The component formula of Salvia miltiorrhiza and Panax ginseng induces apoptosis and inhibits cell invasion and migration through targeting PTEN in lung cancer cells

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Background: Lung cancer is the leading cause of death from cancer worldwide. It is an urgent need for development of novel therapeutic agents to improve current treatment of this disease. Here we investigate whether the effective component formula of traditional Chinese Medicine could serve as new potential targeted drugs to treatment lung cancer.

Methods: The orthogonal design method was adapted to optimize the most effective component formula of Salvia Miltiorrhiza and Panax Ginseng (FMG). The effects of FMG on A549 cells and BEAS-2B cells were assessed by real-time cell analysis (RTCA) and high content screening (HCS). Cell cycle distribution and cell apoptosis were measured by Flow cytometry. Cell migration and invasion were tested by wound healing assay and trans-well invasion assay. The levels of proteins were detected by western blot, simple western and immunofluorescence. The skeleton protein F-actin was measured by HCS. His-PTEN was purified by the ÄKTA purifier M1 protein chromatography purification system and the kinetics of FMG binding to PTEN protein was then assessed using the Octet RED. The phosphatase activity of PTEN protein kit was used to detect the phosphatase activity of PTEN protein after FMG binding to PTEN protein in vitro.

Results: We optimize the most effective component formula of Salvia Miltiorrhiza and Panax Ginseng (FMG), which is composed of Salvianolic acid A, 20(S)-Ginsenoside and Ginseng polysaccharide. We discovered that FMG selectively inhibited A549 cell proliferation and induced A549 cell apoptosis but had no any cytotoxic effects on BEAS-2B. Moreover, FMG inhibited cell migration and invasion. Mechanistically, we found that FMG significantly promoted p-PTEN expression and subsequently prevented PI3K/AKT signaling pathway. The phosphatase activity of PTEN protein was increased after FMG binding PTEN protein, indicating that PTEN could be the FMG targeted protein. In addition, FMG regulated expression of some marker proteins relevant to cell apoptosis, migration and invasion.

Conclusions: We provide mechanistic insight into the anti-NSCLC of FMG by enhancing the phosphatase activity of PTEN, and suggest that FMG could be as a potential option for lung cancer treatment.