

LUNG CANCER

1. Etiology
2. Pathology
3. Manifestations
4. Therapy
5. Epidemiology

LUNG CANCER

ETIOLOGY

Cigarette smoking causes 90% of cases

Evidence is of two types:

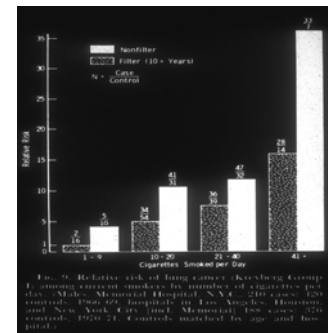
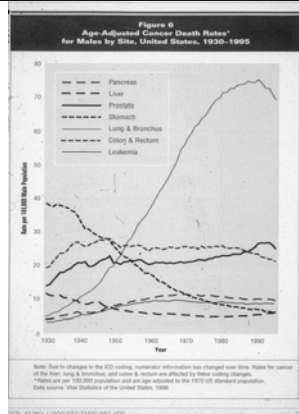
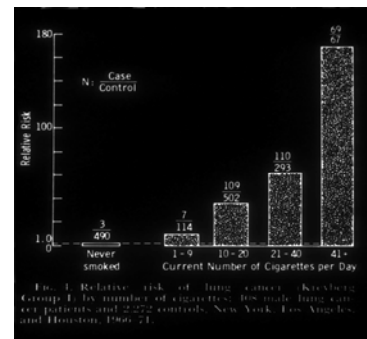
1. Epidemiological
2. Experimental

LUNG CANCER

Number of cases/year in U.S. approaches 200,000

Five year survival low – 10-15%

Commonest cause of cancer death in men and women



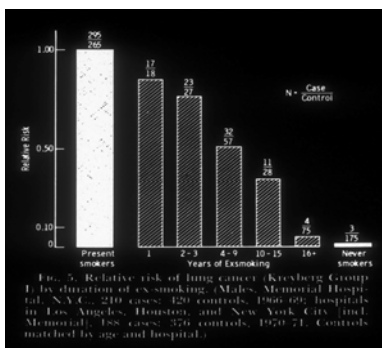


Fig. 5. Relative risk of lung cancer (Kriebel Group I, by duration of ex-smoking. (Males, Memorial Hospital, N.Y.C., 210 cases; 420 controls, 1960-69; hospitals in Los Angeles, Houston, and New York City, 114; Memorial, 188 cases; 376 controls, 1970-71. Controls matched by age and hospital.)

Table 1. Odds ratios of lung cancer for various categories of tobacco use among ever smokers, adjusted for age and study center

Category of tobacco use*	No. of case patients	No. of control subjects	Odds ratio	95% confidence interval
Nonsmokers	117	1750	1.0	Reference
Cigars, pure smokers	16	42	5.6	2.9-10.6
Cigarillos, pure smokers	21	31	12.7	6.9-23.7
Cigars and cigarillos, pure smokers†	43	77	9.0	5.8-14.1
Pipe, pure smokers	61	129	7.9	5.5-11.8
Cigarettes, pure smokers	4204	3930	14.9	12.3-18.1
Mixed smokers‡	1182	1309	12.7	10.3-15.6

*Pure smokers are those considered to smoke only one type or category of tobacco product; mixed smokers are those who used cigarettes and cigars, cigarillos, or pipe tobacco.
 †Combines pure smokers of cigars, pure smokers of cigarillos, and smokers of both cigars and cigarillos but not cigarettes or pipe tobacco.
 ‡Excludes 14 case patients and 60 control subjects who smoked cigars, cigarillos, and pipe tobacco but not cigarettes.

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54 J. 300 No. 16 TOBACCO AND HEALTH

Table 2. Major Toxic Agents in the Gas Phase of Cigarette Smoke (Unaged)*

Agent	Biologic Activity	Concentration, Cigarette
		Range (approx.)
Dimethylnitrosamine	C	1-100 µg
Ethylmethylnitrosamine	C	0.1-10 µg
Diethylnitrosamine	C	2-42 µg
Nitrosopyrene	C	0-20 µg
Other nitrosamines	C	0-20 µg
Heliolane	C	24-40 µg
Vinyl chloride	C	1-16 µg
Urethane	TI	10-35 µg
Formaldehyde	CT, CcC	20-90 µg
Hydrogen cyanide	CT, T	20-200 µg
Acrolein	CT	25-140 µg
Acetaldhyde	CT	10-1,000 µg
Nitrogen oxides (NO _x)	T	10-600 µg
Ammonia	TI	10-150 µg
Peridine	TI	8-43 µg
Carbon monoxide	T	2-20 mg

*Nitrosamines may also contain such compounds as acrolein, acetaldehyde, and possibly some substituted amines and pyridines.
 C, Direct carcinogen; Cc, Indirect carcinogen; TI, tumor initiator; CT, cocarcinogen; CT, Cc, non-agent; T, toxic agent.
 †All are cigarette smoke after 100 breaths on the open market (1973-1976).
 NO_x, NO and NO₂.
 ‡This toxic smoke of filtered US cigarettes because pH < 5.5, & therefore ammonia & pyridine are present only in gaseous form.

LUNG CANCER

ETIOLOGY

1. Asbestos
2. Radiation
3. Chemicals
 - chromium
 - benzpyrene
 - chloro-methyl-methyl ether

LUNG CANCER

ETIOLOGY

Passive cigarette smoke
 Associated with a small increased risk

LUNG CANCER

ETIOLOGY

- Asbestos
1. Long latent period
 2. Brief exposures
 3. Indirect (low level) exposures
 4. Multiplied risk in cigarette smokers (synergistic effect)

LUNG CANCER

ETIOLOGY

Radiation

1. Uranium miners
– synergistic interaction with
cigarette smoking
2. Radon in homes
– controversial, degree of risk (if any)
debated

LUNG CANCER

CLINICAL FEATURES

1. Growth at primary site
2. Metastatic spread
3. Paraneoplastic (remote) effects

LUNG CANCER

PATHOGENESIS

Genetic Abnormalities

1. Deletion 3p
2. Mutations p53
3. Mutations *k-ras*

LUNG CANCER

MANIFESTATIONS OF LOCAL TUMOR GROWTH

1. Hemoptysis – ulceration of tumor
2. Cough – stimulation of nerve endings
3. Wheezing – partial airway obstruction
4. Pneumonia – airway obstruction
5. Atelectasis – airway obstruction

LUNG CANCER

PATHOLOGY

- I. *Non-small Cell Lung Carcinoma* - 70-75%
 1. Squamous (epidermoid)
 2. Adenocarcinoma
 3. Large cell
- II. *Small Cell Lung Carcinoma* - 20-25%
- III. *Combined Patterns* - 5 - 10%

LUNG CANCER

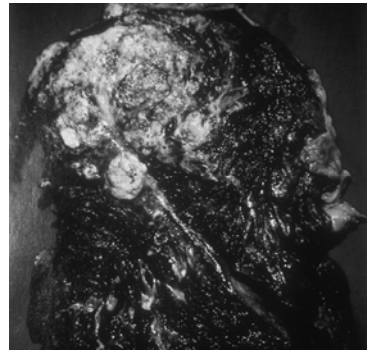
METASTATIC SPREAD

1. Direct extension
2. Lymphatic channels
3. Hematogenously

LUNG CANCER

DIRECT EXTENSION

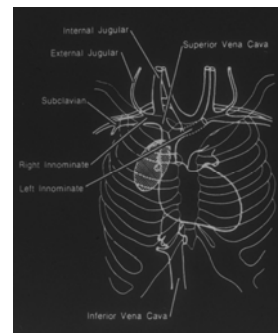
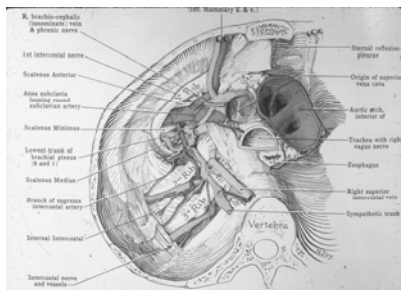
1. Neurological structures
2. Pericardium
3. Pleura
4. Esophagus
5. Chest wall
6. Vertebral column



LUNG CANCER

LYMPH NODE METASTASES

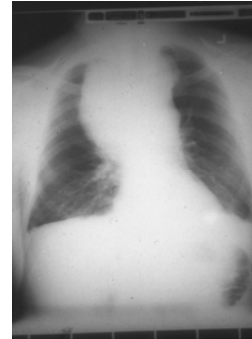
1. Hilar
2. Ipsilateral mediastinal
3. Contralateral mediastinal



SUPERIOR VENA CAVA COMPRESSION

SYMPTOMS

1. Swelling of the face
2. Swelling of the arms
3. Shortness of breath
4. Cough



SUPERIOR VENA CAVA COMPRESSION

SIGNS

1. Distention of jugular veins
2. Distention of veins over shoulders, chest wall, upper abdomen
3. Edema of the face
4. Plethora of the face
5. Congestion of retina
6. Edema of arms, hands

LUNG CANCER

SYSTEMIC METASTASES

1. Lungs
2. Liver
3. Bones
4. Adrenal glands



LUNG CANCER

PARANEOPLASTIC (REMOTE) EFFECTS

1. Cushing's syndrome (Ectopic ACTH)
- small cell lung cancer
2. Syndrome of inappropriate ADH secretion
- small cell lung cancer
3. Eaton-Lambert syndrome
- small cell lung cancer
4. Hypercalcemia – PTHrP
- non-small cell lung cancer
5. Pulmonary osteoarthropathy
- non-small cell lung cancer

LUNG CANCER

THERAPY

Small Cell Lung Cancer

1. Chemotherapy
2. Radiation therapy
3. Surgery

LUNG CANCER

Finger Clubbing



LUNG CANCER

THERAPY

Non-Small Cell Lung Cancer

1. Surgery
2. Radiation therapy
3. Chemotherapy

LUNG CANCER

THERAPY

Non-Small Cell Lung Cancer

1. Surgery
2. Radiation Therapy
3. Chemotherapy

LUNG CANCER

THERAPY

Small Cell Lung Cancer

1. Rapidly proliferating cells
2. Systemic metastases have developed
by time the primary lesion
presents