Summary of “Mitochondrial Transfer from Immune to Tumor Cells Enables Lymph Node Metastasis”

Journal: Cell Metabolism

Authors: Terasaki et al.

Publication Year: 2026

Background

Cancer cells frequently spread to lymph nodes despite the immune system’s role as a barrier to tumor growth. The mechanisms that allow tumor cells to evade immune surveillance and establish metastatic colonies in immune-rich environments such as lymph nodes are not fully understood. This study investigates a specific intercellular interaction between immune cells and tumor cells involving mitochondria.

Objective

The research aims to determine whether **mitochondrial transfer** from immune cells to tumor cells is a common feature in cancer and whether it contributes to immune evasion and lymph node metastasis.

Methods

The article identifies mitochondria originally from immune cells within tumor cells and assesses the consequences of this exchange. Experimental approaches include analysis of immune cell function after mitochondrial loss and examination of signaling pathways activated in tumor cells following mitochondrial acquisition. The study also tests whether disrupting mitochondrial transfer machinery affects lymph node metastasis.

Results

Tumor cells were found to acquire mitochondria from surrounding immune cells across cancer types. Immune cells that lost mitochondria showed reduced activation and weakened anti-tumor functions. In tumor cells, transferred mitochondria integrated into existing mitochondrial networks, causing mitochondrial DNA leakage and activation of cGAS–STING signaling. This signaling promoted immune evasion and increased lymph node metastasis. Blocking mitochondrial transfer or inhibiting cGAS–STING and type I interferon signaling significantly reduced metastatic spread.

Conclusions

The findings identify immune-to-tumor mitochondrial transfer as a mechanism that simultaneously weakens immune defenses and enhances tumor metastatic potential. Mitochondria function not only as metabolic components but also as signaling triggers that support immune evasion. Targeting mitochondrial transfer or its downstream pathways may offer new strategies to limit lymph node metastasis.

Implications

This study reframes immune suppression in cancer as a resource-based interaction rather than solely a signaling imbalance. Therapeutic approaches that preserve immune cell mitochondrial integrity or prevent organelle transfer could strengthen immunosurveillance and reduce early metastatic progression.

References

Terasaki, M., et al. (2025). Mitochondrial transfer from immune to tumor cells enables lymph node metastasis. Cell Metabolism. https://www.sciencedirect.com/science/article/abs/pii/S1550413125005455