.
- **Prognostic marker**: A biological feature associated with clinical outcomes, such as survival or disease progression.

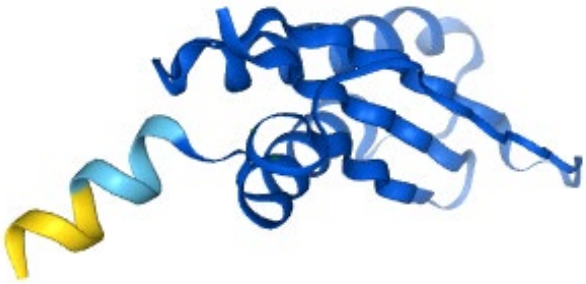


Figure 1. Protein structure of DYNLT1 (UniProt).

Background

The MCM project focuses on identifying molecular signatures that distinguish lung cancer from healthy controls. Among the top 26 high-scoring genes, DYNLT1 stands out due to its involvement in intracellular transport mechanisms and its implications in cancer biology. This protein, a non-catalytic component of the cytoplasmic dynein motor complex, is essential for cellular processes such as mitosis, neurogenesis, and viral entry into host cells.

DYNLT1 also regulates the length of primary cilia, influencing critical cellular signaling pathways. Furthermore, it interacts with oncogenic nucleoporins and viral proteins, contributing to disrupted gene regulation and leukemic transformation. These multifaceted roles underscore its significance in both normal physiology and disease states.

DYNLT1 interacts with oncogenic nucleoporins, contributing to disrupted gene regulation and leukemic transformation. It also binds viral proteins, such as the human papillomavirus (HPV) minor capsid protein L2, aiding in viral nucleic acid delivery to the host nucleus.

Since its discovery, DYNLT1 has been linked to various cancers and biological processes. Its expression across tissue types has been studied, revealing low tissue specificity but notable prognostic value in certain cancers.

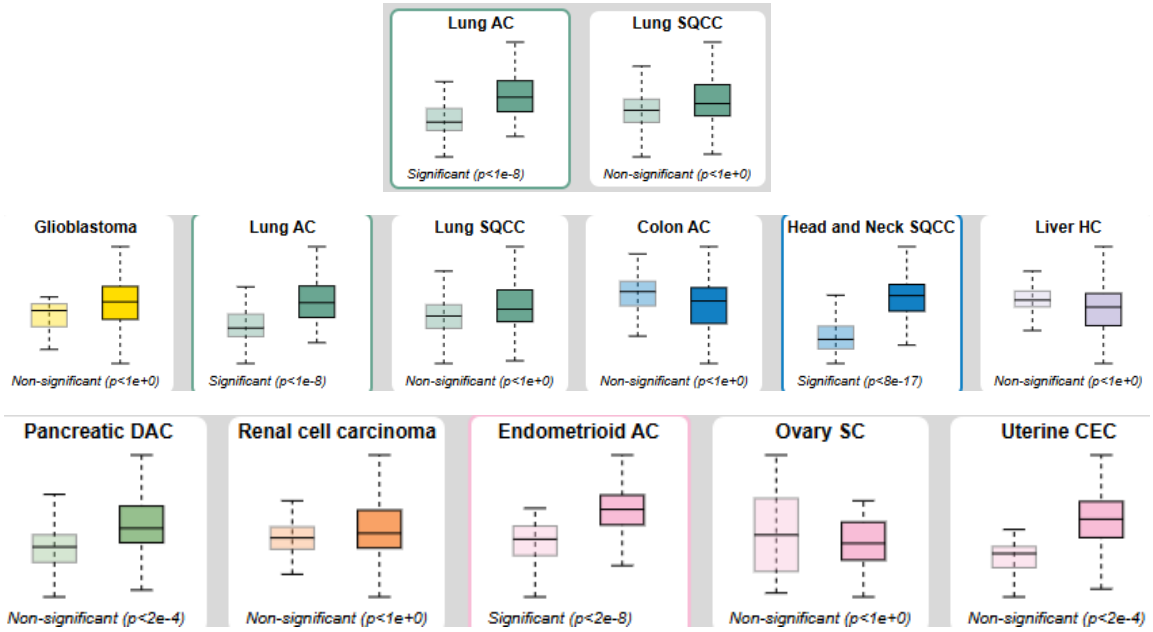


Figure 2. Protein expression of DYNLT1 across cancers (Human Protein Atlas).

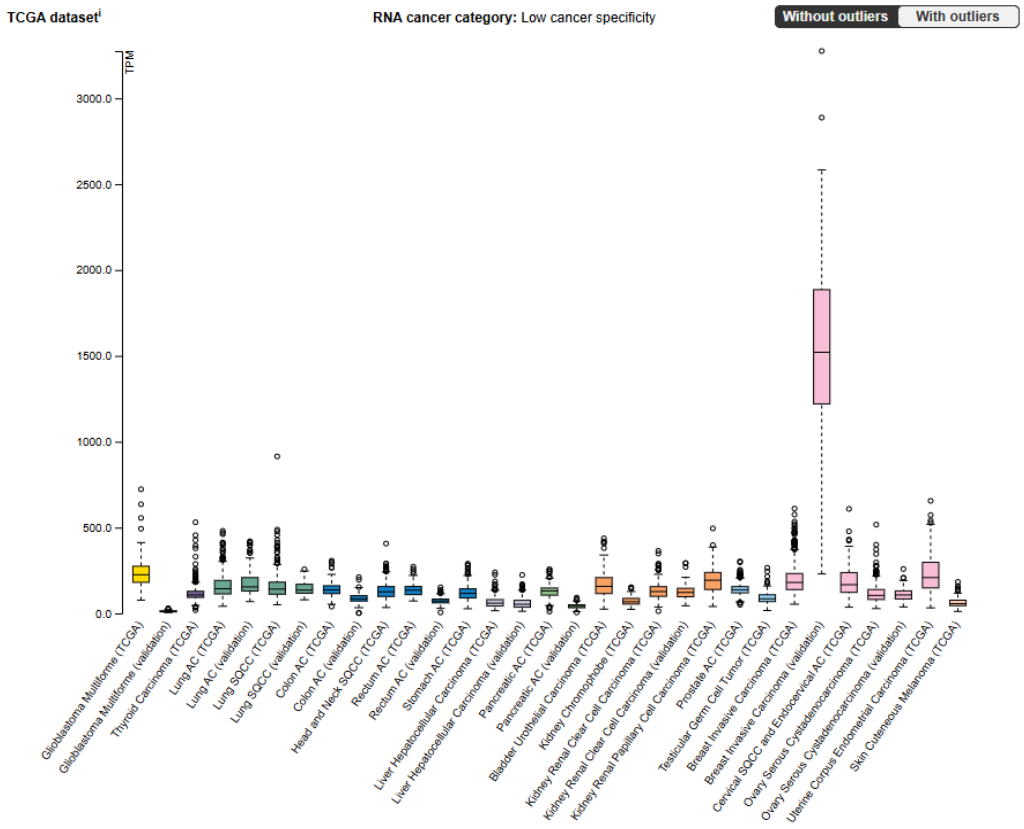


Figure 3. DYNLT1 shows low cancer specificity, except being a prognostic marker in breast invasive carcinoma and liver hepatocellular carcinoma (Human Protein Atlas).

DYNLT1 Research

Role in Lung Cancer

In the context of lung cancer, DYNLT1 shows a protective role in lung adenocarcinoma (ADC) and lung squamous cell carcinoma (SQC).

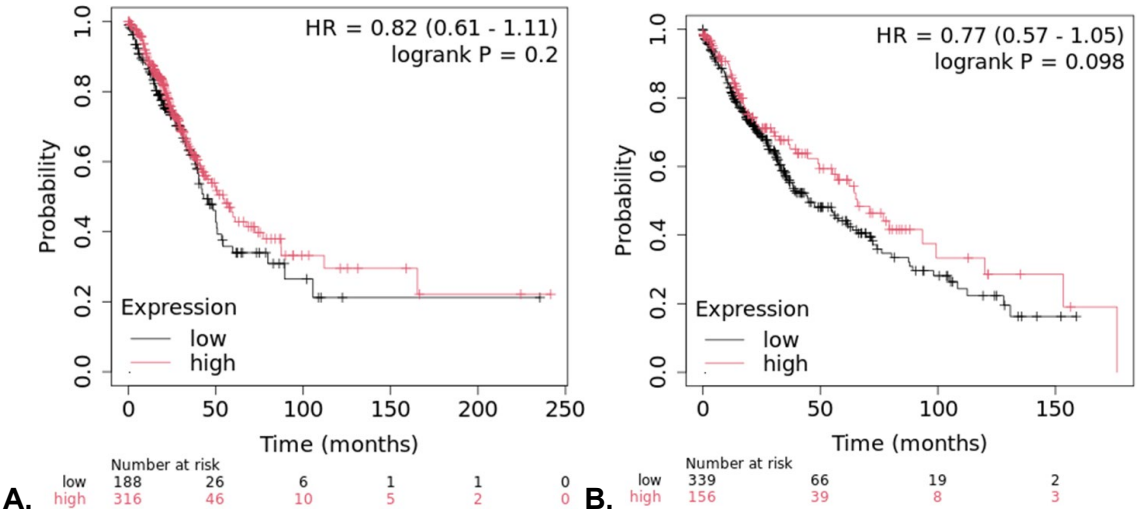


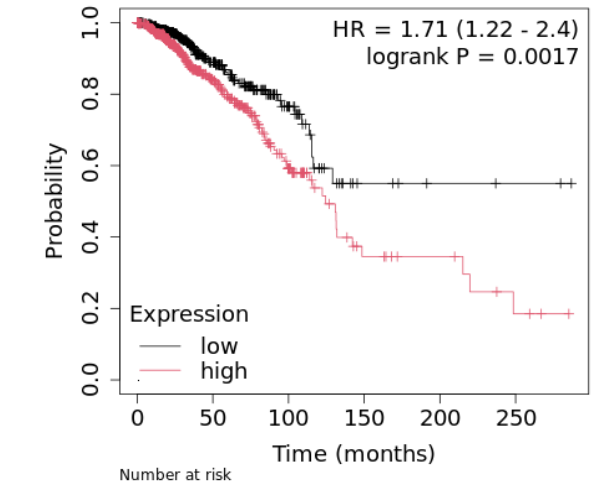
Figure 4. DYNLT1 shows a protective trend both in (A) lung ADC and (B) lung SQC. Figures generated KM Plotter.

Emerging studies suggest that elevated DYNLT1 expression promotes cellular proliferation and migration, critical drivers of cancer metastasis. These findings highlight DYNLT1 as a potential diagnostic and therapeutic target for lung cancer.

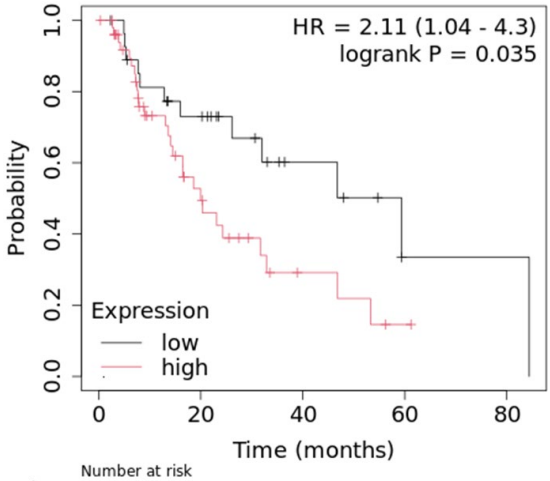
Other Cancer Types

DYNLT1 plays important role in several major cancer types, and it shows both protective and negative trends on prognosis.

- **Breast Cancer**: Enhancing mitochondrial metabolism by inhibiting VDAC1 ubiquitination, fueling tumor growth. It is also a diagnostic and prognostic marker linked to lipid metabolism pathways critical for cancer progression.
- **Glioblastoma**: Contributing to tumorigenesis through interactions with signaling pathways, as demonstrated by immunohistochemical analyses of patient tissues.
- **Gastric Cancer**: Exosomal miR-15b-3p enhances tumorigenesis via the DYNLT1/Caspase-3/Caspase-9 pathway, highlighting its role in malignant transformation.


HR = 1.71 (1.22 - 2.4)
logrank P = 0.0017
Probability
Expression
low
high
Time (months)
Number at risk
low 501 152 40 6 3 2
high 588 168 55 12 8 3

A.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Probability
Expression
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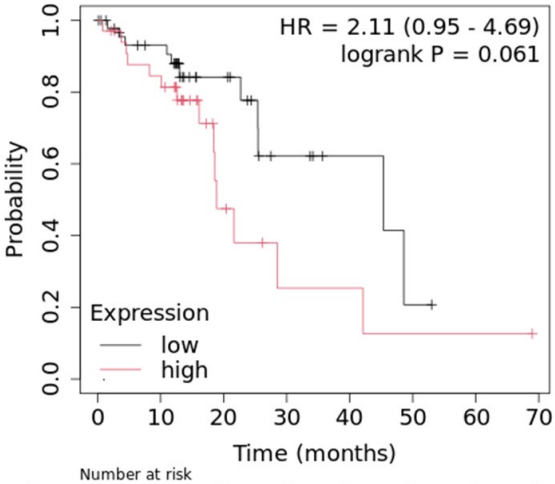
high
Time (months)
Number at risk
low 28 17 6 1 1
high 52 16 4 1 0

B.


HR = 2.11 (0.95 - 4.69)
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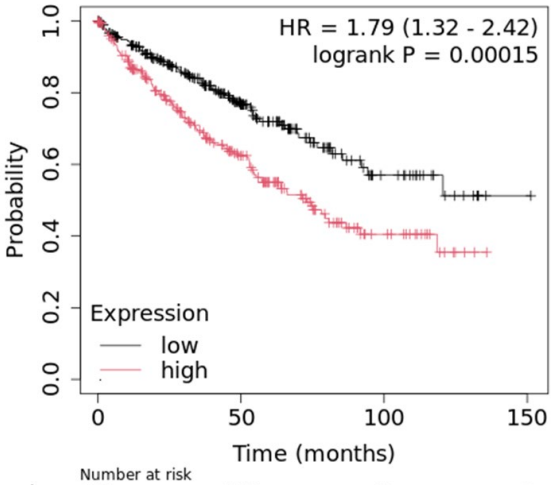
Probability
Expression
low
high
Time (months)
Number at risk
low 47 37 15 6 3 1 0 0
high 34 27 6 2 2 1 1 0

C.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Probability
Expression
low
high
Time (months)
Number at risk
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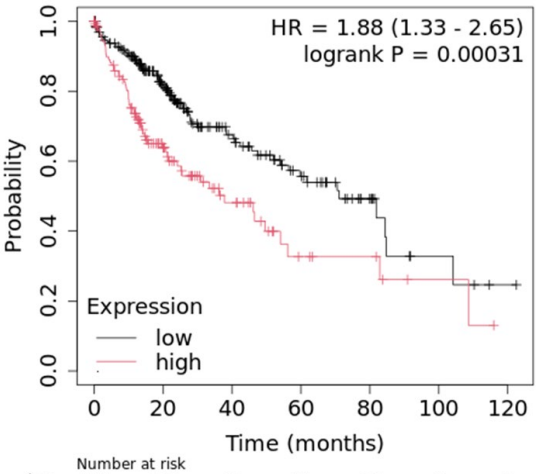
high 249 96 19 0

D.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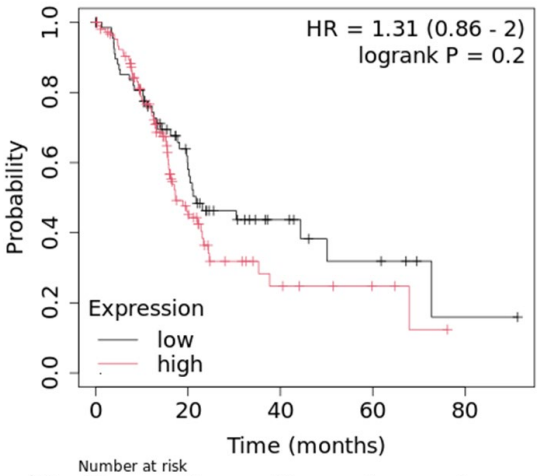
Probability
Expression
low
high
Time (months)
Number at risk
low 233 128 61 34 13 4 1
high 137 54 23 8 6 2 0

E.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Probability
Expression
low
high
Time (months)
Number at risk
low 70 30 10 5 1
high 107 28 7 3 0

F.

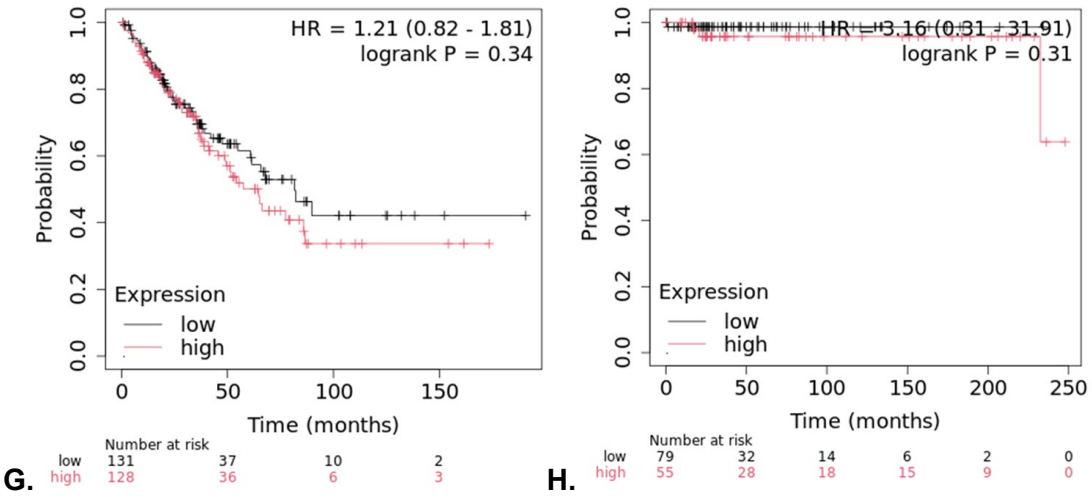
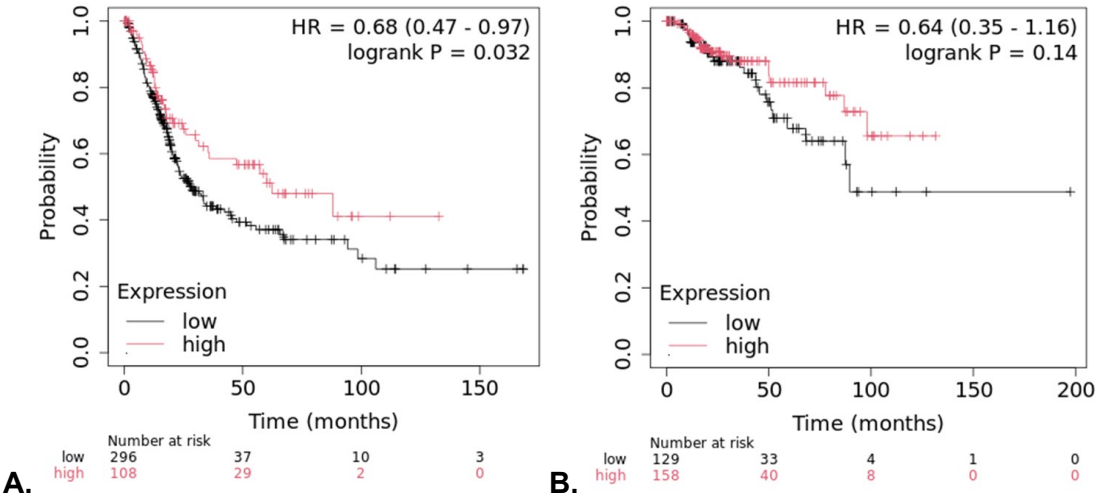
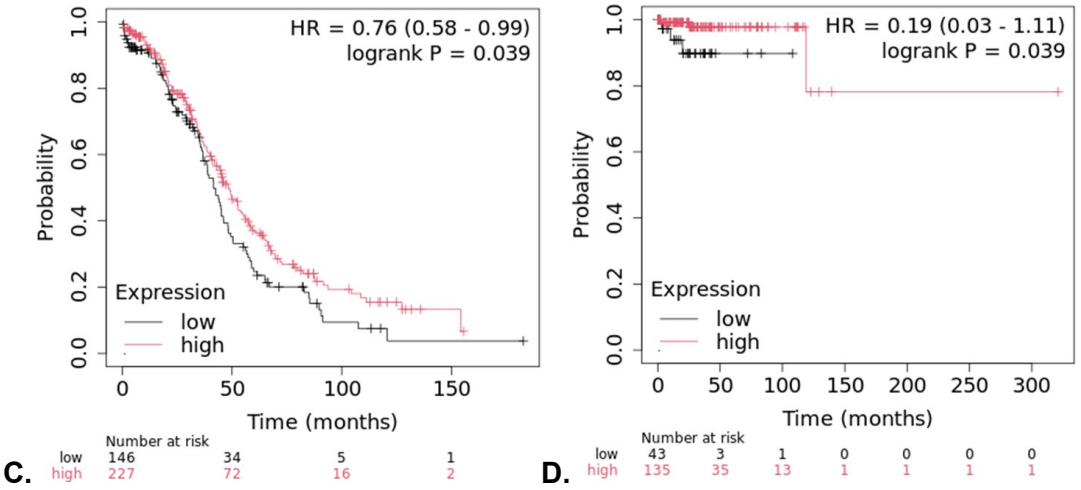


Figure 5. High expression of DYNLT1 shows poor prognosis in (A) Breast Cancer, (B) Esophageal ADC, (C) Esophageal SQC, (D) Kidney renal clear cell carcinoma, (E) Liver hepatocellular carcinoma, (F) Pancreatic ductal ADC, (G) Sarcoma, and (H) Testicular germ cell tumor. Figures generated KM Plotter.





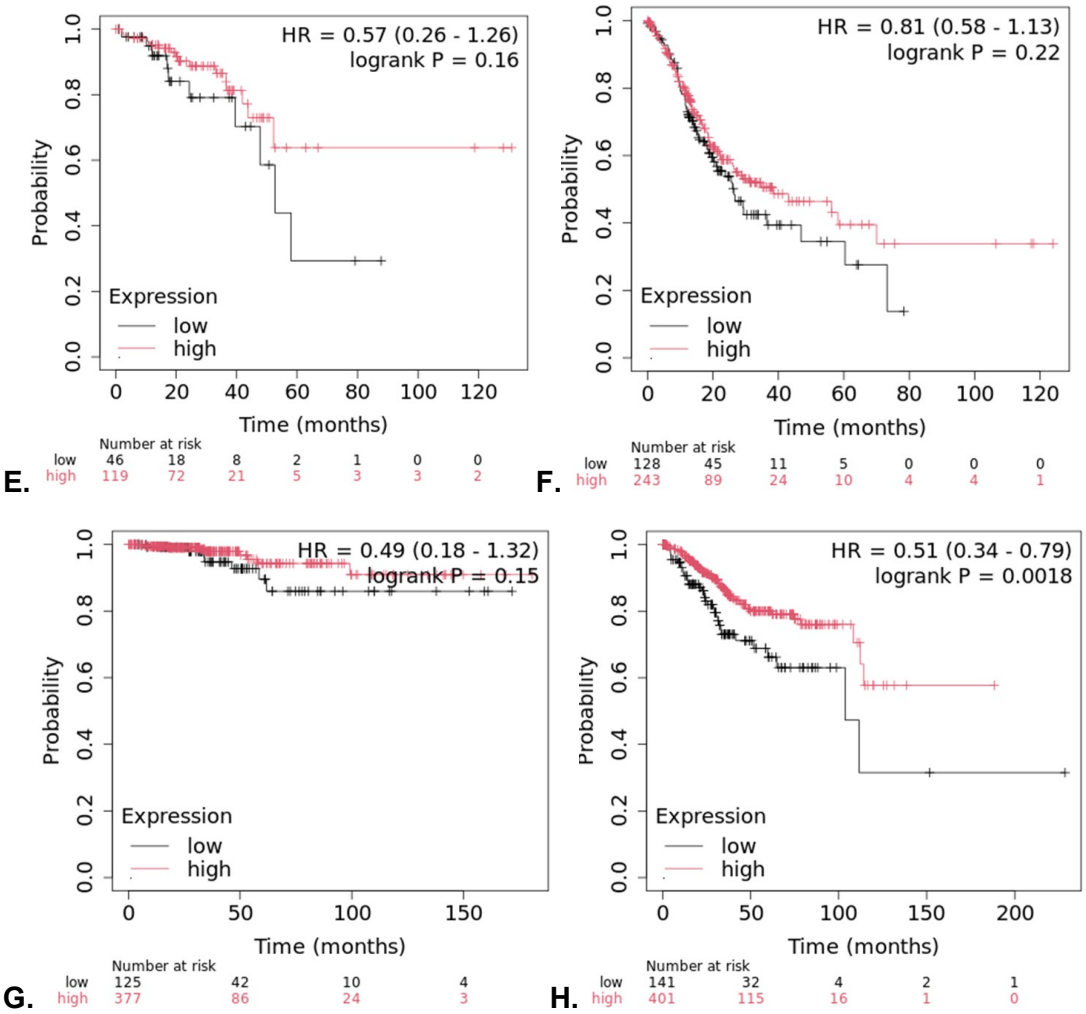


Figure 6. High expression of DYNLT1 shows good prognosis trend in (A) Bladder cancer, (B) Kidney renal papillary cell carcinoma, (C) Ovarian cancer, (D) Pheochromocytoma and paraganglioma (E) Rectum ADC, (F) Stomach ADC, (G) Thyroid carcinoma, and (H) Uterine corpus endometrial carcinoma. Figures generated KM Plotter.

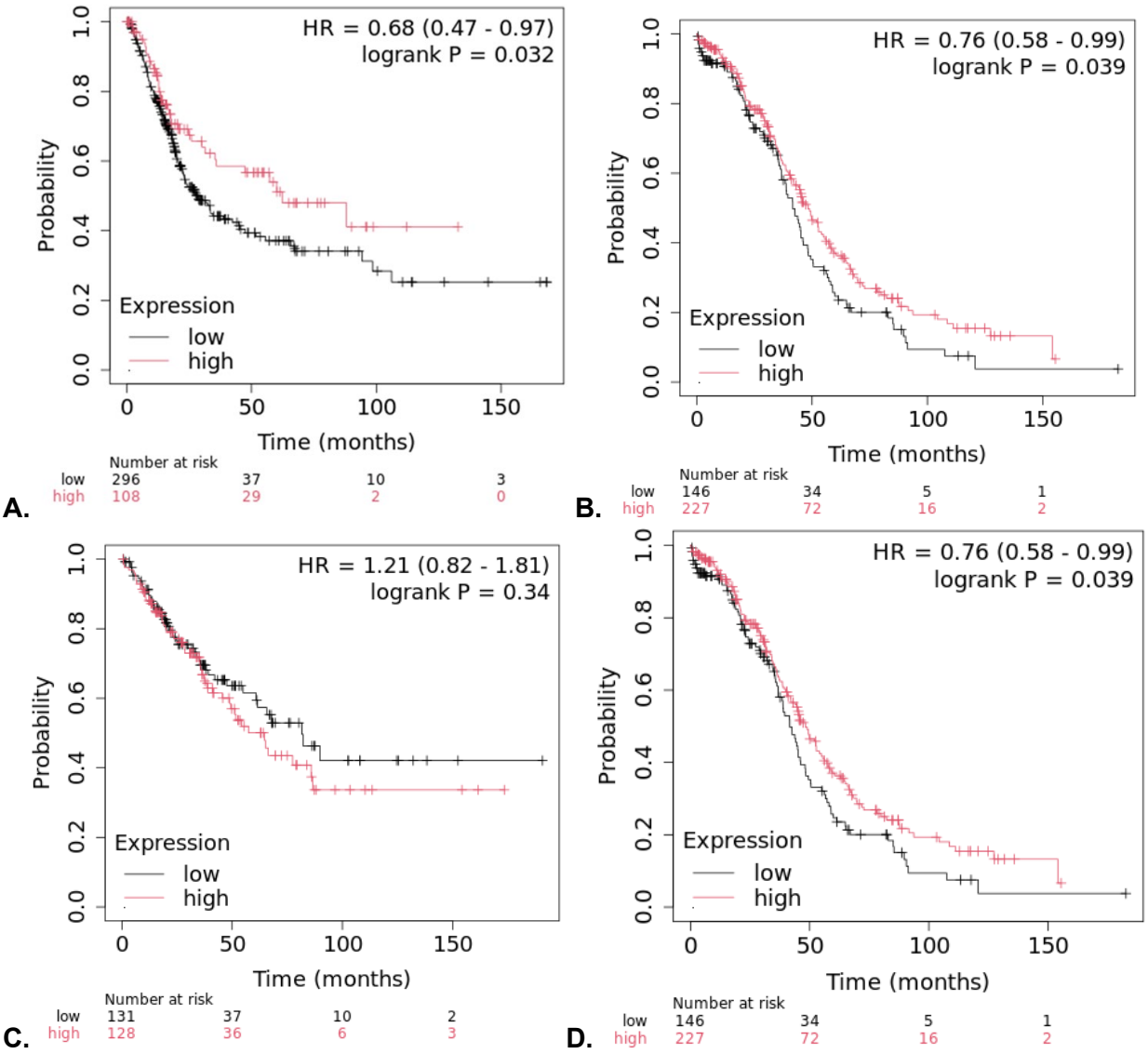


Figure 2. DYNLT1 has a protective role in (A) Bladder carcinoma, (B) Ovarian cancer, (C) Sarcoma, (D) Pancreatic ductal ADC. Figures generated KM Plotter.

Conclusion

DYNLT1 is a key player in cancer biology, influencing cellular transport, signaling pathways, and oncogenesis. Its involvement in lung cancer—along with its broader roles in other malignancies—underscores its potential as a target for diagnostic and therapeutic development. As we delve deeper into the molecular signatures of lung cancer, DYNLT1 stands as a promising candidate for future investigations.

If you have any questions or insights about this update, feel free to share them in the thread. Thank you for supporting our research!

MCM Team