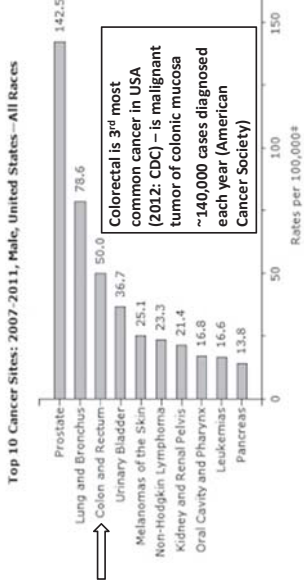


Phytochemical Effect on Colorectal Cancers

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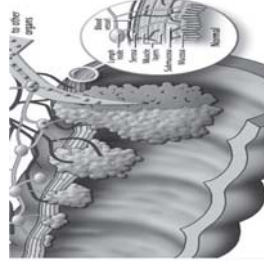
Colorectal Cancer: Epidemiology



Colorectal Cancer: Heredity

- Heredity accounts for 5-10% of colon cancer cases
 - **Familial Adenomatous Polyposis**
 - Mutation in the APC gene - tumor suppressor
 - Attenuated: Functional, but impaired
 - Autosomal recessive: Both parents need to be carriers
 - Risk of colorectal cancer increases with age
 - **Hereditary Non-Polyposis Colon Cancer (Lynch Syndrome)**
 - Mutation in mismatch repair genes
 - Autosomal dominant: Only one parent needs to be the carrier
 - 80% lifetime risk of colon cancer
 - High risk of developing other cancers

Colorectal Cancer: Not Heredity



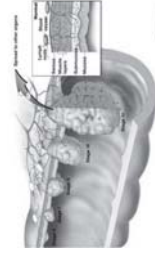
- **Sporadic Colorectal Cancer**
 - Cascade of multiple genetic mutations
 - EXAMPLES: APC, KRAS, p53, mismatch repair genes
 - Accelerated colonocyte replication
 - Progression from benign adenomas to malignant tumors

Colorectal Cancer: Risk Factors



- Traditionally, highest incidence is in the **60-79 year old group**
- As of January 2015, increasing incidence in the **20-39 year age group**
 - "Western diet"
 - Increased consumption of fast-food and processed foods
 - Decreased consumption of fruits and vegetables

Curcumin Effect on Colorectal Cancer



Turmeric



Use of turmeric dates back 4,000 years
Turmeric in humans located in Asian Countries is in the range of 200–1000 mg/day.

Curcuma longa

Traditional Turmeric Uses in India

Cooking: Curry powder is added to several food preparations used at Indian weddings and functions



Anticancer Activity of Natural Compounds

Chemoprevention

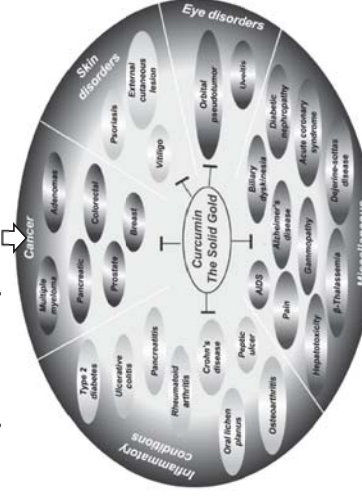
Use of drugs, vitamins or other agents to delay, or reduce the risk of development or recurrence of cancer.

- side effects
- toxicity

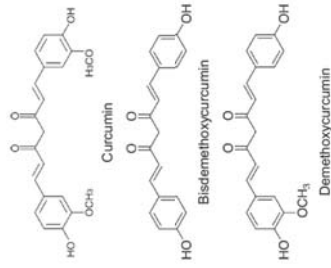
Phytochemicals (fruits, vegetables, spices, herbs)

- no toxicity (long term use by human history)
- effective preventive strategy for people with increased risk of cancer development

Current Scientific Evidence of Turmeric (Curcumin) Effect on Disease



Major Curcuminoids in Turmeric



More than 100 compounds have been isolated from turmeric.
 Tumericone (<3% volatile oil)
 Curcumininoids (5-6%)
 77% curcumin
 17% demethoxycurcumin
 3% bisdemethoxycurcumin

Curcumin Downregulates Polycarb Repressive Protein (PRP), B-cell Moloney Murine Leukemia Virus Insertion Region (BMI1)

BMI1:

- involved in chromatin remodeling
- decreased after cell differentiation
- involved in tumorigenesis
- high expression is correlated with TX failure in: breast, prostate, lung, and ovarian cancer

Novel target for drug discovery in cancer

BMI1 Protein Expression Is Down-regulated by Curcumin

Western Blots



Termitope Adeyemi: American Society of Clinical Laboratory Science (ASCLS) Education and Research (E&R) Fund (L. Dean Spradling Graduate Student Grant)

Synergistic Interactions of Phytochemicals

Epidemiological studies show that regular consumption of fruits and vegetables reduced risk of developing cancer.

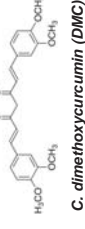


CANCER

Curcumin and its Analogues



B. bisdemethoxycurcumin (BDMC)



D. tetrahydrocurcumin (THC)

Cancer Rate in India Is Low

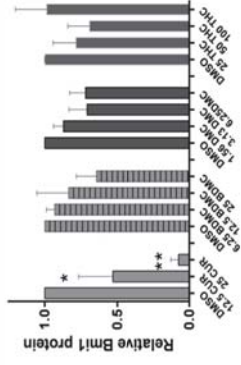
Table 1: Comparison of cancer rates in India and the United States*

	India		United States	
	Male	Female	Male	Female
Cancer Rates, all sites except skin	99.0	104.4	361.4	283.2
Oral	12.8	7.5	6.3	3.7
Oesophagus	7.6	5.1	4.9	1.4
Stomach	5.7	2.8	7.3	3.6
Lung	9.0	2.0	58.6	34.0
Colon/Rectum	4.7	3.2	40.6	30.7
Breast	—	19.1	—	91.4
Ovary	—	4.9	—	10.6
Cervix	—	30.7	—	7.8
Endometrial	—	1.7	—	15.5
Prostate	4.6	—	104.3	—
Liver	2.3	2.0	4.2	1.7
Bladder	3.2	0.7	23.4	5.4
Kidney	1.2	0.5	11.2	6.0
Melanoma of the skin	0.3	0.2	4.2	1.7

Sinha B, Anderson DE, McDonald SS, Greenwald P. Cancer risk and diet in India. J Prevgrad Med 69:222-226, 2003 National Cancer Institute of the NIH.

BMI1 Protein Expression Is Down-regulated by Curcumin

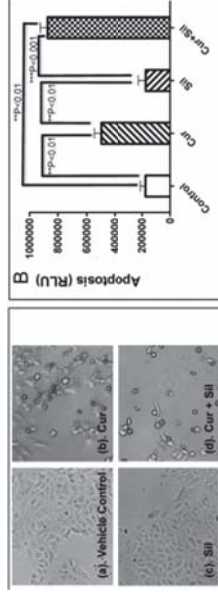
Quantitative Analysis of Western Blots



Curcuminoids (μ M)

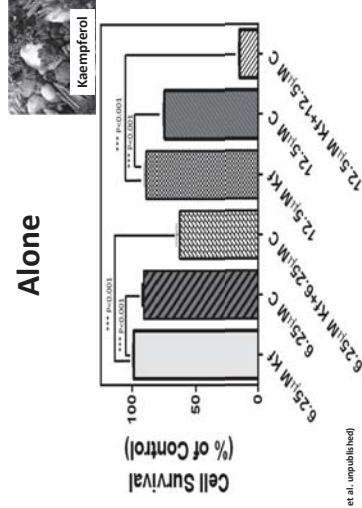
Termitope Adeyemi: American Society of Clinical Laboratory Science (ASCLS) Education and Research (E&R) Fund (L. Dean Spradling Graduate Student Grant)

Curcumin/Silymarin Combination Kills More Cancer Cells Than Either One Does Alone



Termitope Adeyemi: American Society of Clinical Laboratory Science (ASCLS) Education and Research (E&R) Fund (L. Dean Spradling Graduate Student Grant)

Curcumin/Kaempferol Combination Kills More Cancer Cells Than Either One Does Alone



(Ezele et al. unpublished)



Ezekiel

**“Add a little bit of spice to live
a healthy life.”**



Hippocrates

**“Let food be thy medicine
and medicine be thy food.”**



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- Amanda Montgomery
- KayKay San
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- Temitope Adeyeni
- Aravinda Ganapathy
- Sarah Butterfield

Faculty (collaborator)

- Rita Heuertz, PhD

**Ezekiel Lab
Team Members**