Evaluation of metabolomics behavior of human colon cancer HT29 cells treated with ionic liquid graviola fruit pulp extract

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Abstract

Ethnopharmacological relevance: Medicinal plants have been used by indigenous people across the world for centuries to help individuals preserve their wellbeing and cure diseases. Annona muricata L. (Graviola) which is belonging to the Annonaceae family has been traditionally used due to its medicinal abilities including antimicrobial, anti-inflammatory, antioxidant and cancer cell growth inhibition. Graviola is claimed to be a potential antitumor due to its selective cytotoxicity against several cancer cell lines. However, the metabolic mechanism information underlying the anticancer activity remains limited.

Aim of the study: This study aimed to investigate the effect of ionic liquid Graviola fruit pulp extract (IL-GPE) on the metabolomics behavior of colon cancer (HT29) by using an untargeted GC-TOFMS-based metabolic profiling.

Materials and methods: Multivariate data analysis was used to determine the metabolic profiling, and the ingenuity pathway analysis (IPA) was used to predict the altered canonical pathways after treating the HT29 cells with crude IL-GPE and Taxol (positive control).

Results: The principal components analysis (PCA) identified 44 metabolites with the most reliable factor loading, and the cluster analysis (CA) separated three groups of metabolites: metabolites specific to the non-treated HT29 cells, metabolites specific to the treated HT29 cells with the crude IL-GPE, and metabolites specific to Taxol treatment. Pathway analysis of metabolomic profiles revealed an alteration of many metabolic pathways, including amino acid metabolism, aerobic glycolysis, urea cycle and ketone bodies metabolism that contribute to energymetabolism and cancer cell proliferation.

Conclusion: The crude IL-GPE can be one of the promising anticancer agents due to its selective inhibition of energy metabolism and cancer cell proliferation.

Keywords

Colon cancer (HT29); Graviola (Annona muricata); GC-TOFMS; Metabolomics; Principal components analysis

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Cited References: 49
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1. Citric Acid Cycle and Role of its Intermediates in Metabolism
By: Akram, Muhammad
CELL BIOCHEMISTRY AND BIOPHYSICS Volume: 68 Issue: 3 Pages: 475-478 Published: APR 2014

2. Serine and glycine metabolism in cancer
By: Amelio, Alessandro; Felix, G.; Betancur, D.; Daddiouaissa, A.; Ananieva, Aa.; Cao, LA.; Galvis, A.; Saez, J.; Jirisek, M.; et al.
TRENDS IN BIOCHEMICAL SCIENCES Volume: 39 Issue: 4 Pages: 191-198 Published: APR 2014

3. Branched-chain amino acid metabolism in cancer
By: Ananieva, Elita A.; Wilkinson, Adam C.
CURRENT OPINION IN CLINICAL NUTRITION AND METABOLIC CARE Volume: 21 Issue: 1 Pages: 64-70 Published: JAN 2018

4. Antitumor and antiviral activity of Colombian medicinal plant extracts
By: Betancur, D.; Saez, J.; Granados, H.; Cao, LA.; Wang, Guangji; et al.
MEMORIAS DO INSTITUTO OSWALDO CRUZ Volume: 94 Issue: 4 Pages: 531-535 Published: JUL-AUG 1999

5. GC-TOFMS analysis of metabolites in adherent MDCK cells and a novel strategy for identifying intracellular metabolic markers for use as cell amount indicators in data normalization
By: Cao, Bei; Bei, Jiye; Wang, Guangji; et al.
ANALYTICAL AND BIOANALYTICAL CHEMISTRY Volume: 400 Issue: 9 Pages: 2983-2993 Published: JUL 2011

6. Rama midwifery in eastern Nicaragua
By: Core, Felix G.
JOURNAL OF ETHNOPHARMACOLOGY Volume: 117 Issue: 1 Pages: 136-157 Published: APR 2008

7. Metabolomics and cancer drug discovery: let the cells do the talking
By: D'Alessandro, Angelo; Zella, Lelia
DRUG DISCOVERY TODAY Volume: 17 Issue: 1-2 Pages: 3-9 Published: JAN 2012

8. Phytochemical analysis of ionic liquid-Graviola (Annona muricata) fruit extract and its acute toxicity on zebrafish early-life stages
By: Daddiouaissa, D.; Amid, A.; Shirwan, M.A.; et al.
[Show additional data]

9. Anticancer activity of acetogenins from Annona muricata fruit
By: Daddiouaissa, D.; Amid, A.
JOURNAL OF ETHNOPHARMACOLOGY Volume: 236 Pages: 466-473 Published: MAY 2019

10. Antiproliferative activity of ionic liquid-graviola fruit extract against human breast cancer (MCF-7) cell lines using flow cytometry techniques
By: Daddiouaissa, Djabir; Amid, A.; Kabbashi, Nasserddeen A.; et al.
JOURNAL OF ETHNOPHARMACOLOGY Volume: 236 Pages: 466-473 Published: MAY 2019