Anticancer assessment of Rhein and phytic acid against colorectal cancer

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By

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Abstract

Colorectal cancer (CRC) is one of the most commonly recognized fatal cancers universally. The diagnosis of CRC in patients has been determined by the stage of cancer. Recognition of CRC at an initial phase may perhaps lead to a 90% five-year survival rate in contrast to 12% as soon as the distant metastasis stage arose. Regardless of the substantial progress in the arena of cancer therapy, foremost restrictions, i.e., drug inefficacy, drug opposition, distant metastasis, accompanying side-effects, and toxicity, obstruct the use of chemotherapeutic methodologies. Even though surgical resection is implied as the only remedial treatment for CRC, alternative methodology to diminish the mortality rate is desirable. Potential defensive agents that assist in suppressing colon carcinogenesis may lead to chemoprevention of the disease. Up till now, countless chemopreventive agents derived from natural products have been identified to interrelate with varied molecular targets in the course of carcinogenesis.

This study was aimed to assess *in vitro* screening of anti-cancerous properties of Rhein and Phytic acid by inducing apoptosis in colorectal cell lines and also assessed the activities of pro-oxidant and antioxidant enzymes. The advancement of colorectal cancer encompasses numerous signaling proteins that control cellular propagation, differentiation, and immortalization. The key target inflammatory marker proteins selected in the study are COX-1, COX-2, Nrf-2, NF-κB, and iNOS.

In *in vitro* study, we found that Phytic acid and Rhein treated cells demonstrated nuclear fragmentation, nuclear blebbing, nuclear condensation, which are the hallmarks of death due to apoptosis. Rhein was found to be more potent apoptotic inducer as compared to the Phytic acid. **Finding** from all these assays on apoptosis, support the finding of the anti-proliferative assay.

In vivo studies showed that the present study demonstrated that Phytic acid and Rhein both individually and in combination, inhibited cancer cell proliferation via the induction of apoptosis through cellular events like chromosomal condensation, membrane blebbing and genomic DNA fragmentation. The effect however was enhanced in co-therapy under both *in vitro* and *in vivo* condition.

The overall **finding** of this work indicated that the Phytic acid and Rhein have significant anti-proliferative effects by inducing apoptosis in colorectal cell lines. The present study underline the role of novel understanding within the mechanism of Phytic acid and Rhein in colorectal cancer therapy through the induction of apoptosis in cancer cells. In conclusion, combination of Phytic acid and Rhein upregulates antioxidant enzymes, down-regulates pro-oxidant enzyme, inflammatory proteins and colonic inflammation and thus has a therapeutic potential against colorectal cancer.

Therefore, our **findings** suggest that the combination of phytic acid and Rhein can potentially act as an adjunct therapy to enhance the effect of chemotherapy.