Piperine encourages apoptosis in human cervical adenocarcinoma cells through ROS generation, DNA fragmentation, caspase-3 activation and cell cycle arrest

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Abstract:

Background: Cancer is one of the most common destructive diseases and the second leading cause of death in humans. Among cancer, cervical cancer is the second most common malignancy among women globally. Thus, there is a continuous need to search for chemotherapeutic chemicals or naturally occurring drugs to resolve this global health problem. Piperine (1-piperoylpeperdine) is present in the fruits of black pepper (*Piper nigrum* Linn.) and long pepper (*Piper longum* Linn.). It possesses several pharmacological properties and in the present study we have evaluated its anti-cancer potential on human cervical adenocarcinoma (HeLa) cells.

Methods: The anti-proliferative effect of piperine were investigated through some potent markers of apoptosis *viz.* reactive oxygen species (ROS) generation, cellular apoptosis and loss of mitochondrial membrane potential (MMP), DNA fragmentation, cell cycle kinetics, caspase-3 activity and cell migration against HeLa cells.

Results: The results showed that piperine exposure induces apoptosis significantly in a dose-dependent manner and inhibits the growth of HeLa cells with an increase in ROS generation, nuclear condensation and delayed wound healing. In addition, piperine also encourages cell death by the loss of MMP, DNA fragmentation and the activation of caspase-3. Growth inhibition of HeLa cells was found to be associated with G2/M phase arrest and sub-G1 accumulation.

Conclusions

The present study provides useful insight into the apoptotic potential of piperine and further *in vivo* and clinical studies will be needed for its validation and in the finding of more effective and least toxic regimens against cervical cancer.

Keywords: Cervical cancer, Anti-tumor, Apoptosis, Caspase-3, Cell cycle kinetics, Piperine, ROS, MMP, DNA fragmentation, Wound healing