Aloe: Could the popular plant have a role in colon cancer treatment?

Jayne Phippen-Hunt, DO-25 | College of Osteopathic Medicine | Des Moines University

Jayne Phippen-Hunt, DO-25[1], Benjamin Ptasienski[2], Nathan Eastin[2], Trent Mayberry[2], Braydon Cowan[2], Sarah Matusofsky[2], Justin Murray[2], Ellie Monnette[2], Qian Bai, B.A[2,] Benjamin King, DO-26[1], Mark R. Wakefield, MD[2,3], Yujiang Fang, MD, Ph.D[1,2,3]

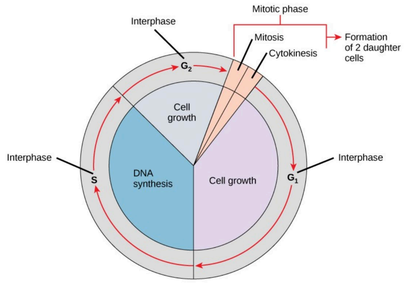
DES MOINES UNIVERSITY
MEDICINE & HEALTH SCIENCES

Introduction

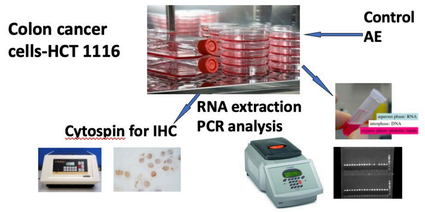
- Colon cancer is the 4th most common cancer in the US. It is estimated that nearly 1 in 25 Americans will be diagnosed in the next year.
- Aloe extract (AE) has been investigated as a potential cytotoxic agent for treatment of cancer.
- This study was designed to investigate the effects of AE on colon cancer cells from the cell line HCT 1116.
- Normal cells undergo apoptosis when they are no longer functional. Cancer cells must avoid this to proliferate.
- Survivin, aptly named, prevents apoptosis via inhibition of caspase proteins. Its expression is increased in many malignant tumors. Downregulation of survivin may lead to increased apoptosis.
- Results indicated that AE has pro-apoptotic effects on colon cancer cells via downregulation of survivin.

Informational graphics

Survivin is highly expressed at the G2/M phase of the cell cycle and declines rapidly in G1 phase

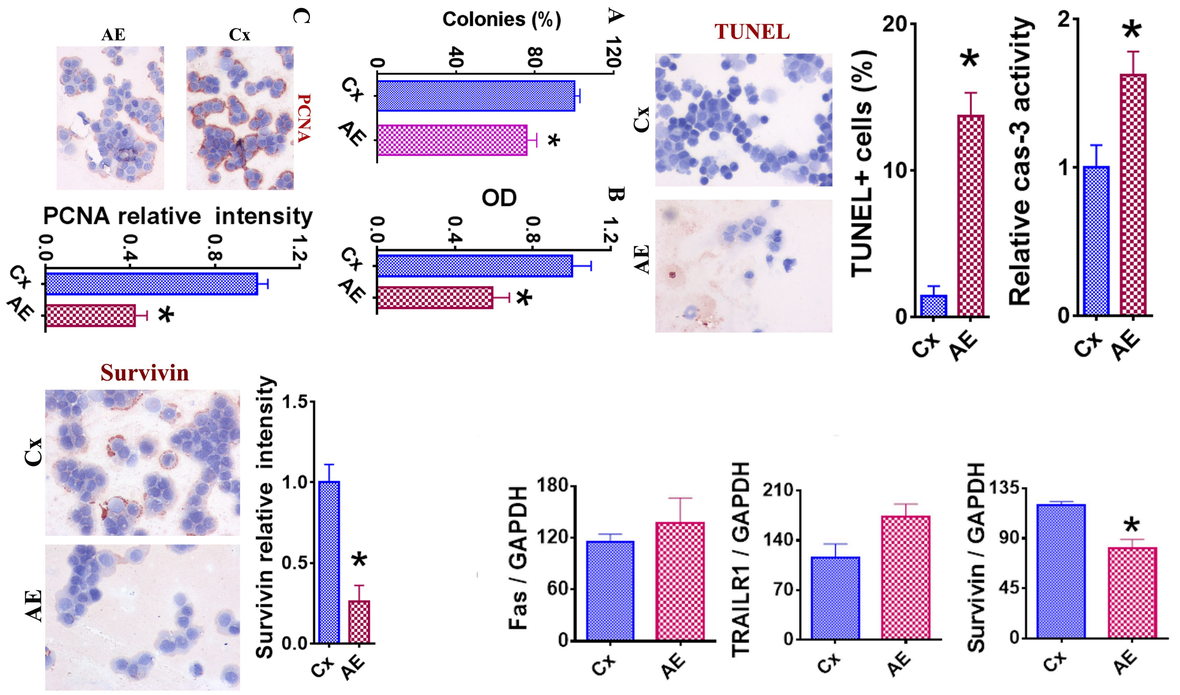


Methods



- Cells from the HCT 1116 line were exposed to aloe extract (AE)
- The effects of AE on the survival, proliferation, and apoptosis of the cells were studied using clonogenic survival assays, cell proliferation, and caspase-3 activity kits
- RT-PCR and immunohistochemistry were used to further investigate molecular mechanisms

Results



Conclusion & Discussion

- The downregulation of survivin and decrease in cell colonies in the presence of AE suggests that it has a pro-apoptotic effect on HCT 1116 colon cancer cells.
- Colon cancer cell colony count was significantly lower in the presence of AE. This was further supported by a decrease in the optical density value of colon cancer cells in the presence of AE.
- The relative caspase-3 activity was higher in the presence of AE in colon cancer cells. This correlates with downregulation of survivin, which inhibits caspases. Such results suggest that AE has an anti-apoptotic effect on HCT 1116 colon cancer cells.
- Downregulation of anti-apoptotic molecules is a promising target for cancer treatment and further investigation into AE as a potential anti-tumor agent is warranted.

References

- Centers for Disease Control and Prevention. (2023, June 8). *Colorectal Cancer: United States Cancer Statistics data visualizations - CDC*. Centers for Disease Control and Prevention. https://gis.cdc.gov/Cancer/USCS/#/AtAGlance/
- Jaiswal PK, Goel A, Mittal RD. Survivin: A molecular biomarker in cancer. Indian J Med Res. 2015 Apr;141(4):389-97. doi: 10.4103/0971-5916.159250. PMID: 26112839; PMCID: PMC4510718.
- Mattaini, Katherine. Introduction to Molecular & Cell Biology. Roger Williams University. 2020.
- Nićiforović A, Adzić M, Spasić SD, Radojcić MB. Antitumor effects of a natural anthracycline analog (Aloin) involve altered activity of antioxidant enzymes in HeLaS3 cells. Cancer Biol Ther. 2007 Aug;6(8):1200-5. doi: 10.4161/cbt.6.8.4383. Epub 2007 May 4. PMID: 17726368.
- Sah NK, Khan Z, Khan GJ, Bisen PS. Structural, functional and therapeutic biology of survivin. Cancer Lett. 2006 Dec 8;244(2):164-71. doi: 10.1016/j.canlet.2006.03.007. Epub 2006 Apr 18. PMID: 16621243.

Acknowledgements

- This work was supported by the grant from Des Moines University for Dr. Yujiang Fang. (IOER 112-3119).

1Department of Microbiology & Immunology, Des Moines University College of Osteopathic Medicine, West Des Moines, IA, 50266
2Department of Surgery, University of Missouri School of Medicine, Columbia, MO, 65212
3Ellis Fischel Cancer Center, University of Missouri School of Medicine, Columbia, MO, 65212