

### SUMMARY OF EVIDENCE FOR ROLE OF ENVIRONMENTAL FACTORS

1. TIME TRENDS CANCER MORTALITY
2. GEOGRAPHIC VARIATIONS & MIGRANT STUDIES
3. IDENTIFICATION OF SPECIFIC CAUSES (CIGARETTE SMOKING, OCCUPATIONAL FACTORS, DIETS, ETC.)
4. GENETIC STUDIES

EVIDENCE IS CONSISTENT WITH MULTIFACTOR ETIOLOGY (ENVIRON. + GENETIC)

### Occupationally Related Cancers

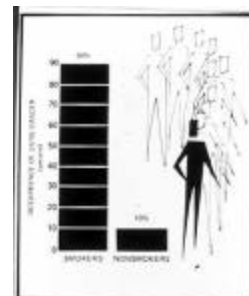
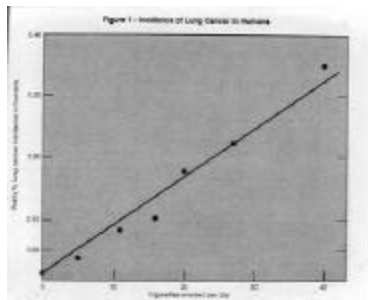
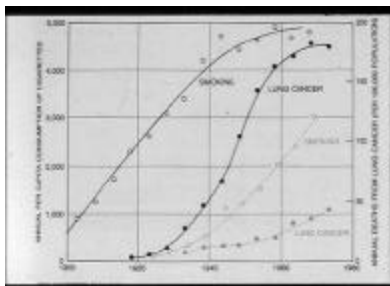
Occupation	Causative Agent	Cancer Type
Fuchsin dye industry	4-aminobiphenyl	Bladder
Chemical industry	2-naphthylamine	Bladder
Chemical industry	Benzene	Myeloid leukemia
Plastics industry	Vinyl chloride	Hepatic angiosarcoma
Mining	Radon	Large cell lung
Mining	Cadmium	Prostate
Insulation industry	Asbestos	Mesothelioma
Furniture manufacturing	Wood dust	Nasal sinus adenocarc.
Farming/construction	Sunlight (UV-radiation)	Skin

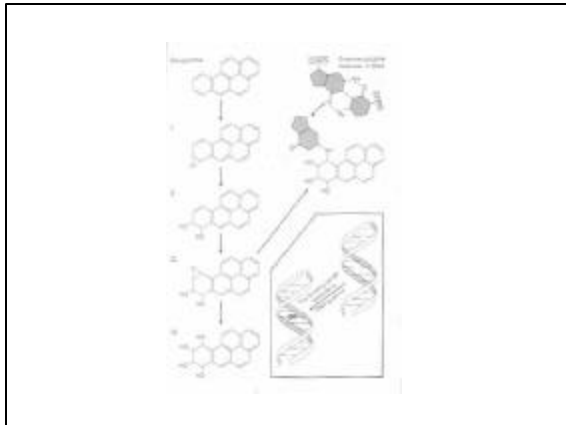
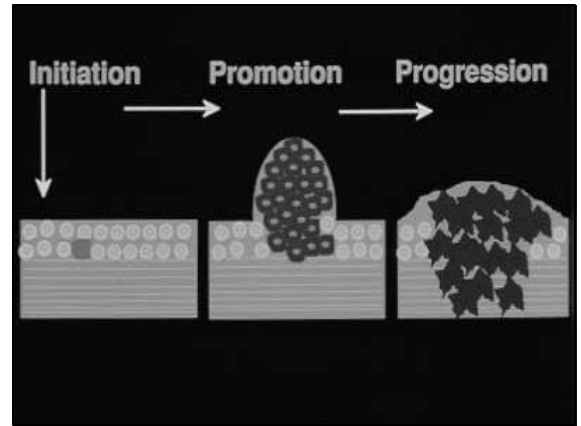
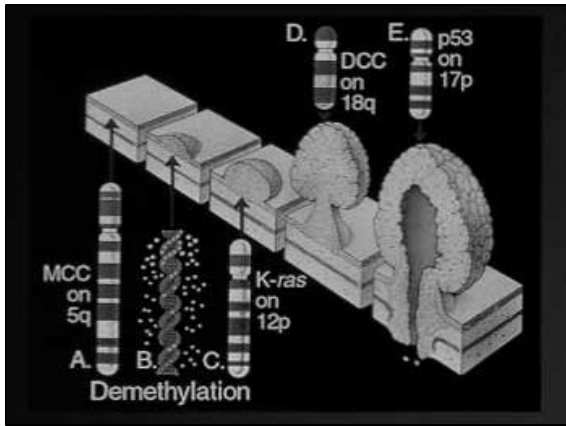
## Cancer Causation: Occupational and Environmental Chemicals

Over 50 specific chemicals or chemical processes are known to be carcinogenic in humans

May account for 5–20% of all cancers

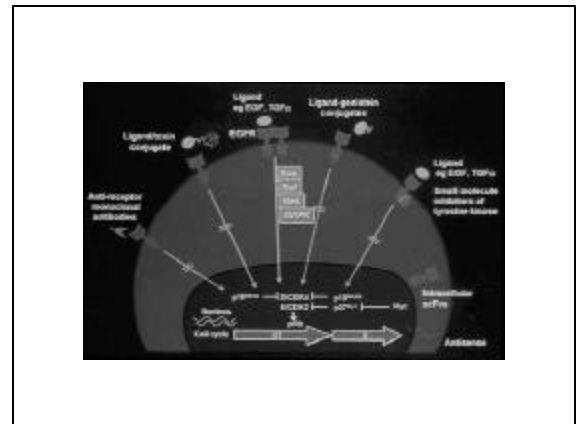
Preventable and requires ongoing surveillance





**Disease Susceptibility in Cigarette Smokers Demonstrates Gene-Environment Interactions**

Allele	Function	Disease
CYP1A1 (1q21)	P450 monooxygenase	Lung cancer
CYP2D6 (22q13)	P450 monooxygenase	Lung cancer
GSTA1 (1p13)	glutathione S-transferase	Lung & bladder cancers
M17 (10q24)	W-acetyl transferase	Bladder cancer
SNK24x3 (10q)	anethalyl 3C synthase	Internal stenosis Hypertension



**NONGENOTOXIC AGENTS CAN ENHANCE CARCINOGENESIS**

**Examples:**

- Asbestos
- Hormones
- Tumor promoters: Phorbol esters  
Phenobarbital  
TCDD
- Various halogenated compounds

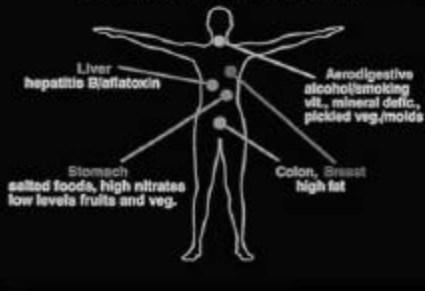
Note that of 138 rodent carcinogens in the NTP data base 33% are nongenotoxic.

**Diet and Cancer**

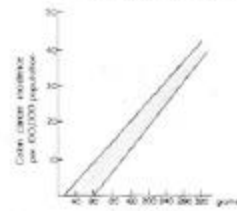
- Risk Factors
  - Positive energy balance (not necessarily high dietary fat)
  - Physical inactivity
  - Increased consumption of red meat
  - Excessive alcohol consumption
- Protective Factors
  - Fruits and vegetables
  - Folic acid
  - Physical activity
  - Weight control

Modified from Willet, W.G., *EBP*, 19, 3-6, 2011 (ACR-ACD Award Lecture, 2011)  
"Much remains to be determined about diet and cancer"

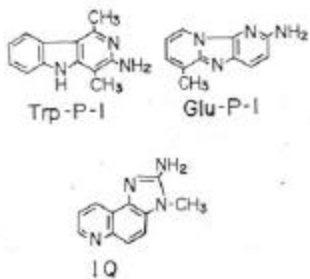
**Diet and Human Cancer**



Correlation Between Colon Cancer Incidence and Meat Consumption



Adapted from: Armstrong & Doll *Int. J. Cancer* 15: 617-631, 1975.



**Multifactor Interactions**



Cancer is likely to arise from combinations of etiological factors

In Lanzhou, a region in northern China, circumstances are as follows:

1. The incidence of gastric cancer is high.
2. *Helicobacter pylori* infection is prevalent.
3. The year-round diet contains a high proportion of salted & spiced foods.
4. Consumption of vegetables is seasonal.

AMERICAN CANCER SOCIETY  
DIETARY GUIDELINES

1. Avoid obesity.
2. Cut down on total fat intake.
3. Include a variety of vegetables and fruits in the daily diet.
4. Eat more high fiber foods, such as whole grain cereals, vegetables, and fruits.
5. Limit consumption of alcoholic beverages, if you drink at all.
6. Limit consumption of salt-cured, smoked, and nitrite-cured foods.

**Diet and Cancer**

**Risk Factors**

- Positive energy balance (not necessarily high dietary fat)
- Physical inactivity
- Increased consumption of red meat
- Excessive alcohol consumption

**Protective Factors**

- Fruits and vegetables
- Folic acid
- Physical activity
- Weight control

Modified from Willett, W.C., *CESP*, 30, 3-6, 1991 (AACR-ACS Award Lecture, 2000)  
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