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Cytotoxicity and enhancement activity of essential oil from *Zanthoxylum bungeanum* Maxim. as a natural transdermal penetration enhancer

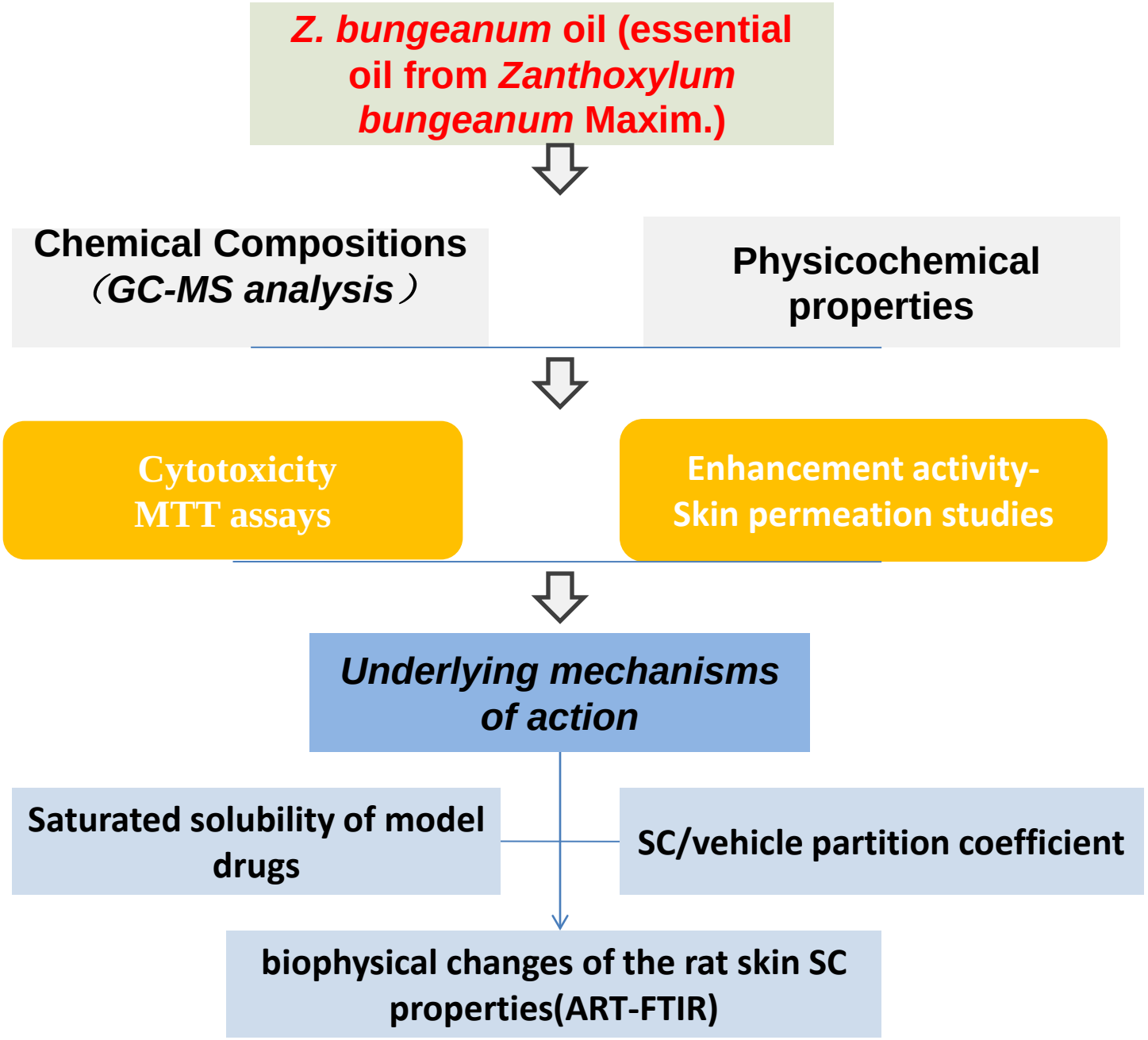
花椒挥发油作为天然经皮促透剂的细胞毒性及促透活性研究

Key words: *Zanthoxylum bungeanum* Maxim., Essential oil, Transdermal delivery, Penetration enhancer, HaCaT, Attenuated total reflectance-Fourier transform infrared spectroscopy (ATR-FTIR)

关键词：花椒挥发油；天然经皮促透剂；透皮吸收；表皮角质形成细胞（HaCaT）；傅利叶变换红外光谱（ATR-FTIR）

- Our previous studies found that *Z. bungeanum* oil in Zhitong cataplasm, a clinical empirical formula mainly consisting of the extracts of four herbs, Pericarpium Zanthoxyli Rhizoma Chuanxiong, Radix Angelicae Dahuricae and Herba Asari, had the function of facilitating the percutaneous absorption of the active components besides its medicative function as described above. However, there is currently no systematic information available about the skin permeation enhancement effect of *Z. bungeanum* oil.
- According to the statement on Li Yue Pian Wen (A.D. 1870), an ancient classic literature on topical remedies in China, these herbs like *Z.bungeanum* Maxim., peppermint oil, which are rich in essential oil, can effectively promote the percutaneous absorption of the active components in a prescription for their unique properties.

- **Thus, we investigated the cytotoxicity and percutaneous penetration enhancement activity of *Z. bungeanum* oil and its underlying mechanisms.**


Z. bungeanum oil (essential oil from *Zanthoxylum bungeanum* Maxim.)
Chemical Compositions (*GC-MS analysis*)
Physicochemical properties
Cytotoxicity MTT assays
Enhancement activity-Skin permeation studies
Underlying mechanisms of action
Saturated solubility of model drugs
SC/vehicle partition coefficient
biophysical changes of the rat skin SC properties(ART-FTIR)

- It was found that the IC_{50} values of *Z. bungeanum* oil were significantly lower in HaCaT and CCC-ESF-1 cell lines compared to the well-established and standard penetration enhancer Azone. *The Z. bungeanum* oil at various concentrations effectively facilitated the percutaneous penetration of two hydrophilic and lipophilic model drugs across the rat skin. In addition, the mechanisms of permeation enhancement *by Z. bungeanum* oil could be explained with saturated solubility, SC/vehicle partition coefficient, and secondary structure changes of stratum corneum.