RECENT ADVANCES IN THE NUTRITION AND FUNCTIONAL ASPECTS OF TROPICAL FRUITS

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INTERNATIONAL SEMINAR ON CONSUMER TRENDS AND EXPORT OF TROPICAL AND SUBTROPICAL FRUITS
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Food, Nutrition and the Prevention of Cancer

a global perspective

SUMMARY

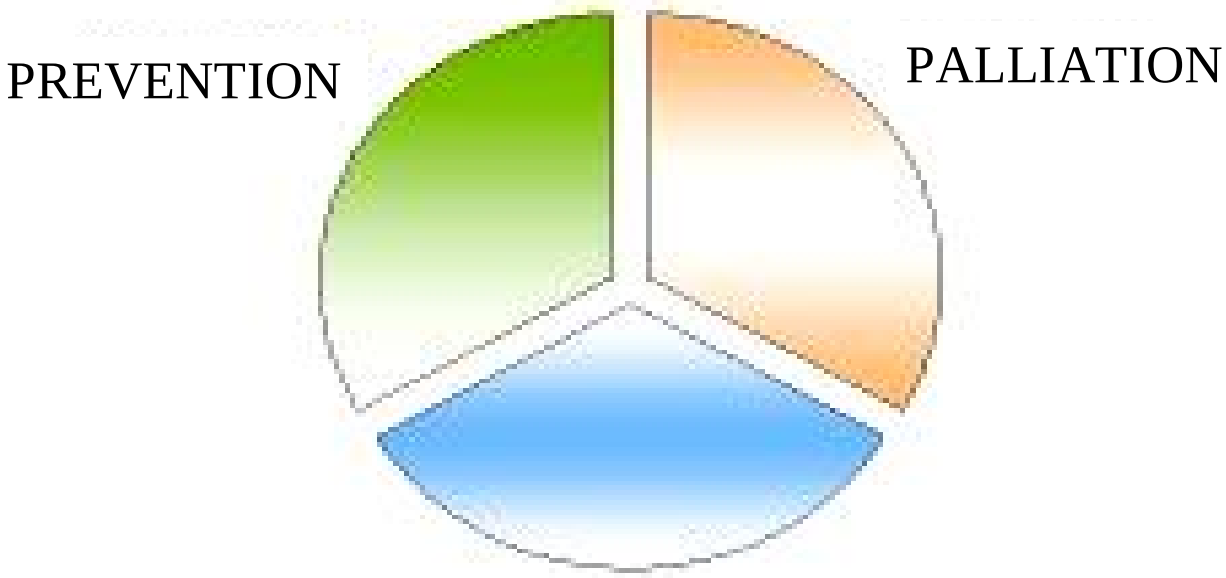
It is abundantly clear that the incidence of all the common cancers in human is being determined by various potentially controllable external factors.

This is surely the most comforting fact to come out of all cancer research, for it means that cancer is, in large part, a preventable diseases.

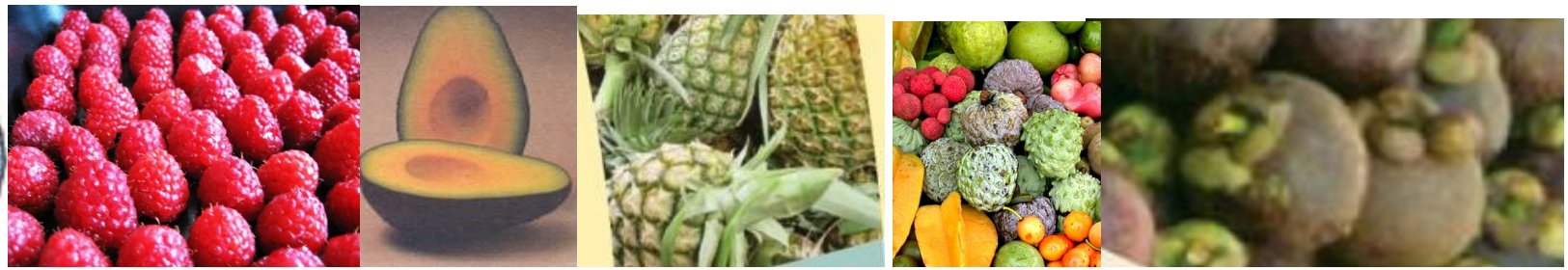
World Cancer Research Funds (WCRF) & American Institute for Cancer Research (AICR) 1997: 670 halaman

WHO 2002

CANCER STRATEGIES



Ten years later:
2007 SECOND REPORT
Food, Nutrition, Physical Activity, and the Prevention of Cancer:
a Global Perspective



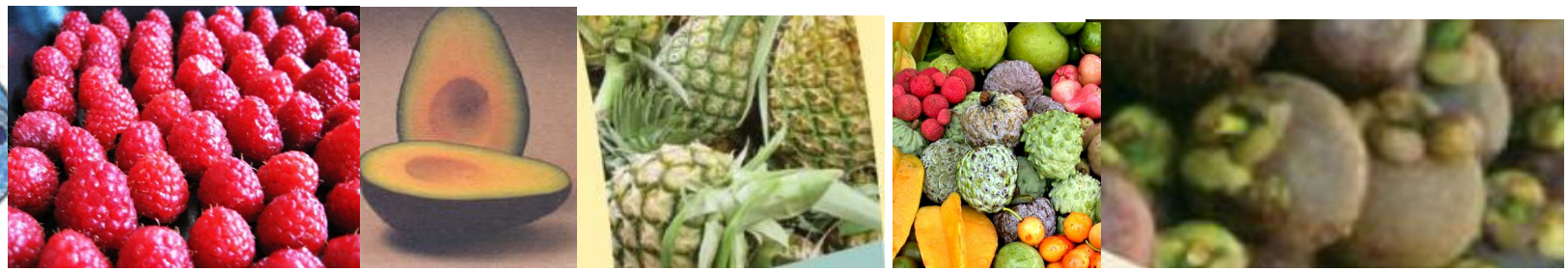
Scale of the second decade project

1. 5 years

2. Meeting every 6 months

3. Initially identified 500,000 papers

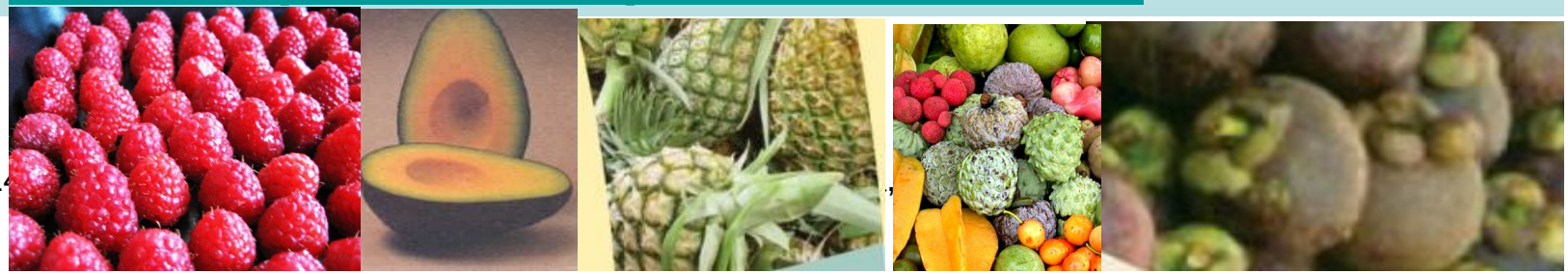
- **> 6000 considered**
- **20 Systematic Literature Review groups**



Recommendations for Cancer Prevention

From the WCRF/AICR Second Expert Report 2008.

- **Be as lean as possible without becoming underweight.**
- **Be physically active for at least 30 minutes every day.**
- **Avoid sugary drinks. Limit consumption of energy-dense foods (particularly processed foods high in added sugar, or low in fiber, or high in fat).**
- **Eat more of a variety of vegetables, *fruits*, whole grains and legumes such as beans. (at least 400-600 fruits and non-starch vegetable)**
- **Limit consumption of red meats (such as beef, pork and lamb) and avoid processed meats.**



Recommendations for Cancer Prevention

From the WCRF/AICR Second Expert Report 2008.

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- If consumed at all, limit alcoholic drinks to 2 for men and 1 for women a day.
- Limit consumption of salty foods and foods processed with salt (sodium).
- Don't use supplements to protect against cancer.

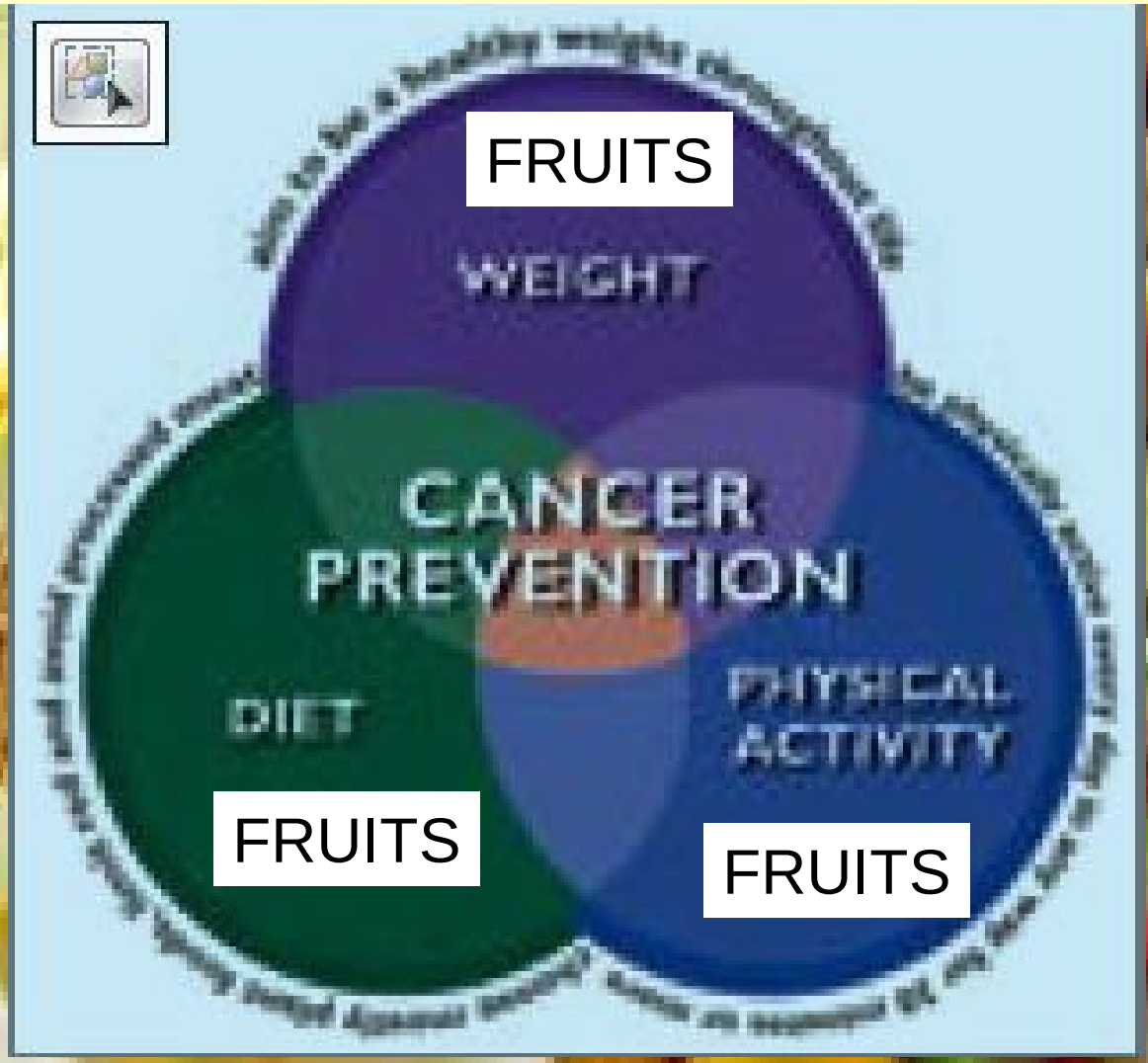
Special Population Recommendations

- It is best for mothers to breastfeed exclusively for up to 6 months and then add other liquids and foods.
- After treatment, cancer survivors should follow the recommendations for cancer prevention.

And always remember – do not smoke or chew tobacco

AICR GUIDELINES FOR CANCER PREVENTION

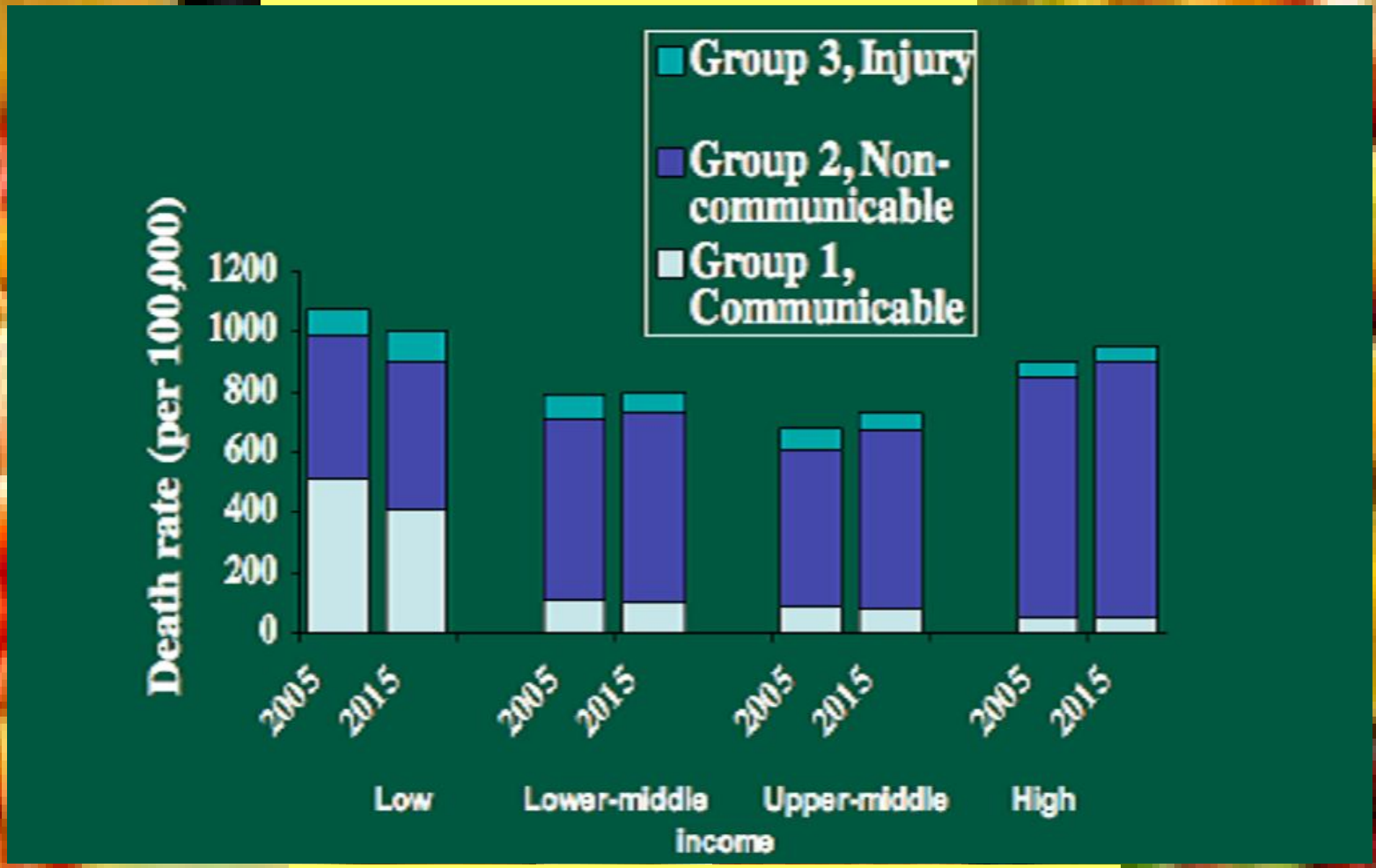
2008



Guideline	Cancer (WCRF, 1997)	Chronic Diseases (USDA/DHHS, 2000)
Plant foods	Eat a variety of plant based foods: ≥5 servings/d of vegetables/fruits ≥ 7 servings/d of pulses/whole grains	Follow the Food Guide Pyramid: 5-9 servings/d of a variety of veg/fruit; 6-11 servings/d of a variety of grains, esp. whole grains
High-Fat Foods	Limit fatty foods, especially of animal origin	Choose diet low in saturated fat and cholesterol, and moderatein total fat

Comparison between Guidelines for Cancer and for Major Chronic Diseases

Global Pattern of Disease

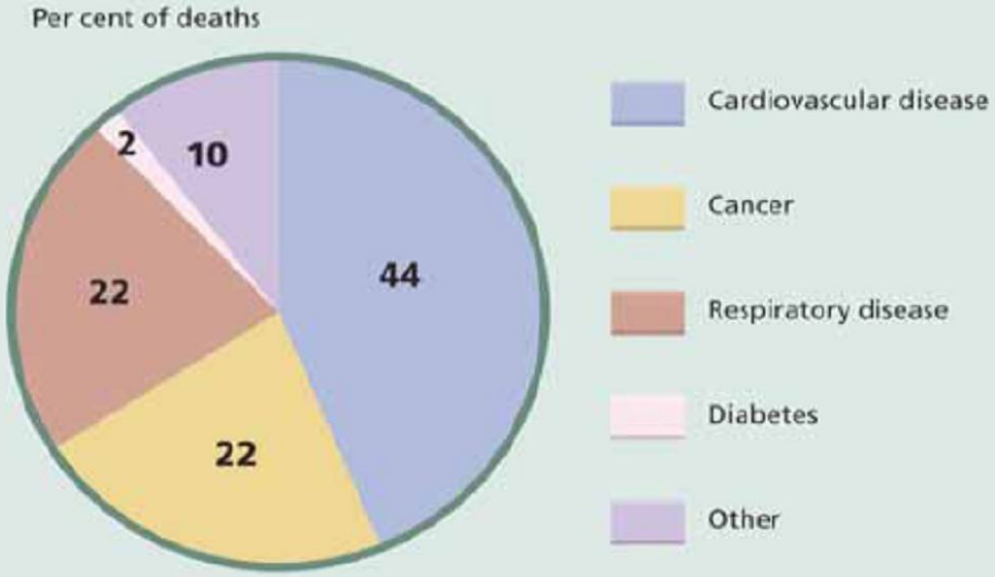


Countries grouped by income

(WHO 2005)

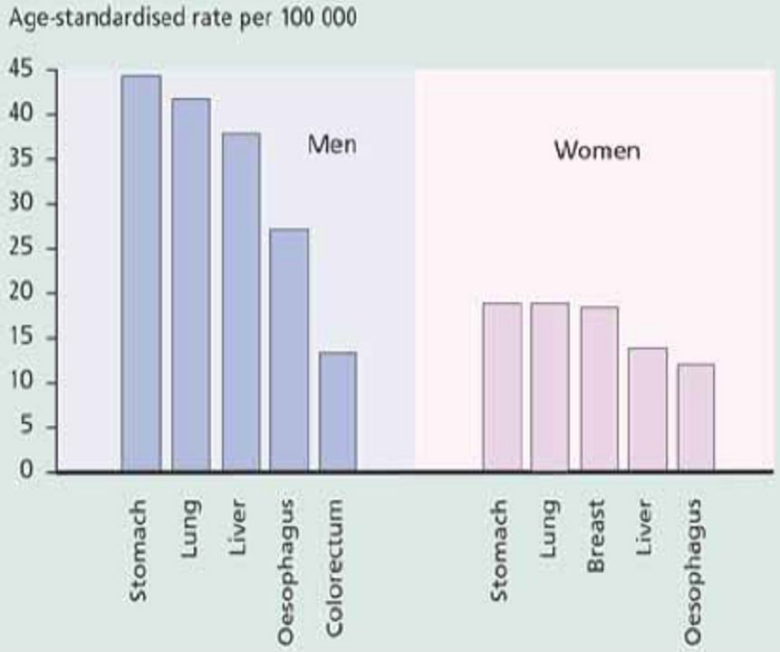
Global Patterns in Cancer: China

Non-communicable causes of death — China



Data from World Health Organization[46]

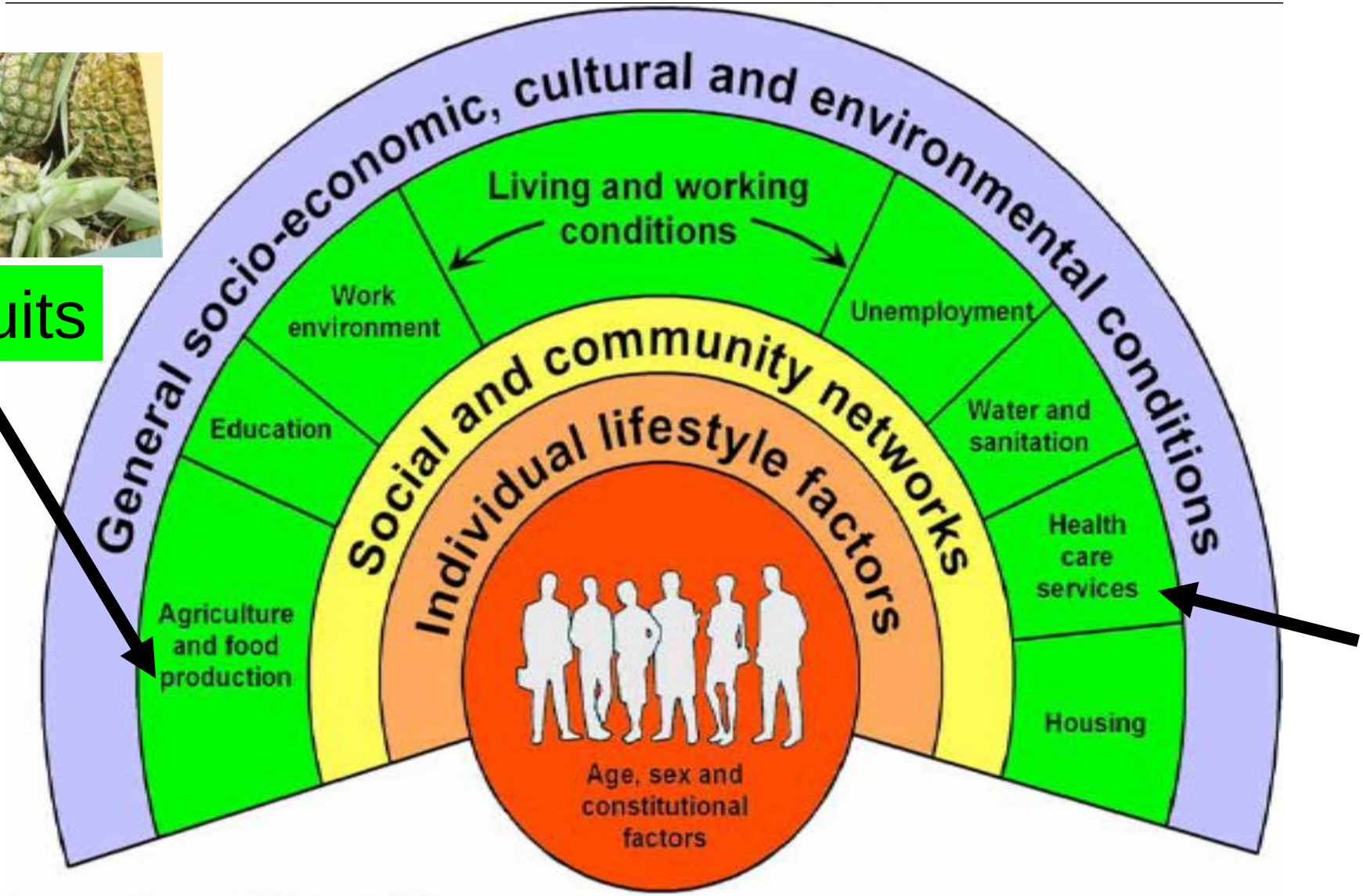
Age-standardised rates of common cancers — China



Data from International Agency for Research on Cancer[20]

The main determinants of health

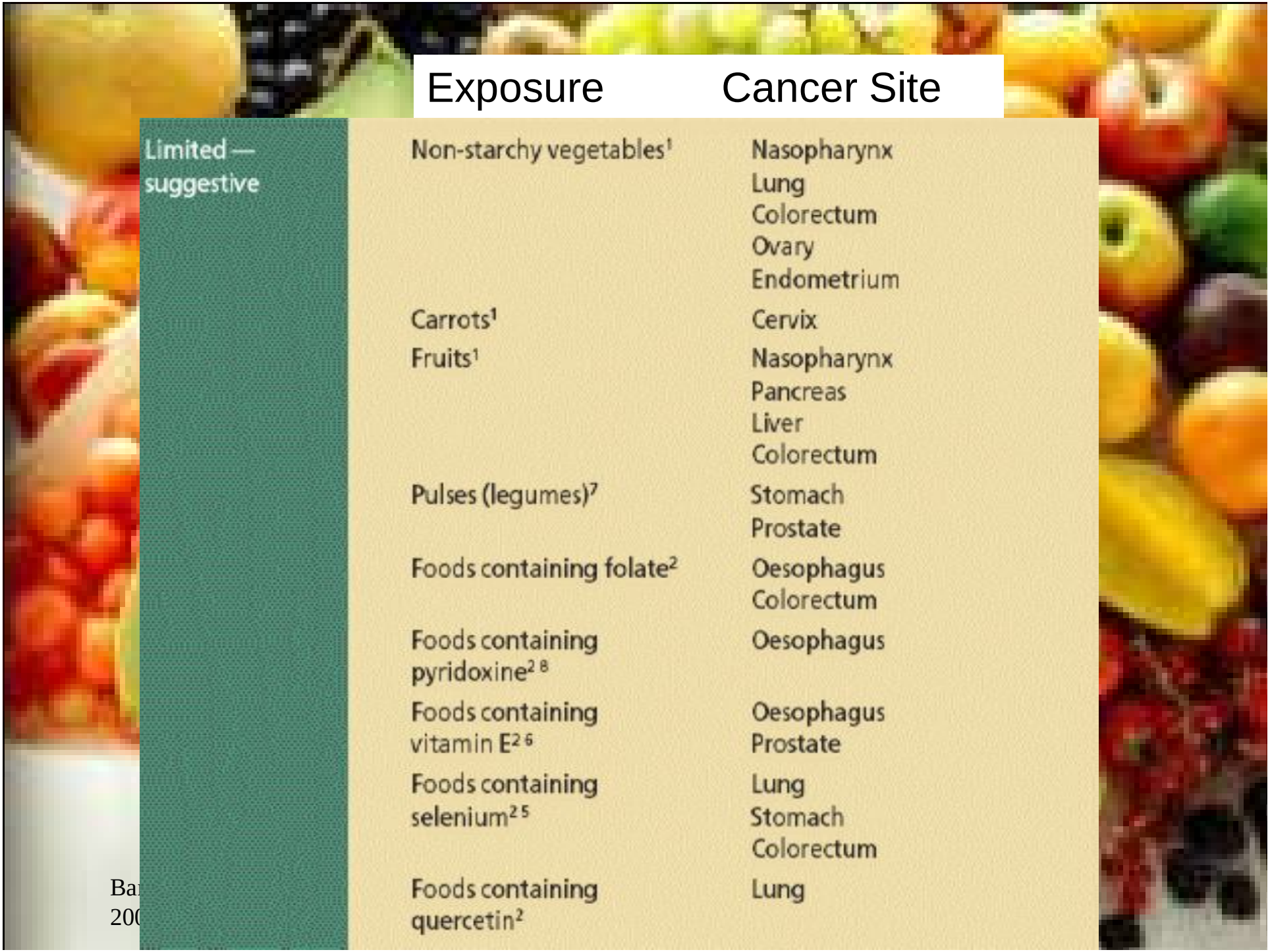
Fruits



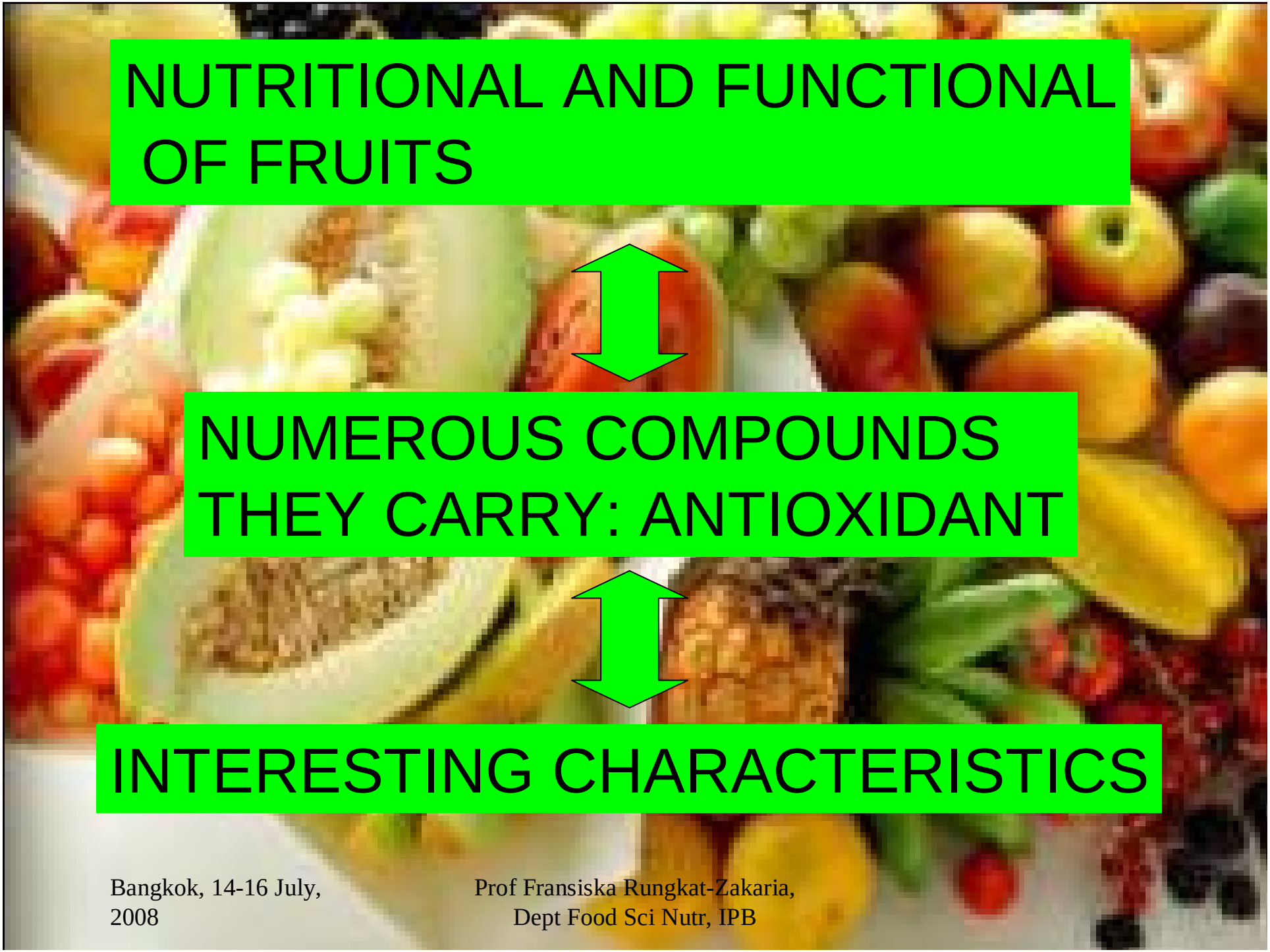
Source: Dahlgren and Whitehead, 1991

	DECREASES RISK	
	Exposure	**Cancer site**
Convincing		
Probable	Non-starchy vegetables[1]	Mouth, pharynx, larynx Oesophagus Stomach
	Allium vegetables[1]	Stomach
	Garlic[1]	Colorectum
	Fruits[1]	Mouth, pharynx, larynx Oesophagus Lung Stomach
	Foods containing folate[2]	Pancreas
	Foods containing carotenoids[2]	Mouth, pharynx, larynx Lung
	Foods containing beta-carotene[2]	Oesophagus
	Foods containing lycopene[2,3]	Prostate
	Foods containing vitamin C[2,4]	Oesophagus
	Foods containing selenium[2,5]	Prostate

Ba
20



	Exposure	Cancer Site
Limited — suggestive	Non-starchy vegetables[1]	Nasopharynx Lung Colorectum Ovary Endometrium
	Carrots[1]	Cervix
	Fruits[1]	Nasopharynx Pancreas Liver Colorectum
	Pulses (legumes)[7]	Stomach Prostate
	Foods containing folate[2]	Oesophagus Colorectum
	Foods containing pyridoxine[2 8]	Oesophagus
	Foods containing vitamin E[2 6]	Oesophagus Prostate
	Foods containing selenium[2 5]	Lung Stomach Colorectum
	Foods containing quercetin[2]	Lung


NUTRITIONAL AND FUNCTIONAL OF FRUITS
NUMEROUS COMPOUNDS THEY CARRY: ANTIOXIDANT
INTERESTING CHARACTERISTICS

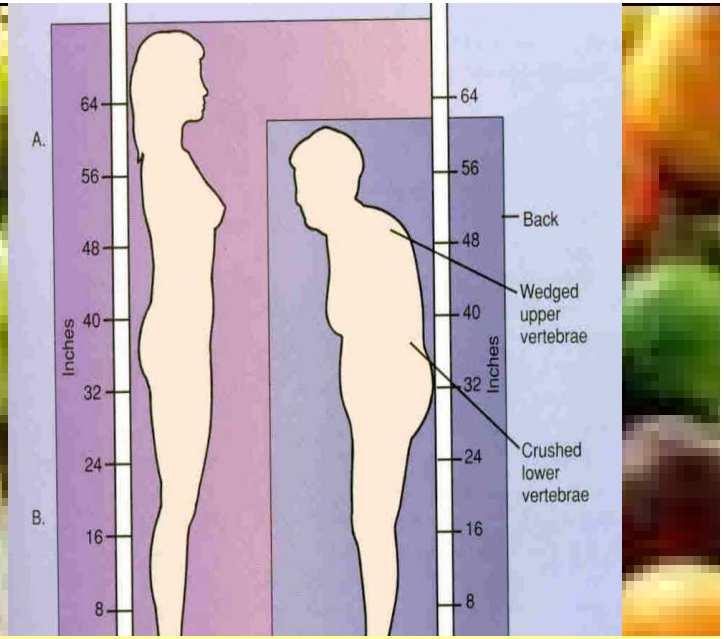
May Reduce Disease Risk. Eating plenty of fruits and veggies may help reduce the risk of many diseases, including heart disease, high blood pressure, and some cancers.

- **Fiber.** Fruits provide fiber that helps fill you up and keeps your digestive system happy.
- **Low in Calories.** Fruits are naturally low in calories.
- **Vitamins & Minerals.** Fruits are rich in vitamins and minerals that help you feel healthy and energized.

Phytochemicals. Aintioxidants and others

- **Color & Texture.** Fruits add color, texture … and *appeal*
- **Convenience.** Nutritious – fresh, frozen, canned, dried, juice
- **Variety.** Available in an almost infinite variety of preperations
- **Quick, Natural Snack.** nature's treat and easy to grab snack.
- **Fun to Eat!** Some crunch, some squirt, some you peel … and some grow right in your own backyard!

VITAMINS AND MINERALS



•**Calcium**: is essential for healthy bones and teeth,normal functioning of muscles, nerves and some glands.

- **Folate:** reduce a woman's risk of having a child with a brain or spinal cord defect.
- **Iron:** healthy blood and normal functioning of all cells.
- **Magnesium:** healthy bones; involved with more than 300 enzymes in the body! Inadequate levels may result in muscle cramps and high blood pressure.
- **POtassium:** maintain a healthy blood pressure.
- **Sodium**: normal cell function throughout the body. Most diets contain too much sodium which is associated with high blood pressure.
- **Vitamin A:** Keeps eyes and skin healthy and helps protect against infections.
- **Vit C:** heal cuts and wounds and keeps teeth and gums healthy

Vitamin A and C in Mango and Other Fruit

Tropical Fruit	Vitamin, A (IU / 100g)	Vitamin C (mg/100g)
Mango	765	27.7
Orange	225	53.2
Banana	64	8.7
Pineapple	56	36.2

Source: USDA National Nutrient Database[1]

	Vit C,mg	Folate,mcg	Ca, mg	Fe,mg	Na
Apple	6(138g)	4(138g)	8	0.17	1
Banana	10(118g)	24(118g)	6	0.31	1
Pumpkin,boile	12(245g)	22	37	1.40	2
Watermelon,	12(152g)	5	11	0.36	2
Pink grapefruit	38(123g)	16(123g)	27	0.1	0
Papayas,	188(304g	116	73	0.30	9
Cantaloupe,	59(150g)				
Plantains, raw	33(179g)	39	5	1.07	7
Tomatoes, Pineapple Carambola Avocado	2.2(17g) 74(155g) 37(10g)	3 28 11(91g) 10(28g)	2 20 3 4	0.05 0.45 0.07 0.05	1 2 2 1

•Phytochemicals

CAROTENOIDS

Alpha-carotene, beta-carotene, and beta-cryptoxanthin: provitamin A carotenoids, can be converted by the body to retinol (vitamin A). Vitamin A is essential for normal immune system function

Lutein, zeaxanthin, and lycopene: vitamin A activity

Biological effects in humans: antioxidant activity or other non-antioxidant activities.

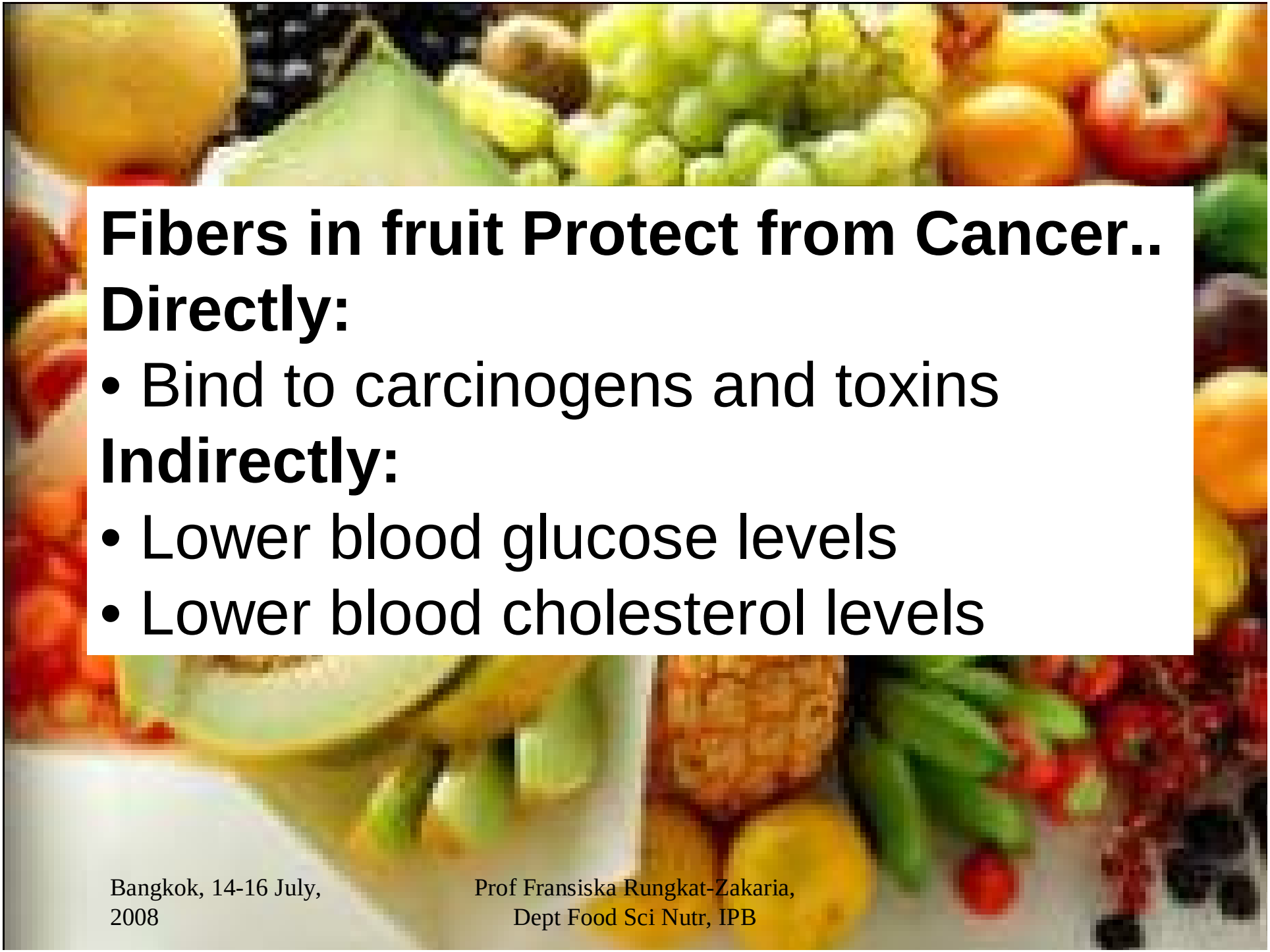
Although the results of epidemiological studies suggest that diets high in carotenoid-rich fruits and vegetables are associated with reduced risk of cardiovascular disease and some cancers, high dose beta-carotene supplements did not reduce the risk of cardiovascular diseases or cancers

Lutein and zeaxanthin:

- the only carotenoids found in the retina and lens of the eye.
- Diets rich in lutein and zeaxanthin may help slow the development of age-related macular degeneration and cataract,
- it is not known whether lutein and zeaxanthin supplements will slow the development of these age-related eye diseases
- Facilitate intercellular communication by increasing the expression of the gene encoding a connexin protein, (appears unrelated to the vitamin A or antioxidant activities of carotenoids).

This communication often lost in cancer cells.

Carotenoids, mcg/100g ep	Carotene, beta	Cryptoxanthin, beta	Lutein + zeaxanthin	Carotene, alpha	**Lycopene**
Apple	**27**	**11**	**22**		
Banana	**26**		**22**	**25**	
Pumpkin (1 cup)	**17,003**	3,553	**2,484**	**11,748**	
Watermelon, 1 wedge		**223**			12,962
Pink grapefruit, ½			180 (250g Juice)		**1,745**
Papayas, 1 m		**2,313**	228 (304g)		
Cantaloupe, 1 cup	**3,232**				
Plantains, raw			54 (179g)	**784**	
Tomatoes, Carambola			60 (91g)	**124, (1m)**	**4631, (**1c)



Fibers in fruit Protect from Cancer..

Directly:

- Bind to carcinogens and toxins

Indirectly:

- Lower blood glucose levels
- Lower blood cholesterol levels

Phytochemicals

- Classified according to chemical structure and functional characteristics
- Include *salicylates, phytosterols, saponins, glucosinolates, polyphenols, protease inhibitors, monoterpenes, phytoestrogens, sulphides, terpenes,* carotenoids, *and lectins*
- Several act as antioxidants, preventing oxidative damage to cells, proteins, and DNA (anti cancer)

Green Foods: contain phytochemicals like *sulforaphane* and *indoles* which are powerful anti-cancer compounds

- **Red foods:** contain many phytochemicals that reduce free radical damage. They are also rich in *lycopene*

- **Orange Foods:** contain *carotenoids* which
may help prevent cancer by repairing the DNA.

Orange /Yellow Foods: rich in *antioxidants*, especially *Vitamin C*, and help to improve the health of the mucus membranes and connective tissue. They may help prevent heart disease by improving circulation and preventing inflammation.

- **White/Green Foods:** contain a variety of phytochemicals. Carambola, mangistan, rambutan, salak, duku

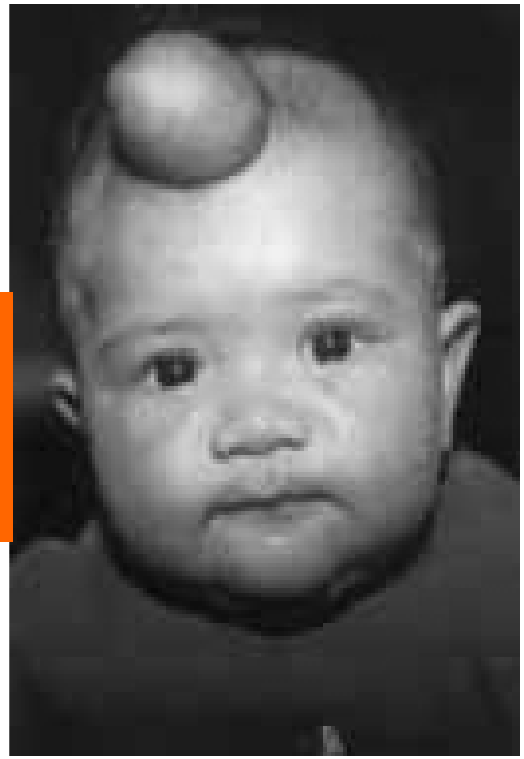
- **Red/Blue/Purple Foods:** very rich in *anthocyanins* that prevent blood clots. They have many antiaging phytochemicals that keep the blood circulating reducing the effects of trans fats and processed foods.

How fruits prevent Cancer and other Degenerative diseases?

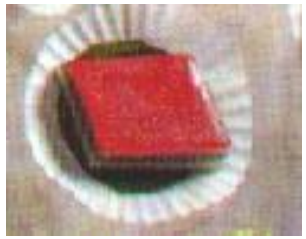
85%-90% of cancer incidence is caused by external factors:

Unwanted chemicals (xenobiotics): polluted/contaminated food, drinks,water, udara; UV; virus; infections

CELL DNA DAMAGE

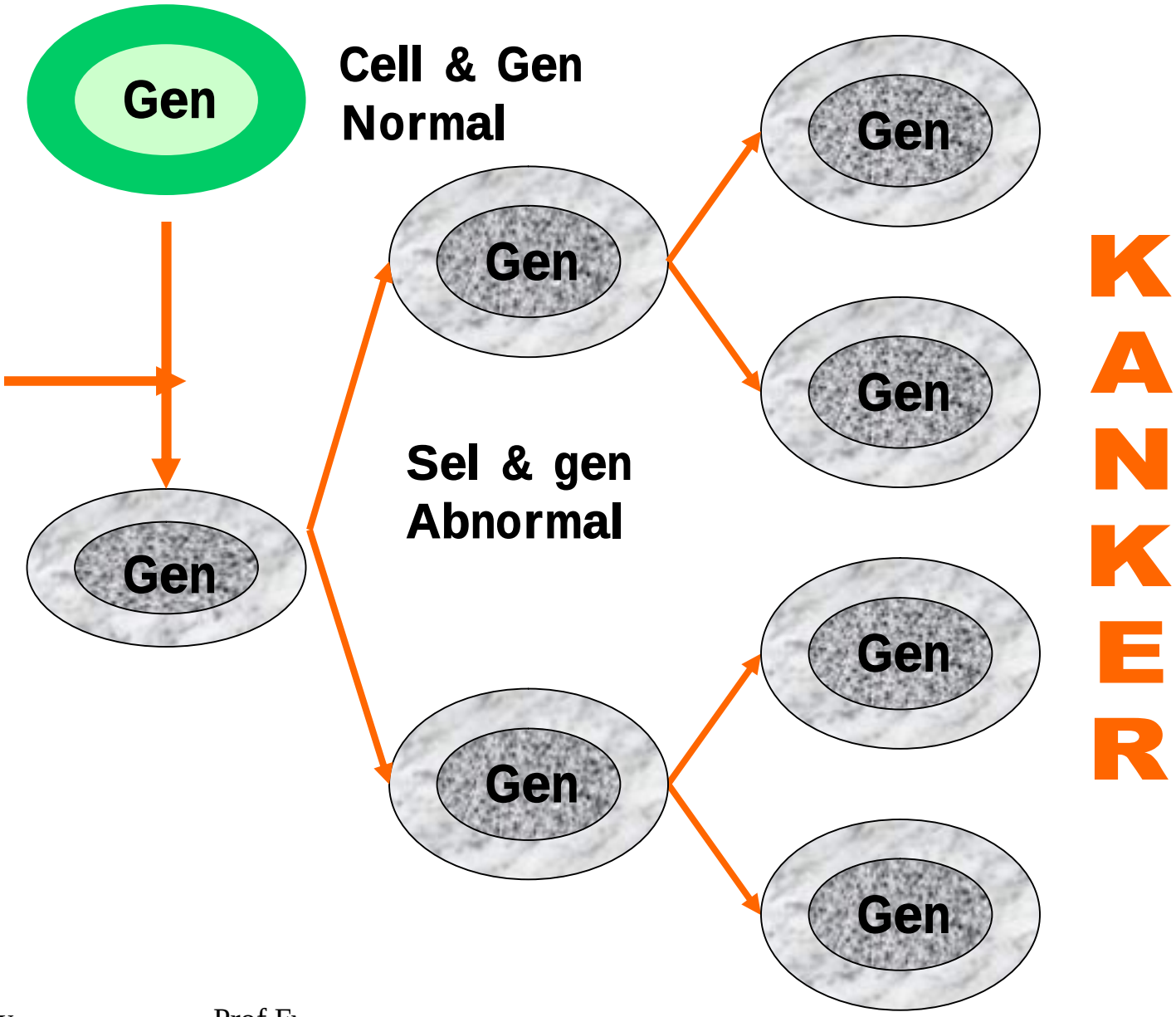


HOW CANCER STARTS ?



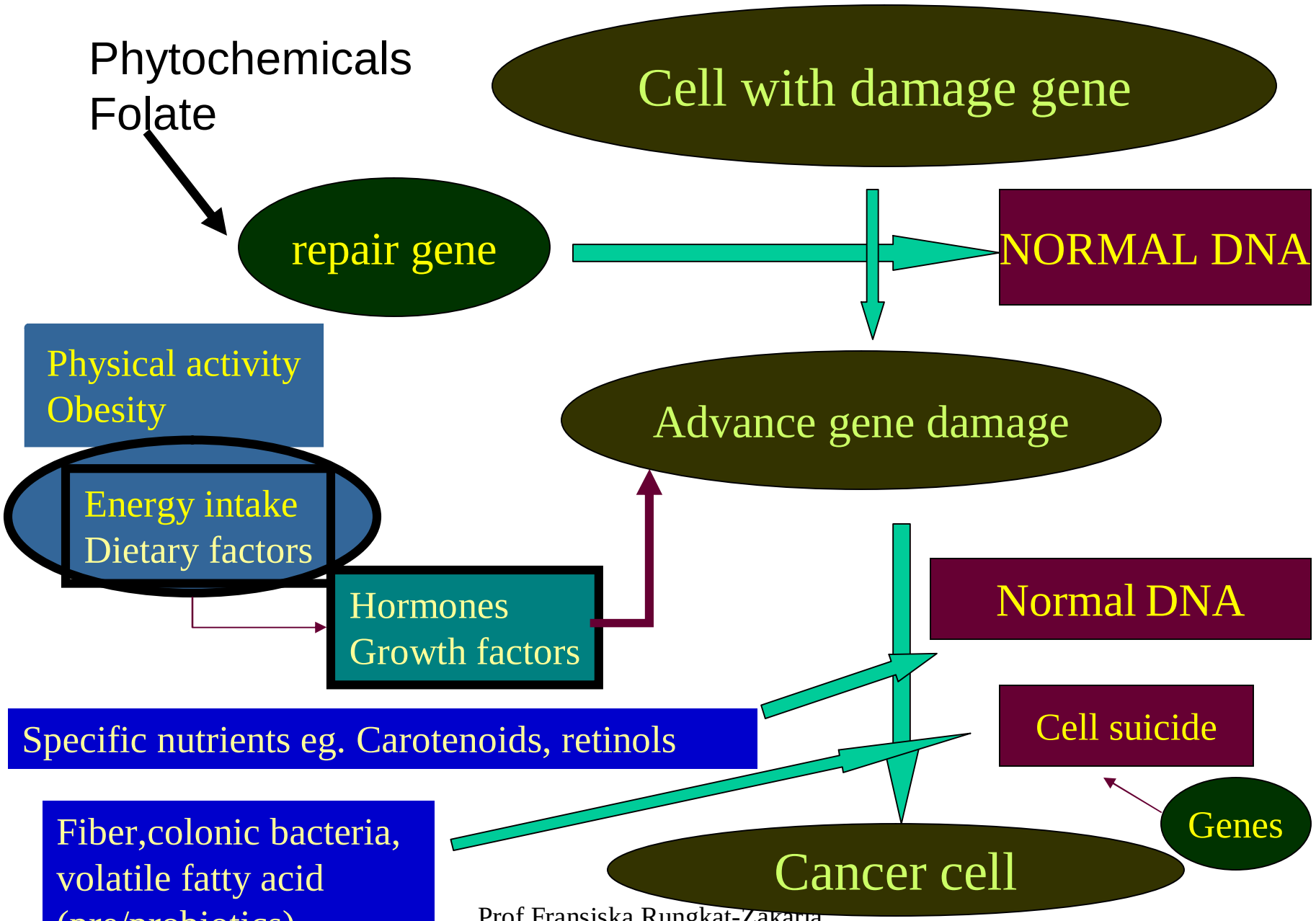
Xenobiotics (food, air,water), UV, virus, infections: 85%-90%

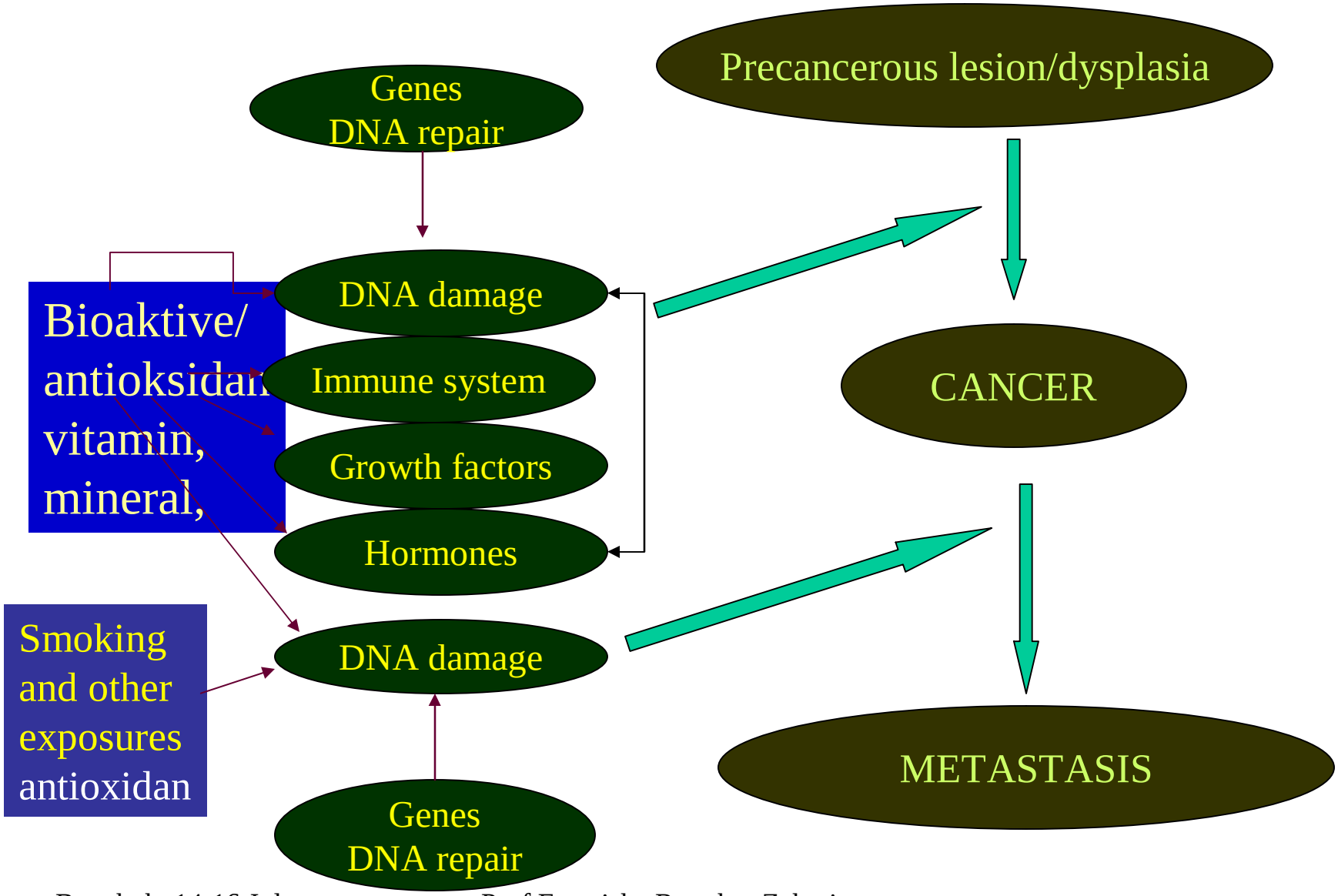
Endogenous: 15%

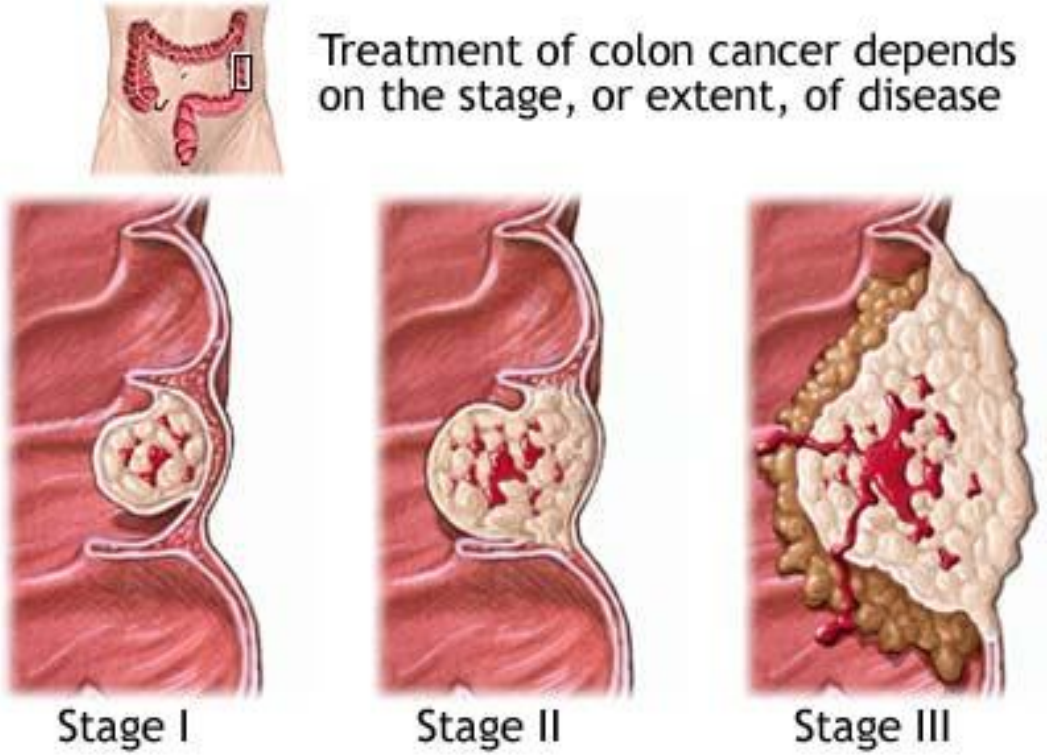


Prof F.

Xenobiotics, UV, virus, infections, over weight, hormones


Phytochemicals
Folate
Cell with damage gene
repair gene
NORMAL DNA
Physical activity
Obesity
Advance gene damage
Energy intake
Dietary factors
Hormones
Growth factors
Normal DNA
Specific nutrients eg. Carotenoids, retinols
Cell suicide
Fiber,colonic bacteria, volatile fatty acid (pre/probiotics)
Genes
Cancer cell


Precancerous lesion/dysplasia
Genes
DNA repair
DNA damage
Immune system
Growth factors
Hormones
Bioaktive/
antioksidan
vitamin,
mineral,
CANCER
Smoking
and other
exposures
antioxidan
DNA damage
METASTASIS
Genes
DNA repair



Dysplasia

(Promotion stage)

Suppressed by SCFA

Crops For Health™ is a unique transdiciplinary research program the goal of which is to improve the disease prevention characteristics of food crops, thereby reducing chronic disease morbidity and mortality. The focus of the program is on the major staple crops of the world's population: dry beans, corn, potatoes, rice, and wheat. Speciality crops are also investigated.

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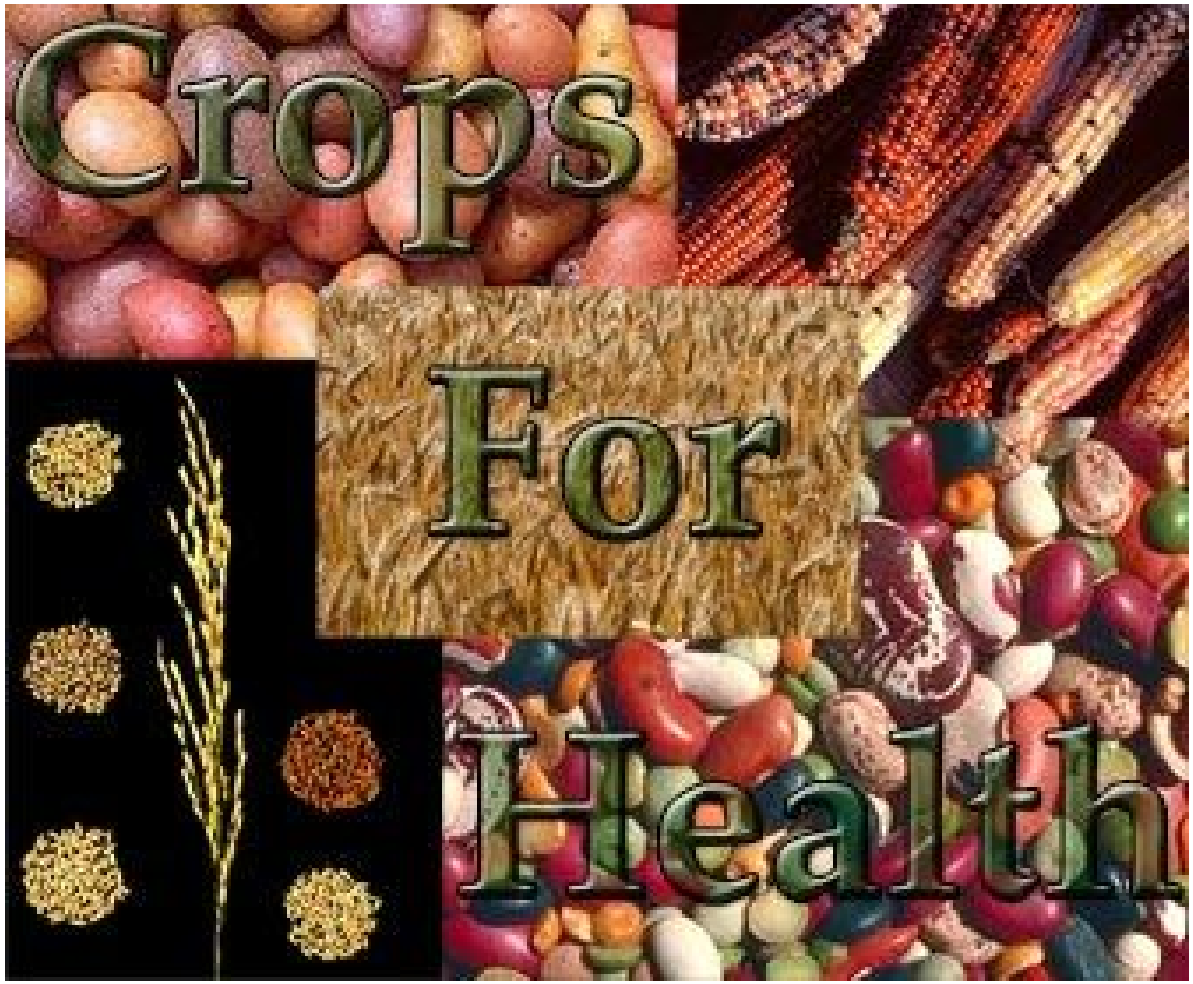
Updated July 2, 2008 3:43 PM



- Dr. Thompson, Ph.D., Professor of Horticulture and Landscape Design at Colorado State University and Director of the University's Cancer Prevention Laboratory, was a pioneer in the study of how food and physical activity influence cancer. Much of Dr. Thompson's current research centers on the cellular effects of energy: energy consumed through food and energy used through activity.

- **Q: Most cancer researchers have appointments in their schools of medicine or health sciences, yet you are a faculty member in your school's department of horticulture and landscape architecture. Why?**
- **A:** Food is the best way to deliver chemicals to the body, yet there is a lack of communication between people in the biomedical sciences and people in agriculture. We believe a cancer prevention laboratory should be located in a place where people make decisions about what is planted. Great science comes from spontaneous interaction when someone's light bulb goes off. If you want to achieve change, you really need to hang your coffee cup in the same place as the people you want to interact with.

Project Title:	Prostate Cancer Prevention by Grape Seed Extract
Research Institution:	AMC Cancer Research Center
State, Country:	Colorado, United States
Researchers:	Chapla Agarwal, Ph.D.
Year:	2000
Project Description:	Dr. Agarwal is assessing the effect of grape seed extract on cell signaling in human prostate cancer lines in culture and the action of the extract on growth and regression of human prostate cancer cells implanted in mice.

Hasil penelitian yang dilakukan oleh Zakaria et al. (1996)Blood vitamin C and E, stress oxidative level and food contamination score*

Parameter	Industry labors (n=77)		Lecturers/High School Students (n=84)	
	Adult	Teens	Adult	Teens
MDA (μmol/L)	1.18	1.05	0.72	0.86
Vitamin C (mg/L)	1.63	1.65	3.23	3.21
Vitamin E (μmol/L)	11.26	11.77	19.54	13.00
Total contamination score	1059.59	1410.70	656.53	678.30
Pb contamination score	555.52	833.10	335.12	412.80

*(Zakaria-Rungkat et al, 1996)

Feeding study

- 80 respondens, industry workers from four industries

- supplemented with vegetables and fruits, that content vitamin C (60 mg/day) and E (10 mg/day)for 30 days.

Table. Vitamin C and E in Some local Fruit*

Material	[Vit. C] (mg/100 g)	[Vit. E] (mg/10 g)
Cassava leaf, boiled	80.81	1.70
Green large chili steamed	40.76	1.69
Pine apple	12.86	-
Papaya*	26.67	-
Banana, King	12.12	-
Clementine	10.11	-
Red large chili	8.03	-
Orange, for juice	7.36	-
Orange, valencia	31.02	-
Mango*	37.14	-
Guava*	52.06	-
Tomato	3.61	-
Apple, local	5.82	-
Soy seed	-	1.79
Coconut meat	-	0.43

*Used In feeding study

*Zakaria-Rungkat Et al, 1997

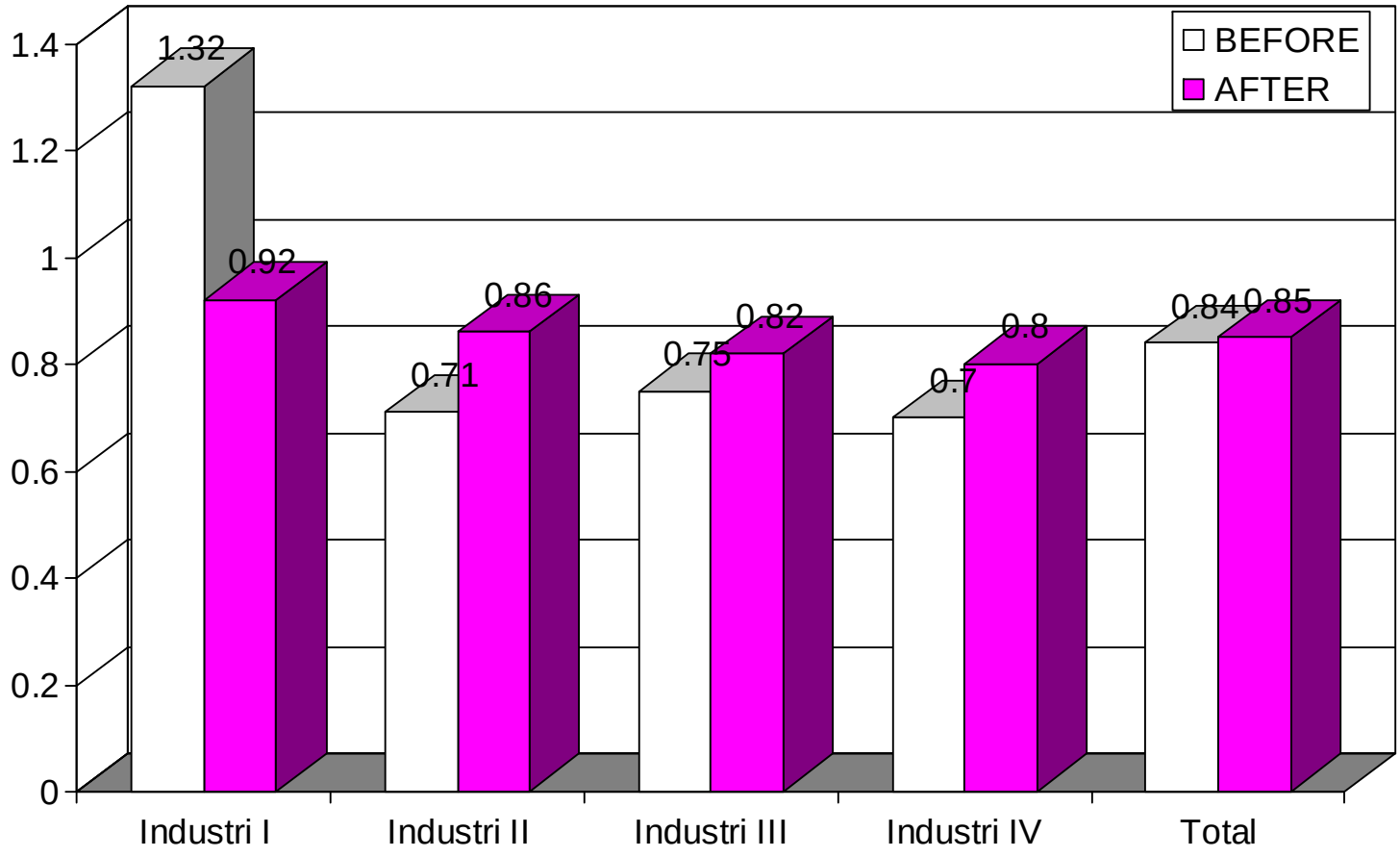


FIGURE. PLASMA Pb OF WORKERS IN 4 INDUSTRIES

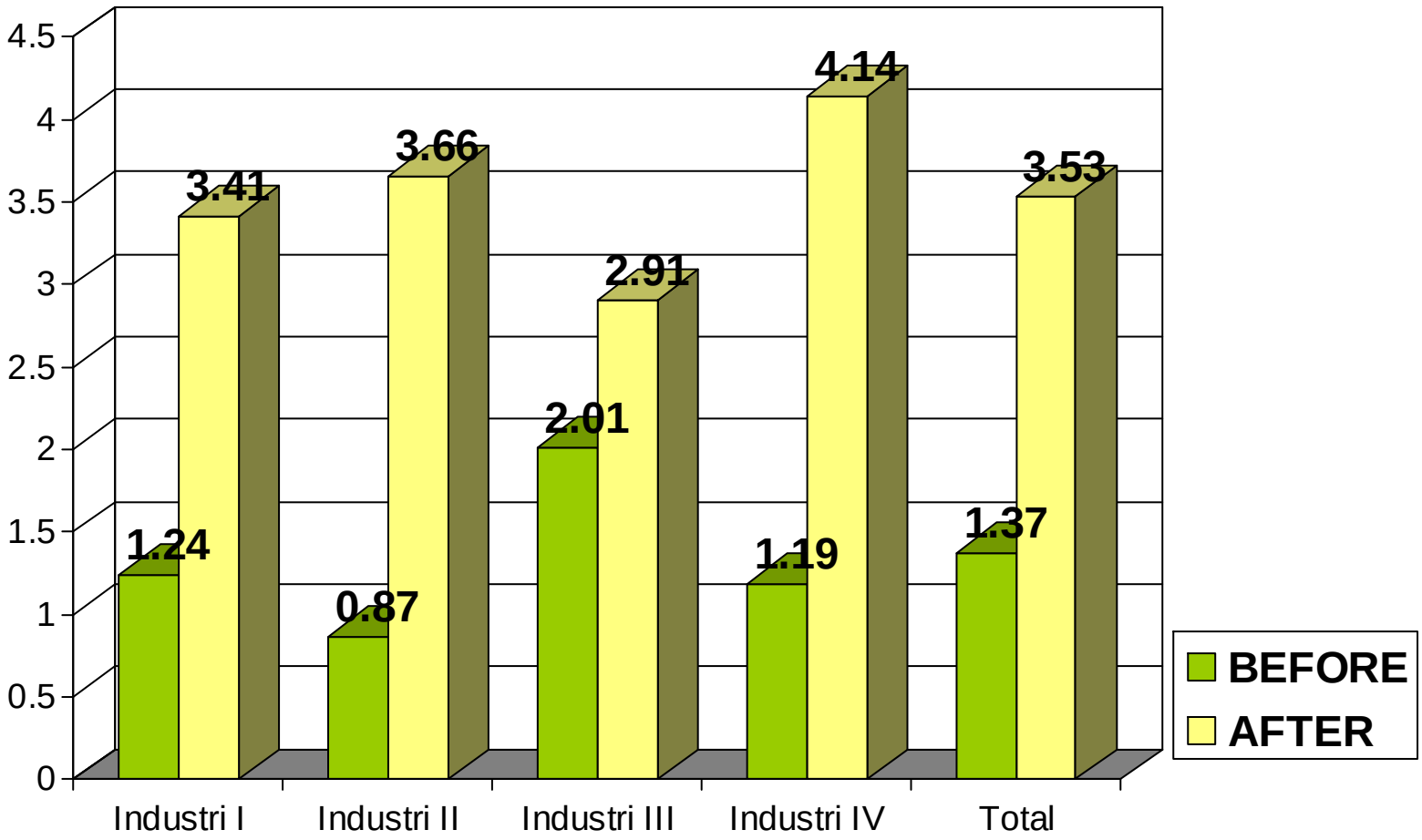


FIGURE. PLASMA VITAMIN C OF WORKERS IN 4 INDUSTRIES

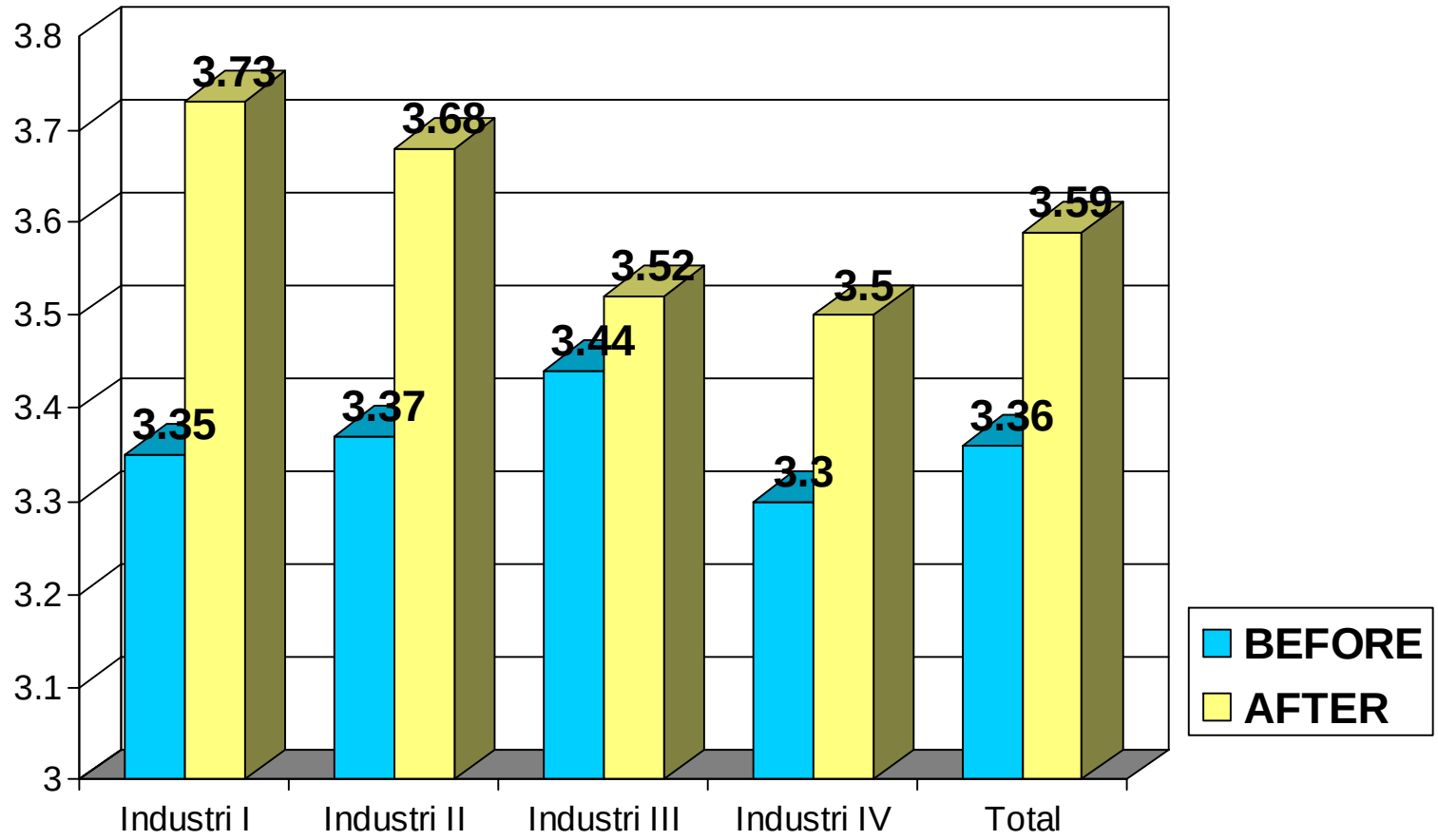


FIGURE. PLASMA VITAMIN E OF WORKERS IN 4 INDUSTRIES

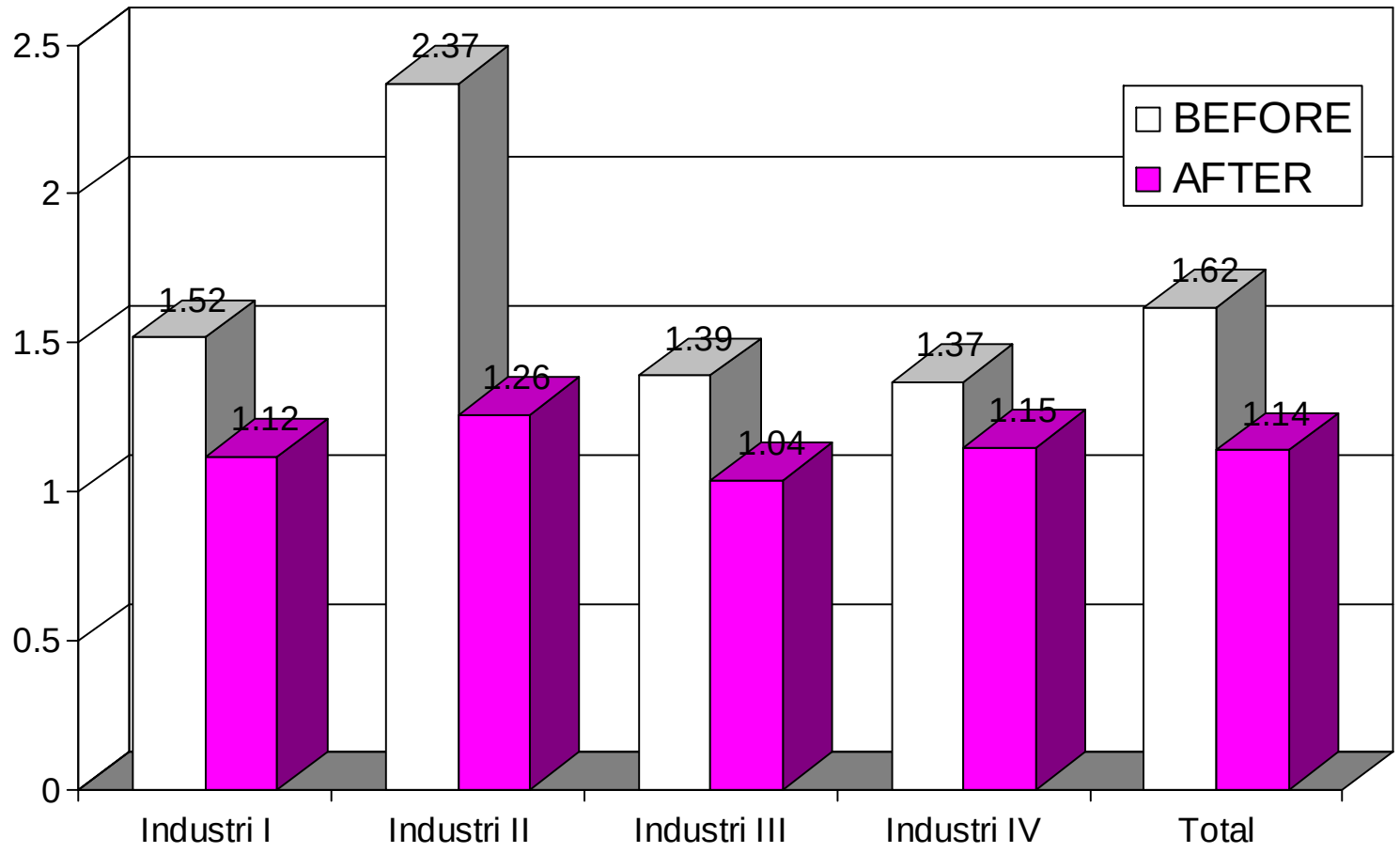


FIGURE. PLASMA MDA OF WORKERS IN 4 INDUSTRIES

- Improvement in lymphocyte proliferation activities: better immune function

Extracts white pomegrande (*Punica granatum, L*) on Leukimic THP-1 cell line *in vitro*

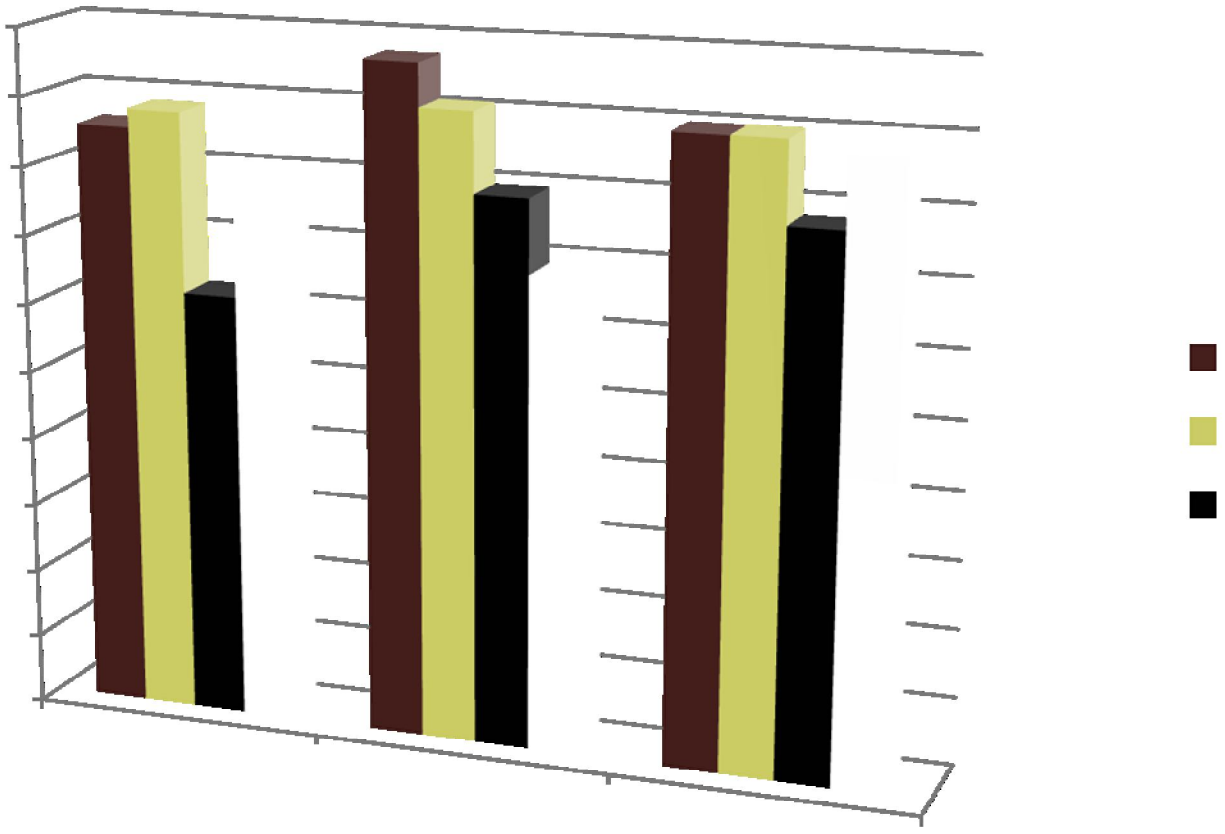
Antioxidant

Antioxidant Activity (BHA equivalent)

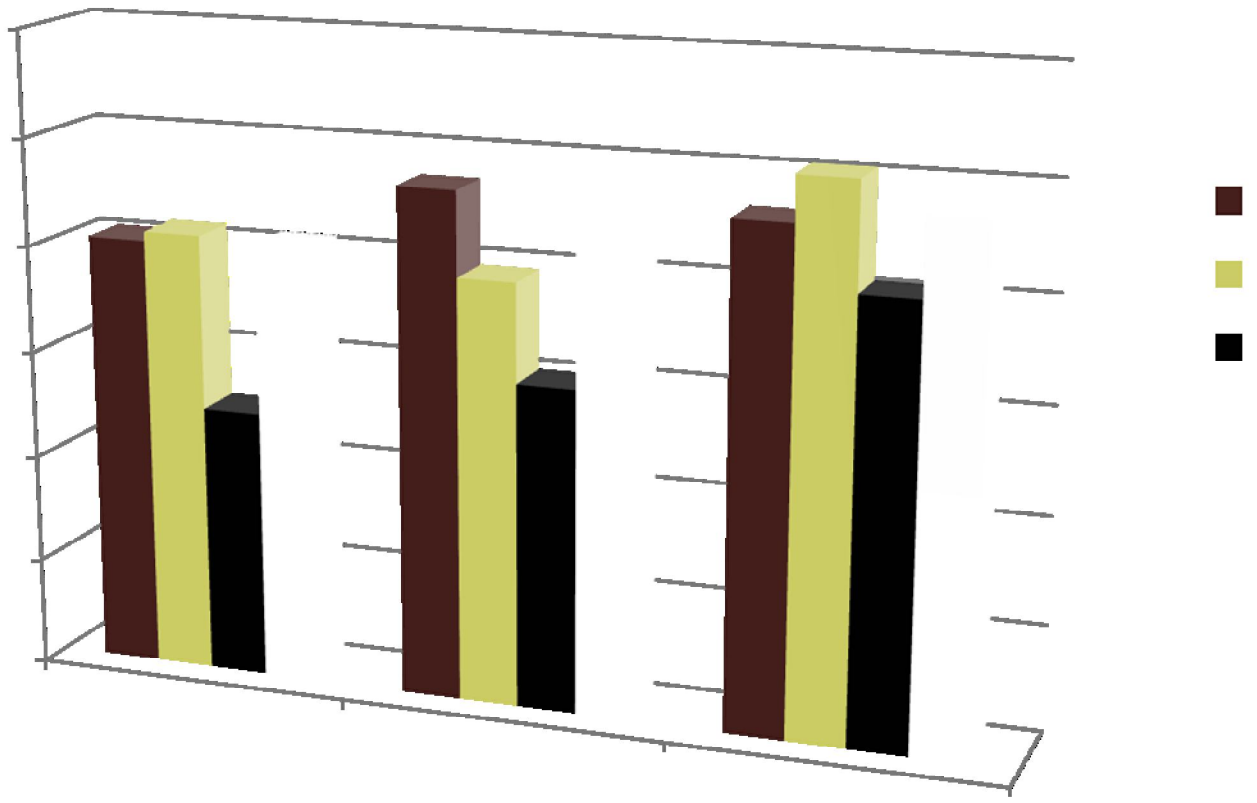
Material	Solvent	BHA (mM)	BHA Eq (mg BHA/g sample)
Pomegranate, white	Water	0,97	0,03
	Methanol	2,89	0,09
	Ethyl Acetate	4,40	0,13
	n-Hex	2,36	0,07
Skin	Water	1,78	0,05
	Methanol	3,12	0,09
	Ethyl Acetate	6,23	0,19
	n-Hex	1,99	0,06

- Antioxidant: elagic acid, elagic tannin, and gallic acid

Cytotoxic on leukemic cell line (flesh)



Cytotoxic on leukemic cell line (skin)

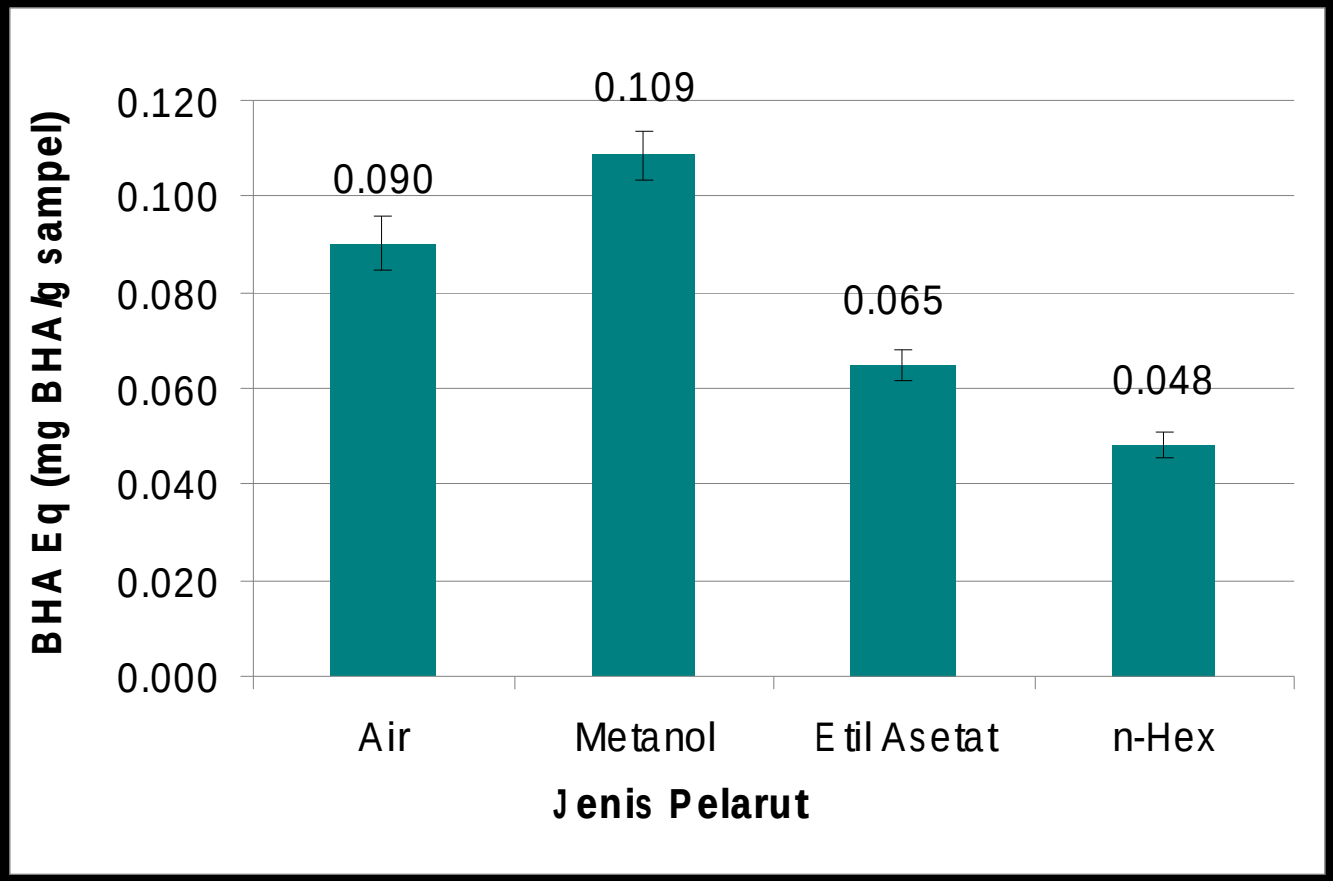


MAHKOTA DEWA

(*Phaleria macrocarpa* (*Scheff*) (Boerl)

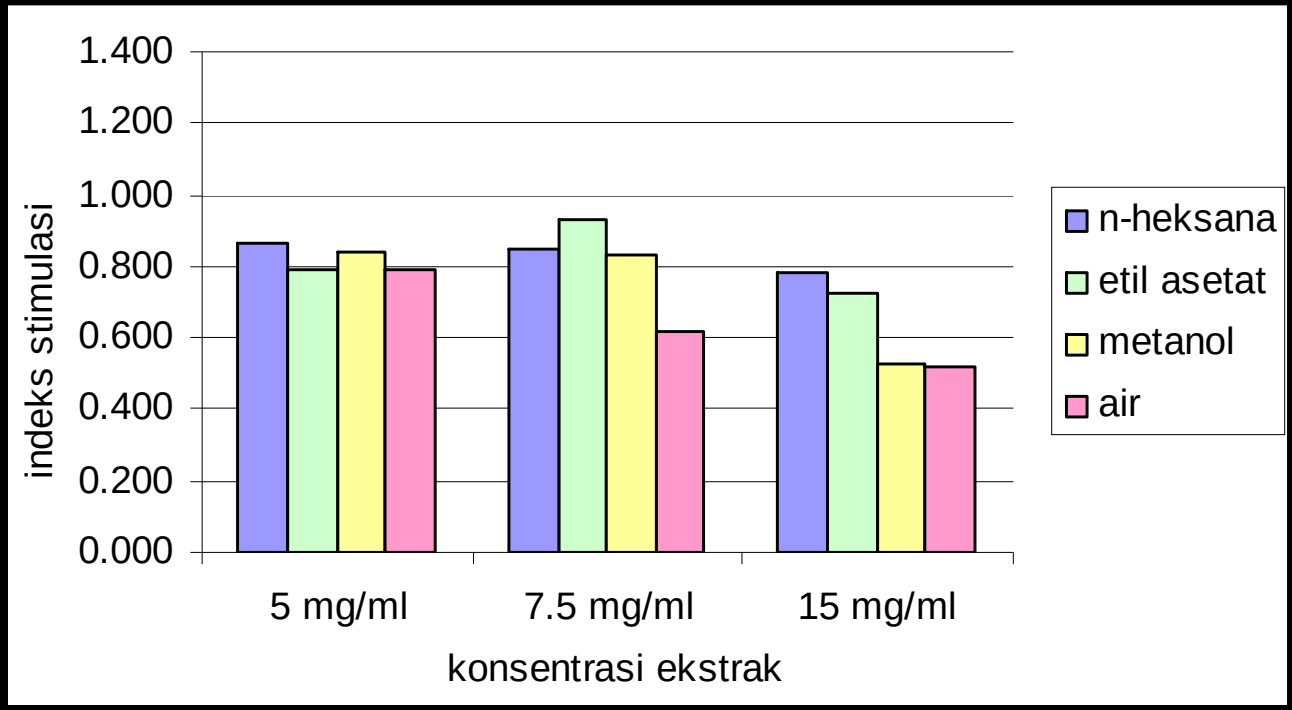
Mahkota Dewa

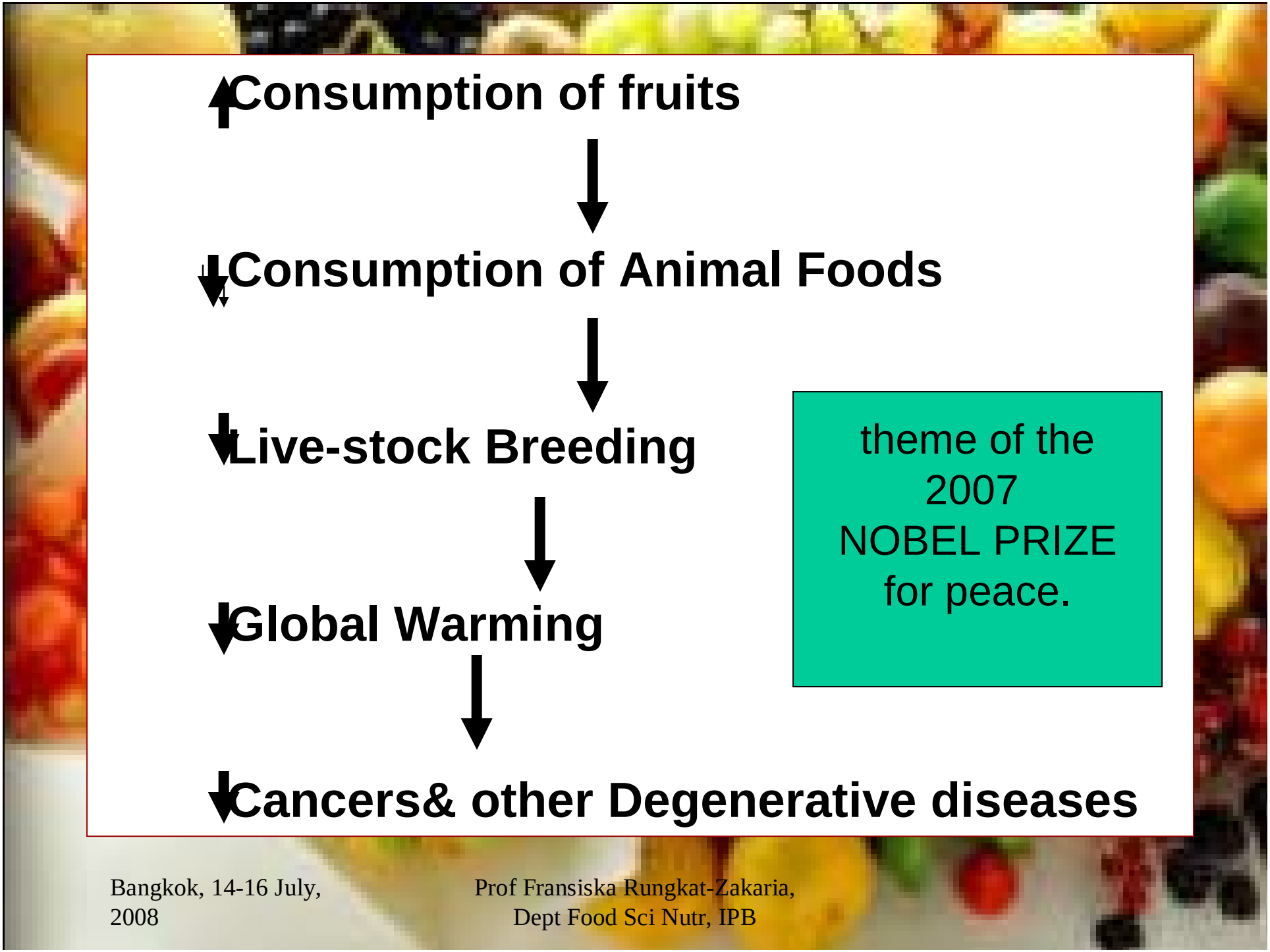
(*Phaleria macrocarpa* (*Scheff*) Boerl)

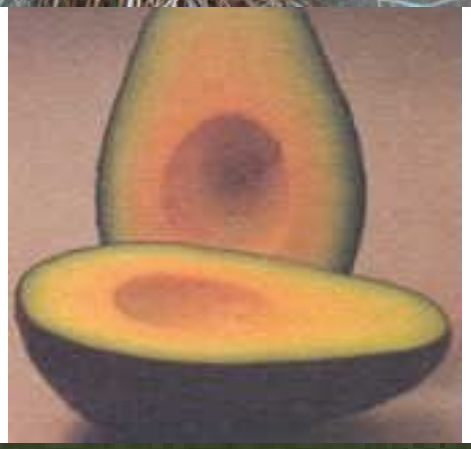


Antioxidant activity

Cell cytotoxicity M cell line mahkota Dewa on THP-1, 72 hrs incubation in vitro




Consumption of fruits
Consumption of Animal Foods
Live-stock Breeding
Global Warming
Cancers& other Degenerative diseases
theme of the
2007
NOBEL PRIZE
for peace.



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Bangkok, 14-16 July, 2008

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