**Unexpected Inhibitory Role of Silica Nanoparticles on Lung Cancer Development by Promoting M1 Polarization of Macrophages**

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**Presenter:** Chen-Fan Shen **Date/Time:** 2025/05/01, 15:20-16:10

**Commentator:** Dr. Chien-Chung Lin **Location:** Room 601, Med College Building

**Background** Lung cancer is the leading cause of cancer-related deaths worldwide, resulting in over 1.8 million deaths each year. With advancements in nanotechnology, silica nanoparticles (SiNPs) have been widely used in various fields, raising concerns about their health impacts. Although studies have shown that SiNPs can cause lung injury and fibrosis, the relationship between SiNPs and lung cancer development remains unclear.

**Objective** To evaluate the impact of silica nanoparticles (SiNPs) on the tumor immune microenvironment in lung cancer and to reveal how SiNPs promote M1 macrophage polarization.

**Results** This study demonstrates that silica nanoparticles (SiNPs) can promote the M1 polarization of macrophages, achieved through the activation of the NF-κB signaling pathway and the enhancement of glycolytic mechanisms, which are associated with lung inflammation and changes in the tumor microenvironment. Experimental results indicate that SiNPs treatment inhibits the proliferation and metastasis of lung cancer cells while increasing the survival rates of mice. Furthermore, RNA sequencing analysis reveals a significant increase in M1-type macrophages in the SiNPs-exposed group, which has important implications for anti-tumor immunity, suggesting that SiNPs play a critical role in modulating the immune microenvironment of lung cancer.

**Conclusion** SiNPs can inhibit the development of lung cancer by promoting the M1 polarization of macrophages within the tumor microenvironment. These findings go beyond the traditional understanding of the effects of SiNPs in biological systems, providing new insights into the role of nanomaterials in lung cancer progression. By revealing how SiNPs influence immune modulation within the tumor microenvironment, this research deepens our understanding of the broader implications of nanomaterials in the context of lung cancer biology.