Chamosite, Late Permian C1 Coal Exposure and the High Incidence of Lung Cancer in Xuan Wei, China

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Background

The Xuan Wei area of Yunnan Province, located in southwestern China, exhibits the unusually high incidence and mortality rate of lung cancer in the world. Epidemiological studies have implicated that this has been associated with the domestic combustion of Late Permian C1 coal from high risk area of lung cancer in Xuan Wei, which contains iron-rich chamosite.

Objectives

The underlying molecular mechanism of lung cancer induced by chamosite-containing C1 coal remains unclear.
Therefore, our study provides experimental evidence
on how particles in C1 coal may promote the initiation of lung cancer,
thereby informing potential public health interventions to improve
the health of Xuan Wei residents.

Methods

Transmission Electron Microscope (TEM) was performed to validate that LTA enters the cells and lung tissue. Changes in BEAS-2B cells after C1 and C9 LTA exposure were investigated by XTT assay and transwell assay. H&E staining, CFSE staining and ELISA were also employed for the observation of lung changes in mice.

Results

C1 and C9 LTA were found both in BEAS-2B cells and lung tissue by TEM. BEAS-2B cells exhibited much of the capacity for malignization. H&E staining demonstrated that LTA treatment for 3 months caused more severe pulmonary injury in mice and ELISA results showed more inflammatory cytokines were in C1 LTA group.
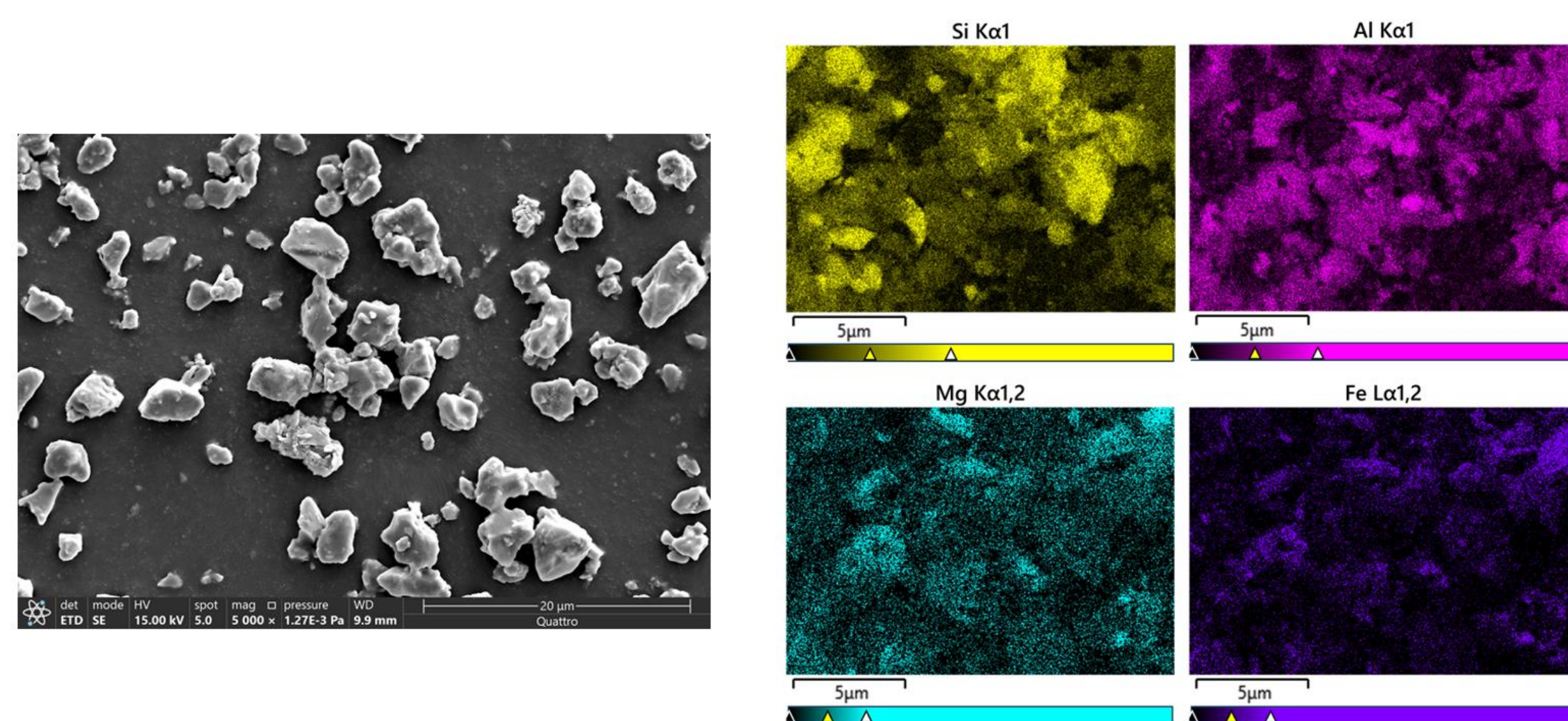
Fig.1. Characterization of C1 LTA

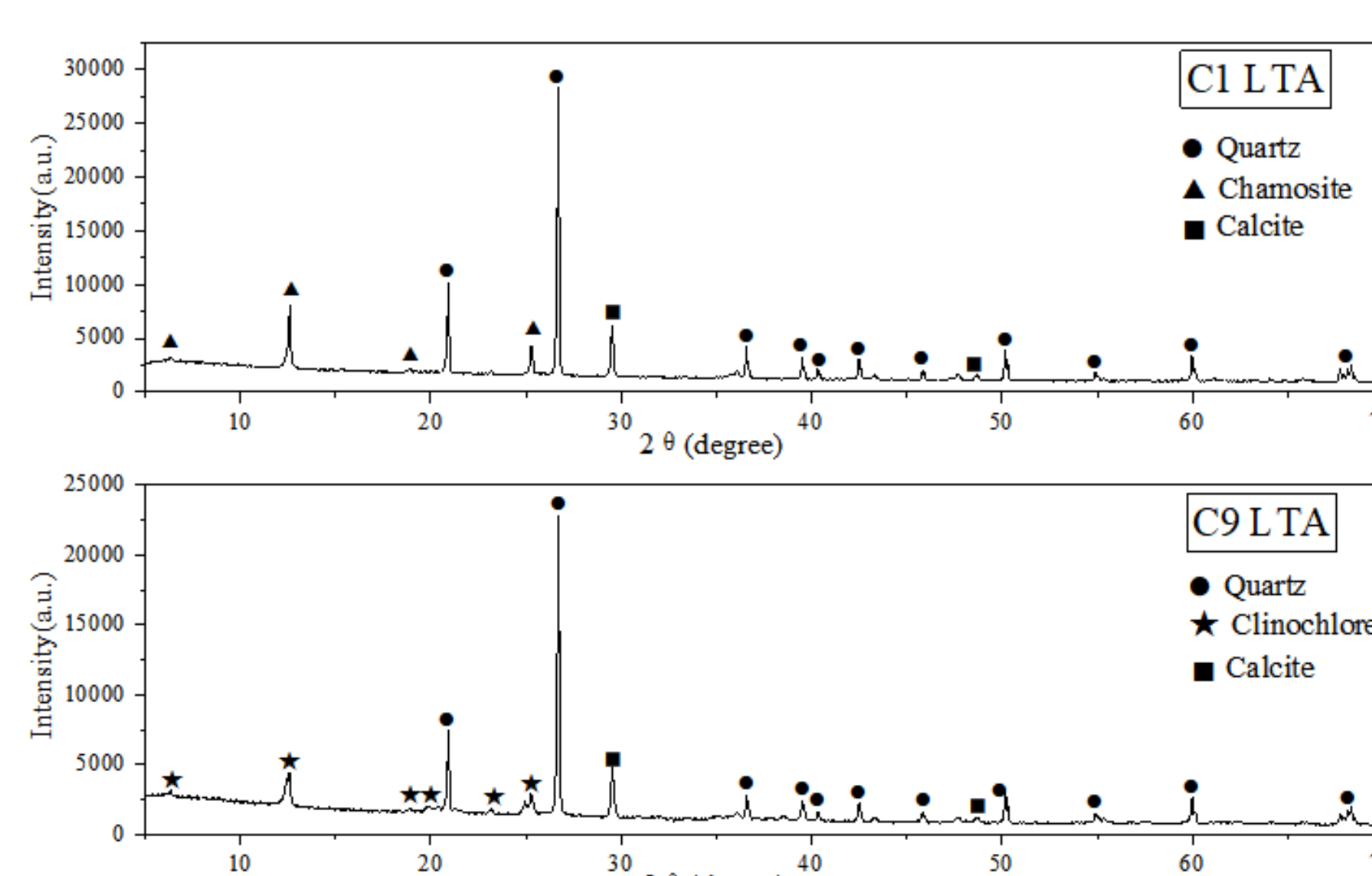Fig.2. Characterization of C1 and C9 LTA
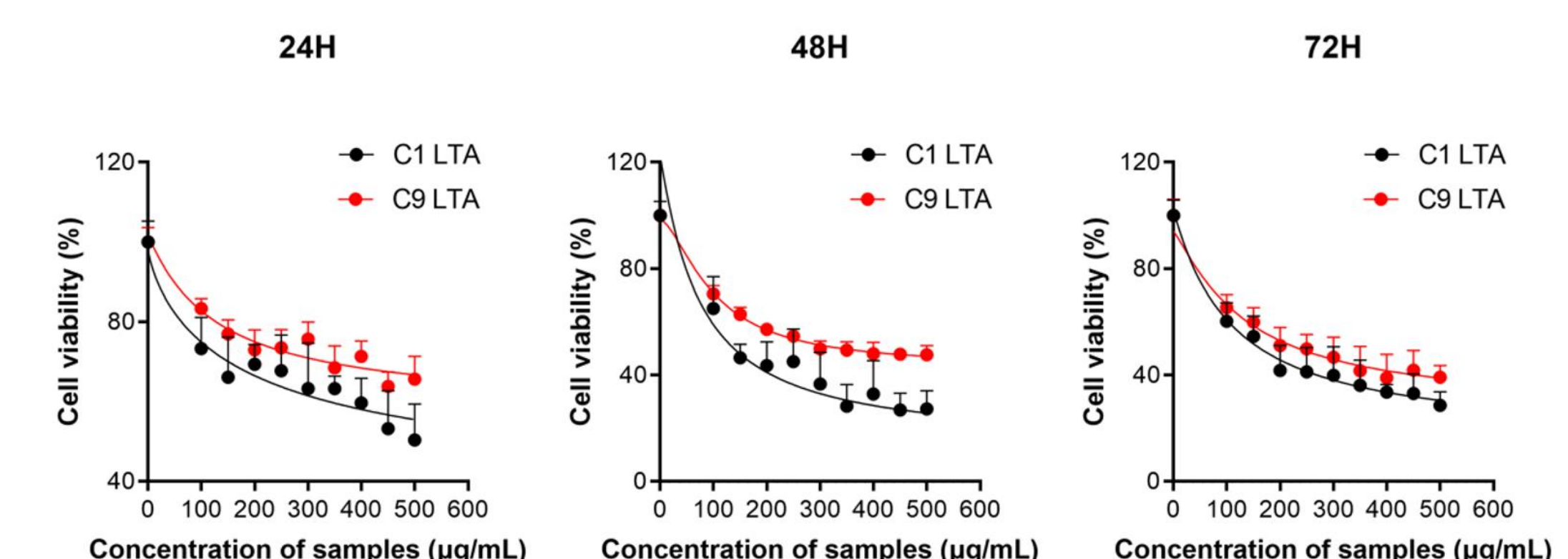

Fig.3. Changes in cell viabilities

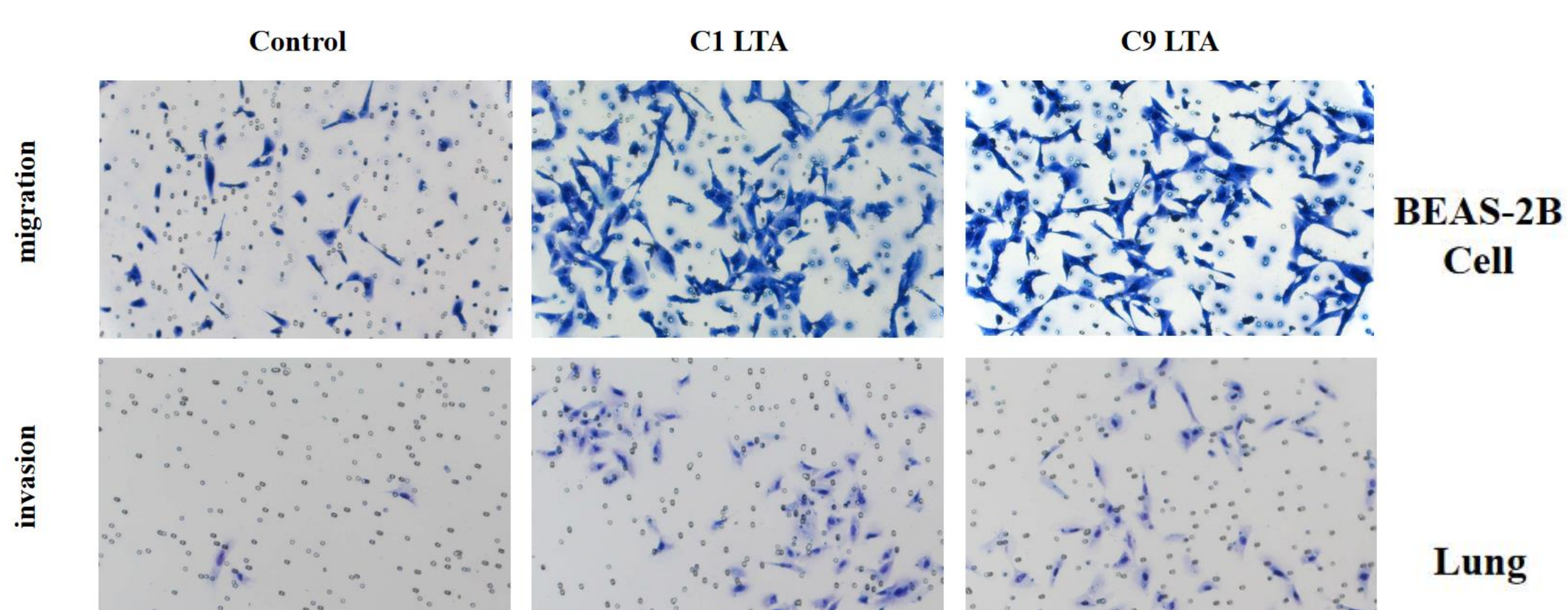Fig.4. Changes in migration and invasion abilities

Fig.5. Observations of cell and lung tissue
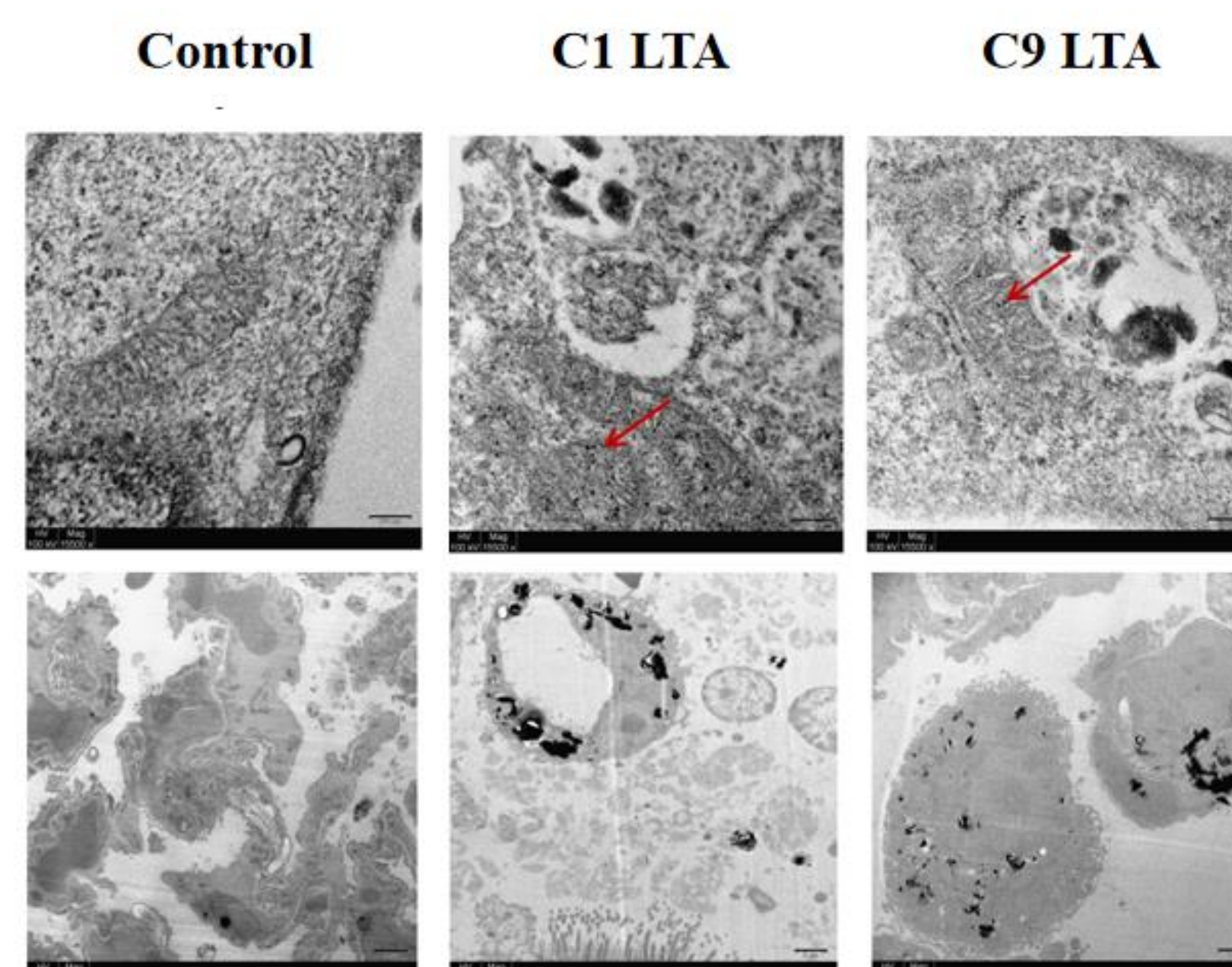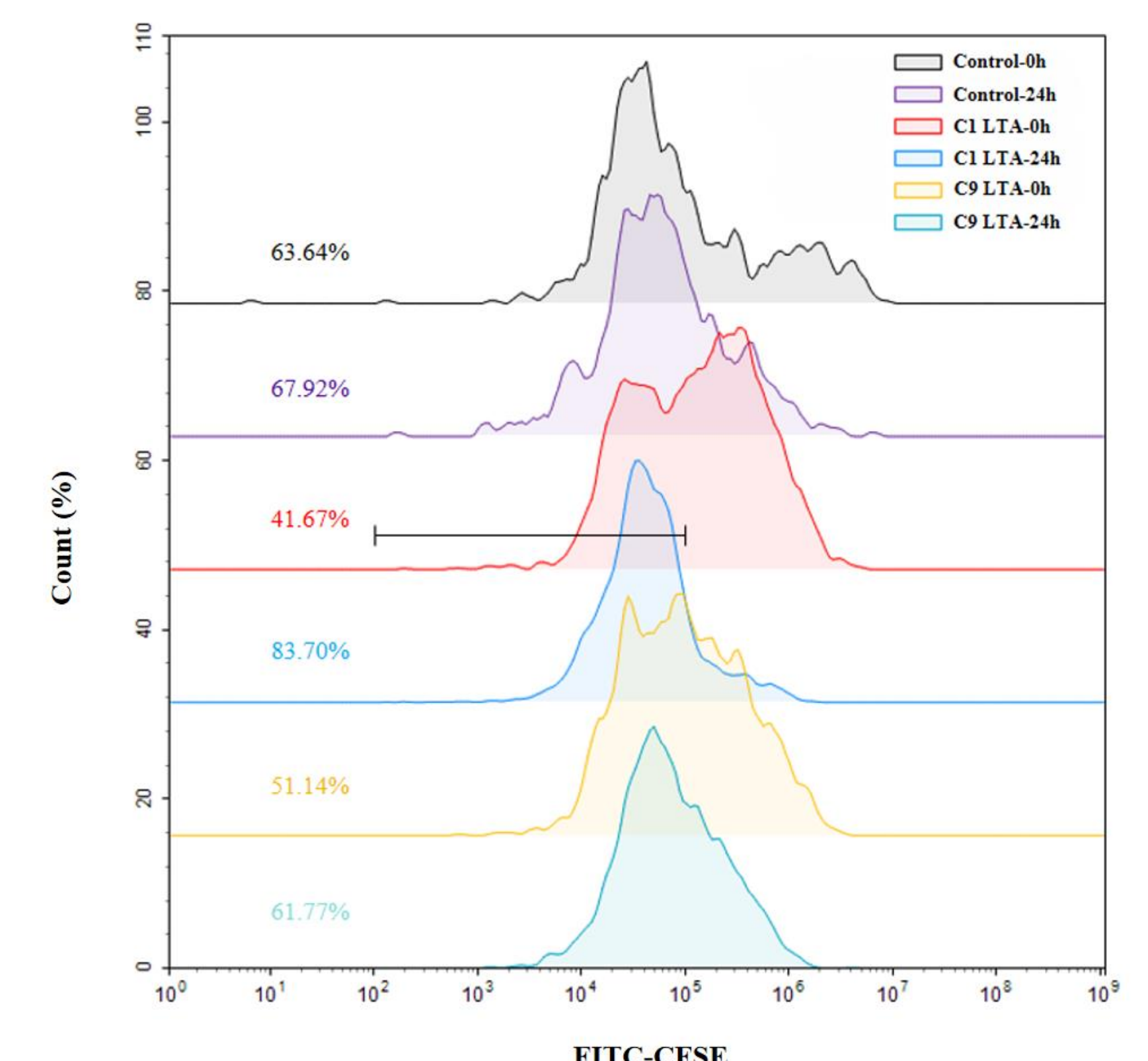

Fig.6. Cell proliferation analysis

Fig.7. HE staining of lung tissue

Fig.8. GO enrichment analysis
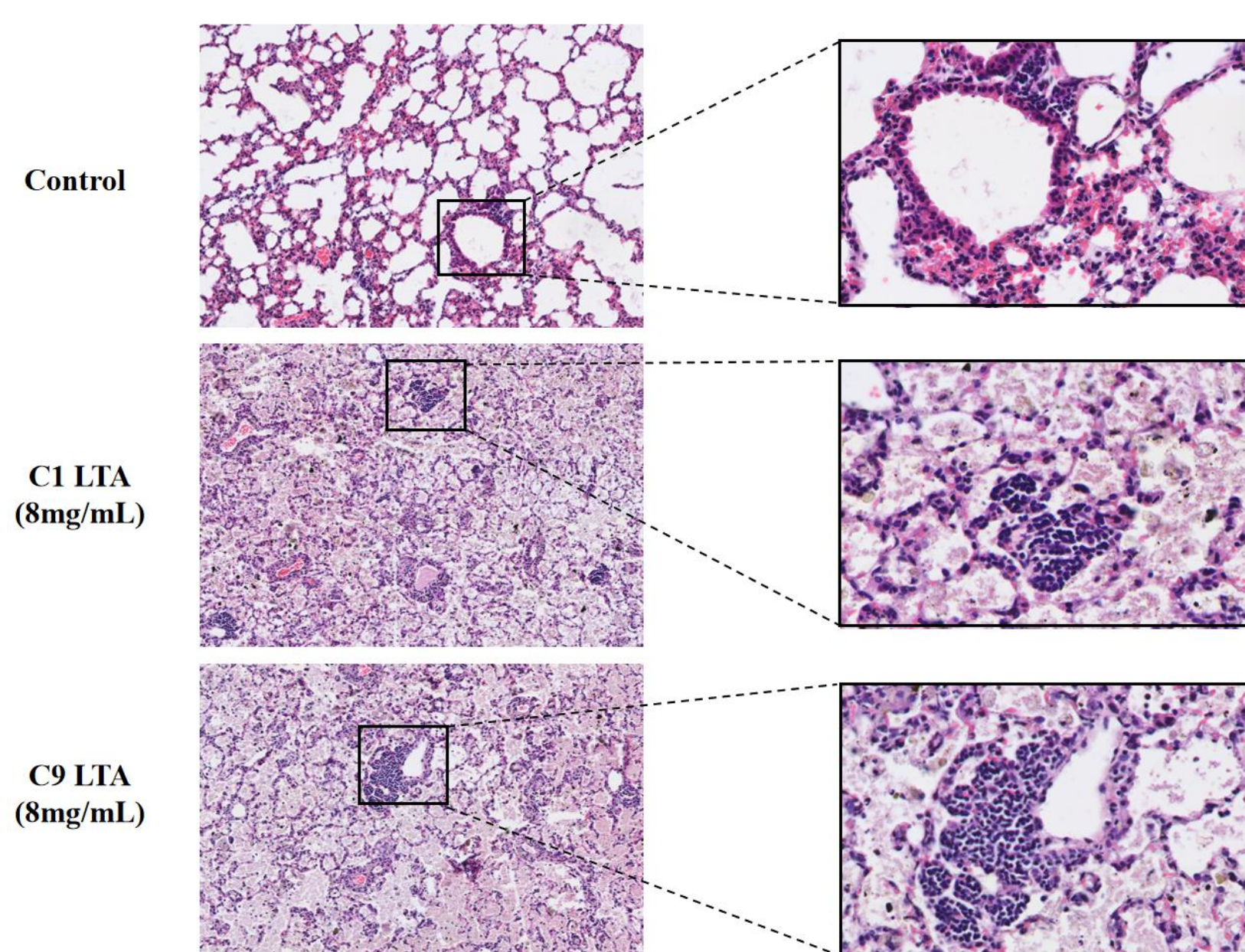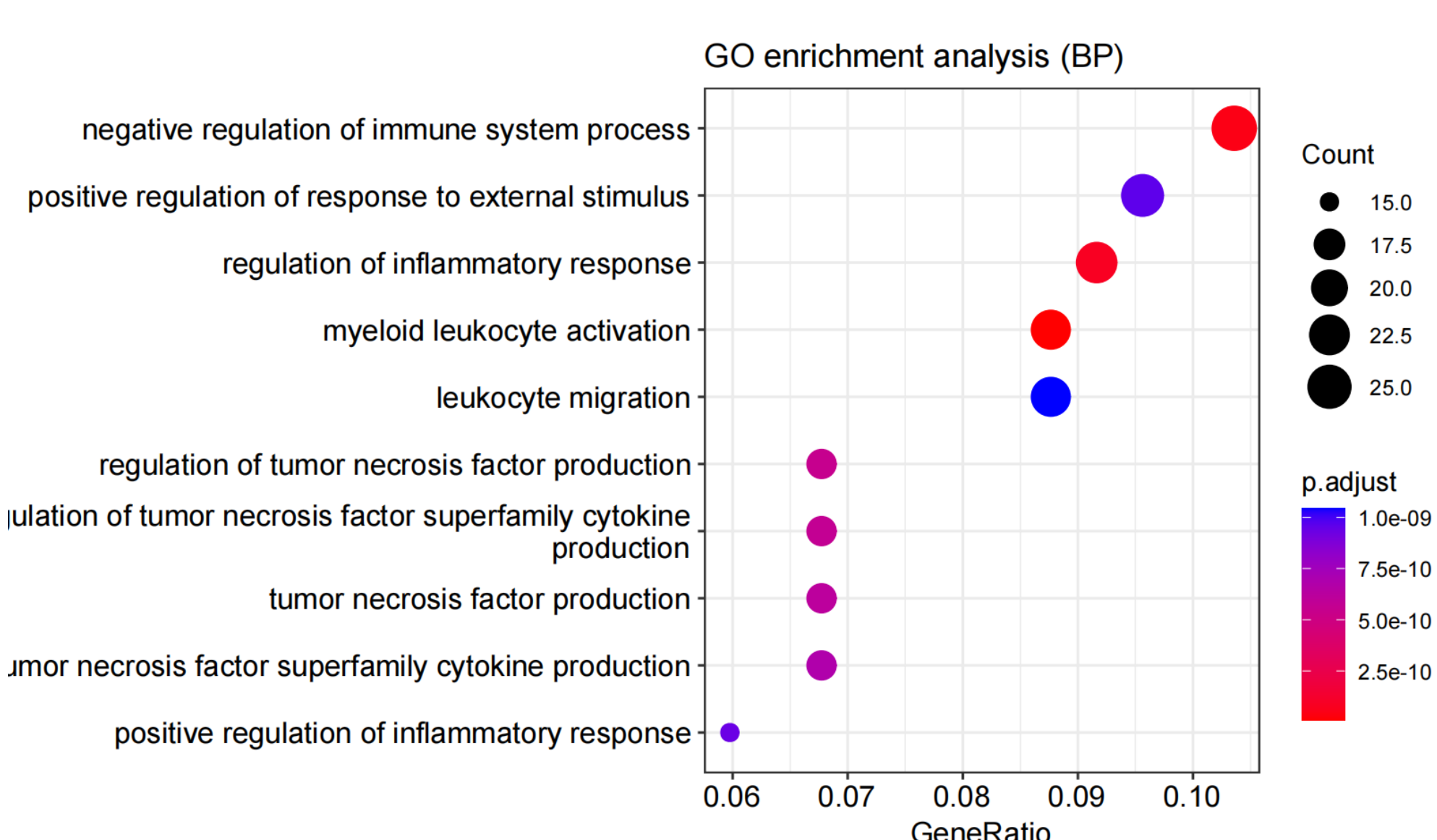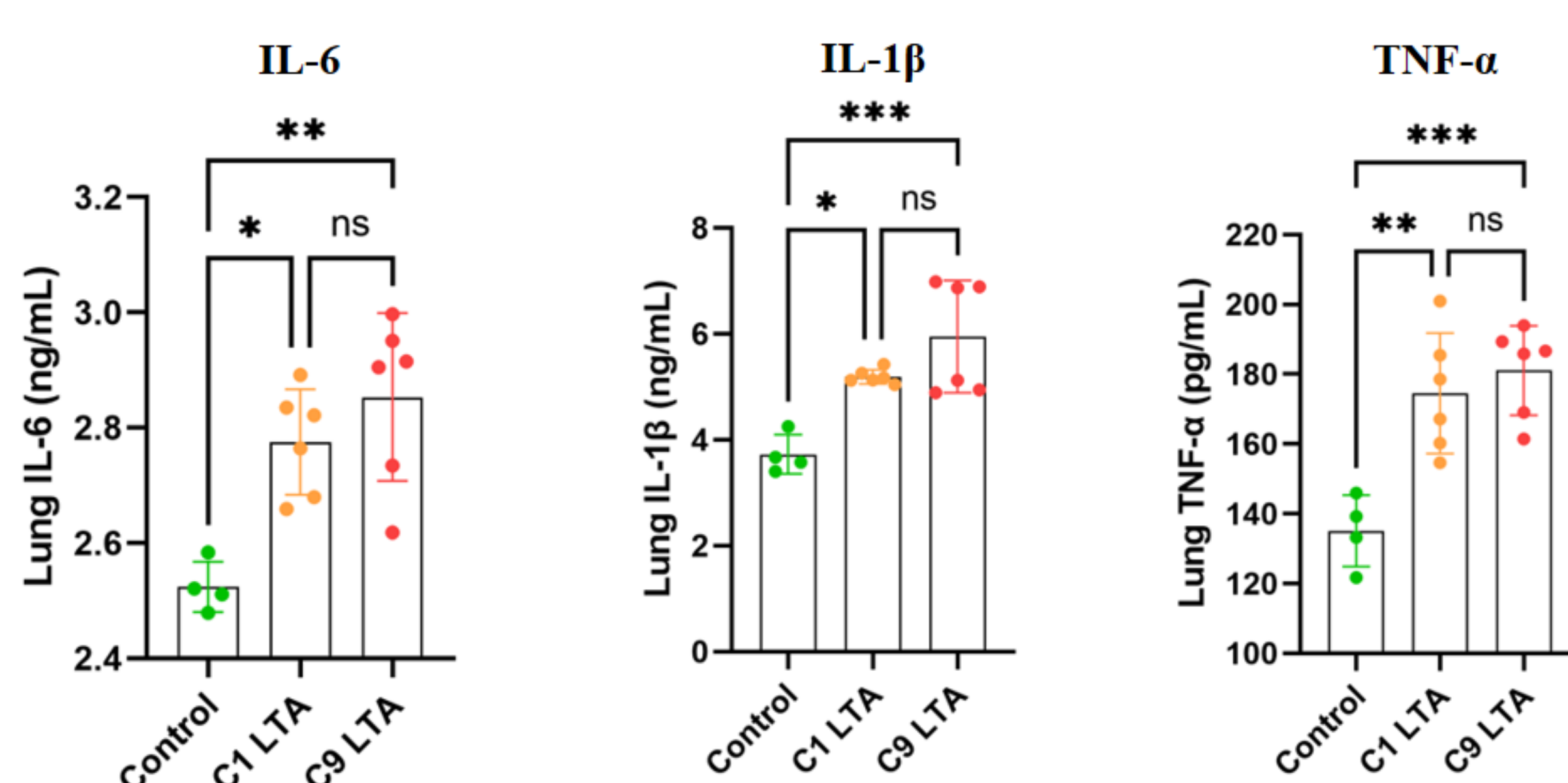

Conclusion

Our study indicates that the chronic exposure of C1 and C9 LTA may lead to malignant transformation of bronchial epithelial cells and alterations in the lung tissue of mice. The deeper mechanisms will be addressed in further work.

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Fig.9.Measurements of the levels of lung inflammatory cytokines