

University of Macau

Abstract

**PROANGIOGENIC EFFECT OF *ANGELICA SINENSIS*
IN HUMAN UMBILICAL VEIN
ENDOTHELIAL CELLS (HUVEC)**

by LAM Hio Wa

Thesis Supervisor: Dr. Ming Yuen LEE

Chinese Medicinal Science

Angiogenesis, the formation of new blood vessels, is essential for normal growth and homeostasis in human body. However, certain diseases can be exacerbated by the loss of balance in angiogenesis, which results in either excessive or insufficient blood vessel formation. Diseases such as cancer, diabetic retinopathy and rheumatoid arthritis are characterized by excessive blood vessel formation while peripheral and coronary ischemia and infarction, chronic wound healing failure and ulcers are characterized by insufficient blood vessel formation. *Angelica sinensis* (Oliv.) Diels, named danggui in Chinese, is commonly used in the prescriptions of traditional Chinese medicine. In traditional systems, it has been used for treatment of dehydration, lumbago, abnormal menstruation, menopausal symptoms, nervous disorders, as well as dealing circulation, anemia, chronic hepatitis and cirrhosis of the liver, etc.

Recently, *Angelica sinensis* was proved to be a potential candidate to cure the diseases, driven by imbalanced angiogenesis. However, the biological effects of *Angelica sinensis* on angiogenesis and the underlying mechanisms are unclear yet. This investigation describes the angiogenic effects of *Angelica sinensis* extract on HUVEC *in vitro*. The extract was identified to stimulate the proliferation of HUVEC by XTT assay and microscopic cell counting; in addition, flow cytometry analysis indicated that

the extract significantly increased percentage of HUVEC on the DNA synthesis phase. The wound healing migration assay illustrated that the dramatic increment of migration could be measured in *Angelica sinensis* extract treated HUVEC; as well as the endothelial cell's cytoskeleton reorganization was detected, using fluorescence staining. Meanwhile, the numbers of invaded cells and the mean tube length were significantly increased in both treatment groups. In addition, *Angelica sinensis* extract was found to enhance VEGF mRNA expression by real-time PCR. In bead-based immunoassay, higher expression levels of phosphorylated forms of p38 and JNK 1/2 were also observed in effusions compared with control cells. All results suggest that *Angelica sinensis* extract can promote angiogenesis in multiple models and the proangiogenic effects.