The Study of Anti-cancer Effects of Bee Venom for Aqua-acupuncture

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Objectives: To characterize the antitumorigenic potential of three representative bee venom components, Melittin, Apamin, and Phospholipase A2, their effects on cell proliferation and apoptosis of the human melanoma cell line SK-MEL-2 were analyzed using molecular biological approaches.

Methods & Results: To determine the doses of the drugs that do not induce cytotoxic damage to this cell line, cell viability was examined by MTT assay. While SK-MEL-2 cells treated with 0.5 - 2.0 µg/ml of each drug showed no recognizable cytotoxic effect, marked reductions of cell viability were detected at concentrations over 5.0 µg/ml. [3H]thymidine incorporation assay for cell proliferation demonstrated that DNA replication of SK-MEL-2 cells is inhibited by Apamin and Phospholipase A2 in a dose-dependent manner. Consistent with this result, the cells were accumulated at the G1 phase of the cell cycle after treatment with Apamin and Phospholipase A2, whereas no detectable change in cell proliferation was identified by Melittin treatment. In addition, trypan blue exclusion and flow cytometric analyses showed that all of these drugs can trigger apoptotic cell death of SK-MEL-2, suggesting that Melittin, Apamin, and Phospholipase A2 have antitumorigenic potential through the suppression of cell growth and/or induction of apoptosis. Quantitative RT-PCR analysis revealed that Apamin and Phospholipase A2 inhibit expression of growth-promoting genes such as c-Jun, c-Fos, and Cyclin D1. Furthermore, Phospholipase A2 induced tumor suppressors p53 and p21/Waf1. In addition, all three drugs were found to activate expression of a representative apoptosis-inducing gene Bax while expression of...
apoptosis-suppressing Bcl-2 and Bcl-XL genes was not changed. Taken together, this study strongly suggests that Melittin, Apamin, and Phospholipase A2 may have antitumorigenic activities, which are associated with its growth-inhibiting and/or apoptosis-inducing potentials.

**Key words**: bee venom (Melittin, Apamin, Phospholipase A2), anti-cancer effect, cell cycle, apoptosis, molecular biology.

I. 서론

피부암은 전체 암 중에서 2~4%를 차지하고 있으며, 암의 증후는 피부암의 1종으로 2) 학회에서는

2) 둘레암, 둘레암, 둘레암, 둘레암 등으로 표현한다. 19)


피부암은 둘레암의 치료에 둘레어 있는 약 40여 가지의 약품으로 구성된 물질로 기원전부터 인체의 질병치료에 이용되어 왔으며 외국에서는 피부암 구성


특히 피부암의 치료에 대한 연구는 국내에서는 둘레암이 피부암 전체를 이용해서 면역학적 방향에서의 치료를 연구 발표하였고, 둘레암이 피부암 전체를 이용해서 치료 효과를 연구 발표하였다. 둘레암이 피부암 전체를 이용해서 치료 효과를 연구 발표하였다. 둘레암이 피부암 전체를 이용해서 치료 효과를 연구 발표하였다.

II. 실험

1. 세포배양