

Asbestos and Cancer

- ① Point out subtle difference between the title as given of Asbestos & Cancer and the question Asbestos & Cancer.

It is important to distinguish there too in our thought processes. It may be possible for cancer and asbestos to have one type of relationship and cancer and asbestos quite another.

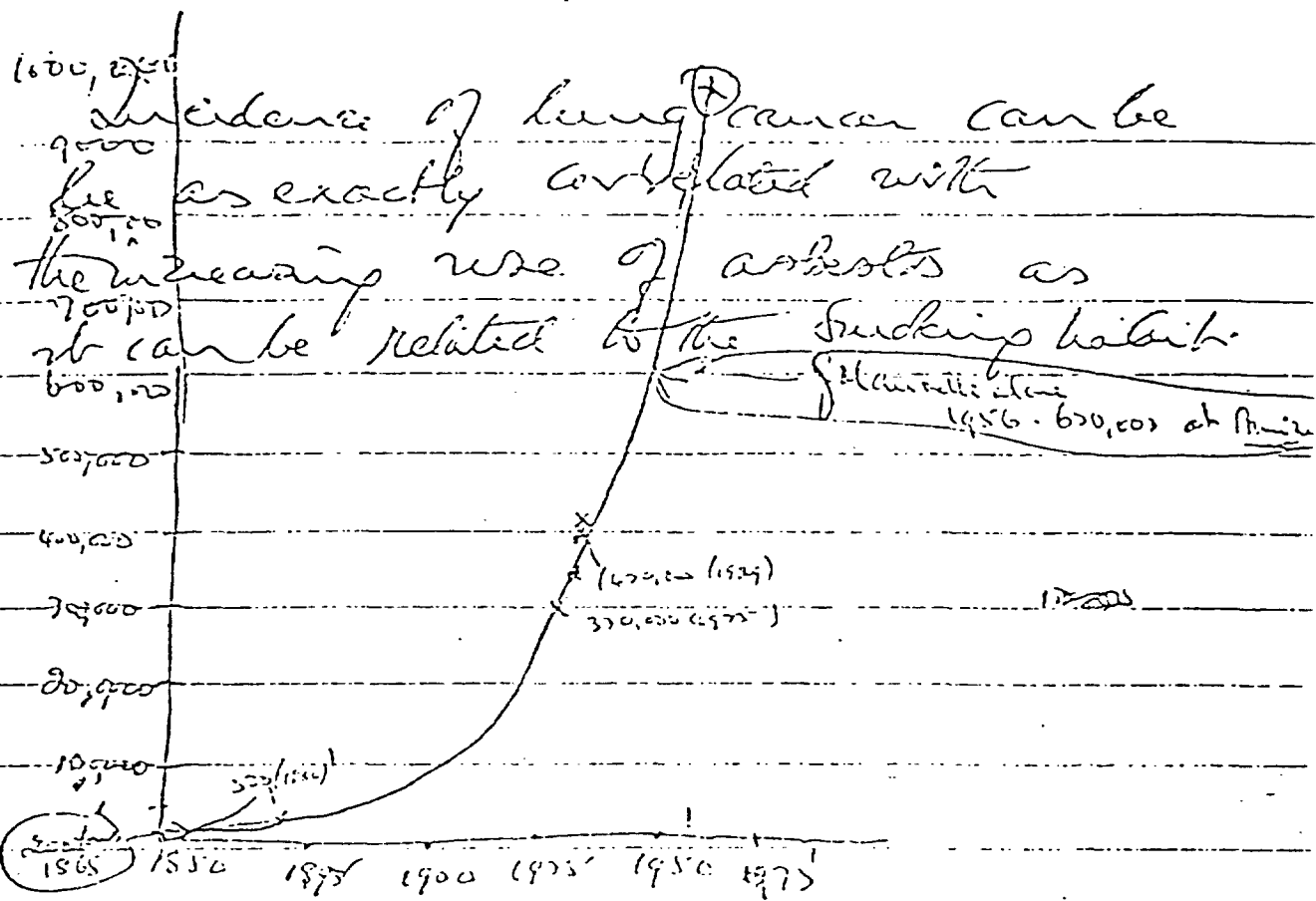
- ② Note also the difference between:
 { Lung cancer & Asbestos (asbestos)
 & { Cancer & " "

If we address ourselves to the latter topic the field is indeed wide because it is now known that asbestos can locate in a variety of locations after surface contact, particularly the liver, kidney & suprarenals (besides the skin).

- 2
- (3) Lung Cancer occurring in asbestos workers has recently been made a compensatable disease in Germany (West). Insofar as there is much exchange currently between the US & W. Germany, it is quite possible that such a legislative decision may also be imported into this country. If asbestos causes lung cancer then surely the German step is the right one, but one is allowed to remain a little skeptical as to the scientific proof available for such a relationship. For it is generally agreed that before a disease be classified as such (a) it must be shown to have a greater statistical incidence in relation to that industry than for the population in general (b) a causal relationship has been ^(partially) experimentally demonstrated.

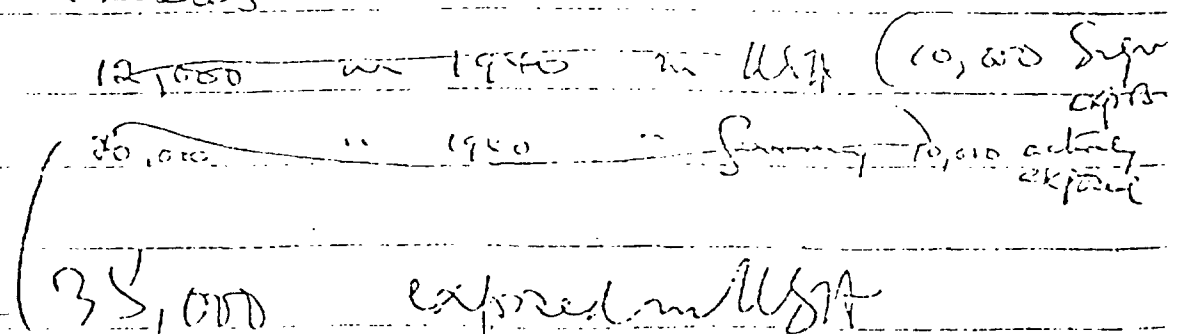
- (4) Most ^{human} diseases are caused by the interaction between the human tissues and external environmental agencies.

7.



i.e. by increasing use of asbestos one of the numerous inanimate environmental pollutants which have been introduced & some of which can be carcinogenic. What role does asbestos play

6. Numbers of persons exposed in U.S. to asbestos



7. Analogy with other neoplasms of
industrial origin

(a) ^{most} All have had their appearance during
the past 40-50 years

(exceptions: { basal cancer of skin, cancer of
{ bladder cancer of { bladder
{ prostate

(b) All have increased progressively in

(exceptions: when cause soon discovered or

ex: Radiation skin cancer,
Bladder bladder cancer,

↑ Europe
↑ into USA, Europe & etc.

(c) Many industrial cancers all have
a known specific cause, unlike
cancers of non-industrial origin.

(d) - Some of the industrial carcinogenic
substances (e.g. dibenzanthracene & Chl. a) have
structural complex structure

comparable to naturally occurring

substances of { sex hormones
{ bile acids
{ cholesterol
{ Vit. D.

8. (a) Crude cancer death rate rose by 65%
between 1900 & 1933 (Reck))

This rate is steadily progressive

(b) Cancer is now the 2nd greatest killer
kills $\approx 1/10$ after age of 40

Q. Definition of occupational tumor

Neoplastic
blastomalous reaction originating in individuals
~~developing~~ ~~tumors~~ as a result of the
negative antitumorally protective exposure to
cancerogenic environmental factors
in the course of occupational activities

10. Classification

a. Environmental Tumors

Non occupational
ep. Habits - betel nut chewing
Climate - high exposure

}}

Occupational
a) Statistical correlation
b) Epidemiological evidence

- (11) Criteria of proof of occupational relationship
- Statistical proof
 - Experimental evidence

(12) Occ. Diseases

- (a) Direct contact - Cutaneous exposure of skin
 - Pulmonary mechanism of Chemo
 - Nasal passage & sinuses of nose
 - Upper alimentary tract etc.

- (b) Excretory contact { - Epithelial of bladder
 - Bladder of anal canal
 - Liver
 - Gonads : of endocrine system

- (c) Repository contact - Skin - Reservoir
 - Bone : marrow { Radioactive
 - Reservoir

- (d) Proximal contact - Haemopoietic : Bone marrow
 - Liver : Reservoir

- (e) Accidental

(13) Pre-cancerous States

Reactions tending varying towards
blastomatoric tissue formation -
cf. { Benylini lung
Hobbes's plasma

(14) Historical (a) Occ Ca in general

Veratium 1543

Ramazzini 1700

Pott 1775 - Soda Ca of chimney

Ashton 1800 - As. in tissue of bladder

Van Volkmann 1875 - Occurrence of paraffin

Hastings & Keese 1879 - Schwaberg Branches

Unna 1893 - Solar keratoma 75

Rehn 1895 - Analis Blackstone

Fricker 1900 - X Ray Ca of skin

Albert Schönborg 1911 - Analis of X R

Jagie Schönborg 1913 - Analis of X R

Ramboulet 1913 - Analis of X R

etc.

(b) Analis

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Hastings & Keese 1879 - Schwaberg Branches

Wöhr 1927 - Gochinshtel 1928

Albrecht 1932 - Chemnitz - Persina

Bridg & Stephens 1938 - Nickel - Analis of X R

Heilzel 1938 - Ca of Rube - two plates
Karl - Analis of X R

(15) Geographic & Racial Factors

Industrial Production { higher in { USSR
(a) { Russia } in { Germany
Switzerland
England
Italy } high rates

(b) low in { Holland
Hungary
Sweden
Denmark } low rates

in { Belgium
Japan
France
Luxembourg } high rates

(c) No change in Iceland

(d) low skin color in Negro
high " " "

(16) Overall Cancer Rates by occupation

Profession	Standardized death rate	Life Expectancy
Miners	1.082	75.512
Textile workers	1.397	1.864
Agricultural	0.965	1.796
Upper & middle classes	1.337	2.148

∴ Textile workers relatively high

(17)

1/2 per 1000 contribution of occupational
Cancer to annual disability quota
but. Total effect on individuals (Total
= $\frac{CNS}{CNS}$) disease rate

(18)

Rate of Skin & sebaceous carcinoma
due to asbestos ??

MB Shaffer makes no reference to it

(19)

Respiratory Tract as an inward
extension of the Skin & the mucous.

Volume of the exposure of the lungs

(20)

Progressive rise in lung cancer &
rate in majority of countries

Country	1850	1875	1900	1925	1935	1945
Germany	0.55	0.65	0.90			
England		0.40	0.24 0.83	2.5	6.7	
USA			0.50	1.7+		

Deaths per 100,000

(20) Progressive rise in lung Ca & of am. bronch

Country	1850-	1860-	1870-	1880-	1890-	1900-	1910-	1920-	1930-
England			0.040			0.50	1.64	3.0	6.3
U.S.A. & Canada							0.82	10.5	11.47
Germany	0.057		0.065			0.90	1.0	8.3	11.6
Russia								1.6	
Switzerland					4.8	3.8	14.9	7.17	
Netherlands						3.2	0.5	5.7	
Denmark								8.0	10.55
Sweden							2.0	3.3	7.3
Norway								2.6	6.55

(21) Note varying statistics from different cities, parts of cities, different provinces in all these countries

(22) Reasoning which must be disposed of before the significance of increasing incidence of lung cancer can become apparent is

- better diagnosis.
- More cases of other cancers & conditions being noted in the same country.
- Growing population, that population of the country.
- Increasing incidence of the disease.

(23) Why the sex difference

ill. ♂ 78%

Kopf ♂ 89%

more ♂ in beds

♂ increased in bed

♂ Sex hormones as cause

(24) Extensive factors

Bacterial

- TB $\frac{?}{?}$ + Kals -
- Anickhant

- Influence of epidemic of 1918-
? but from the place of

- Rhytillite bronchial

Chemical

- Dust bronchitis (15%)

- & increased lung cancer
in { asbestos, mica, talc
silica, asbestos, mica
silica, asbestos, mica

- Lung cancer (25%)

- Cigarette smoking, asbestos, silica

But many calculated this &

up in the premises during

Ca is low

Why in Feb. new English

Anten - S.H. 1935

{ Kness & Sir = 0.70%
" " = 0.71%

1000-7351
ant

- S.H.

15, 587 cases = 0.019%

15% Silica = 1.12% Ca

Quartz 3338 Animals = 0.06% tumor

Asbestos

26% Kals - 17-20%

25. Asbestos

First asbestososis fatality recorded 1899

Not variable liability to +6. (30% in England)

Variable susceptibility to asbestososis { None in Germany

Latent period 10-33 → 15 years

Latent period variable 1-30 yrs

Lung tissue fibrosis

Asbestosis

(26) Asbestos types

Asbestos type	Magnetite	Actinolite	Iron	Niob.
Crocidolite	2	30	70	
Amosite				
Anthophyllite	33	41	57.5	✓

27

Asbestos Neoplasms

No cases prior to 1935 in England (Kenner)

First Case 1934 ... (Stojne)

6 → 17% → 20%

Rate of contribution ^{all to} neoplasms only 0.3%

Short induction period 15-21 yrs (St. 1/10)

Prolonged latent period 10-12 yrs (St. 30%)

Induction period (Exp + latent) 15-21 (St. 18%)

Age at death. NB senescent age 35-41

Types { Squamous majorly
Adeno carcinoma
Anaplastic sarcoma } rarely

Precancerous bronchial changes
Proliferative thickening

Well vascularised } : predisposing to malignancy
slightly proliferative

(28)

What would be a safe breathing exposure to asbestos ? 0%

An individual breathes 18 m³ p.d.

MRC = ???

(29)

What is the role of macrophages in asbestos ?
Worked : Phagocytosis
Cancerous
Cytotoxic
as well

30 What degree of exposure is there in asbestos textile operations to

- Paraffin oil of cotton linter oil mist
- tars of kerosene vapors ^{from England} lamp
- Chromium hexachlorides
- arsenic (pigments)
- nickel
- cobalt

(31) Note relationship between lung ca & laryngeal cancer

AB occur in Asbestos workers
Schneberg.

(32) Note significance of primary malignant neoplasms observed both in Schneberg & in Asbestos cases

General Characteristics of Neoplasms

(A) Predisposed by (constitutional change, (trauma)

} spontaneous lesions

(B) More usual on external organs of skin.

(C) Epithelial mostly

(d) Primary neoplasia multiplicity common.

(e) Require prolonged exposure to causative agents } types

(f) Come at rel. early age.

(g) Proliferates

(h) Dominantly OT

(33) Age	Manifestation age of Car.	Preference for Tumors	Cellular Senescence Theory
0-10 yrs		Placenta	
0-4 yrs.		Gastro, Kidney, Respiratory organs	
15-25 yrs.		Bones	
30-35 "		Prostate	
40-50 "		Brain	
50-55 - -		Female sex organs	
60-65 - -		Skin, abdominal organs	
70 + 75		Prostate	

(34) Renal Susceptibility

Note - low Ca^{2+} levels of Nephros

$\therefore$ w/ Rb nephros levels $Ca = 8$

(35) Renal Susceptibility

M.S.F.

$\therefore$ use more F in factories

(36) Multiple renal neoplasia

Militate against successful resection

1. Mouse. trying to diagnose early

Rebentia is the only solution

May also occur concurrently in

Other organs of kidney & suprarenal

(37) Theories of Carcinogenesis

A. Morphological

{

 Carcinomas: embryonic cell rests - (embryonic)

 Rhabdoids: detached postnatal cell groups

 Melanomas: Chronic irritation

 Basaloid carcinoma
 }

B. Biological

{

 Chromosomal: direct action of physical or chemical agent on cell nuclei

 Metabolic: direct action on some part of c. of nucleus (working)

 Cellular mutation: inheritance

 Virus theory: acquired - direct cellular

 Acquired - allergic
 }

(37) States & Schedule Coverage for Occupational
Neuroblast disease

States: { North Carolina
Pennsylvania

(38) Other Countries & W.C.A. coverage for
asbestos Neuroblast

Germany

(Pabsthorf, V. 1)
Index 2nd 1950 & 1951
3, 298,

④ Reproductive increase in cancer incidence:

♂	Birmingham	+	320%	1937-47
	Dallas		382%	
♀	Birmingham	+	86%	1937-47
	Dallas		1180%	

Indicates industrial factors

④ Geographic Differences

New Orleans	39.1%	/100,000	42%
San Francisco	34.3%	/100,000	32%
Birmingham	18.9%	/100,000	48%
Atlanta	13.4%	/100,000	44%

Indicates industrial factors

④ Atmospheric / Chemical pollutants obtained from

Arsenic	0.050 - 0.104 mg per 1000
3,4-Benzopyrene	7.3 - 37.8 mg per 1000
Radioactive matter	1/10 to 1/1000 of max. for life
Chromium (hexavalent)	

(43) Factors which modify local effect
of carcinogen on lung tissue.

Intrinsic carcinogenic potency	100
Degree of dispersion	100
Solubility in water & fats	0
Direct cytotoxic qualities	?
Permanence of its local deposition	100
Adsorption to Carbon	0
Stability & resistance to metabolic change	100

(44) Metals associated with Cancer.

Chromium

Nickel

Asbestos

Uranium

Radium

Thorium

Beryllium

(4.5) Asbestos found by Keiper
along with Polymerised Carbons -
as polymerised Silicon

(4.6) Asbestos consists of giant fibrous
molecules composed of polymerised
Silica-oxygen tetrahedra arranged
in chains or bands. (Parker & D)
(Keller's Modern Inorganic Chemistry Longmans & Co.
New York 1939, p. 689)

(4.7) All together there are now
68 cases of asbestos associated with
lung cancer. (This excludes the
South African cases which can
easily add another 30.

(4.8) { Remain of asbestos - cancer cases (Kewenau
1951) (range 22-72)
Remain exposure time
20-1 (Range 6-40)

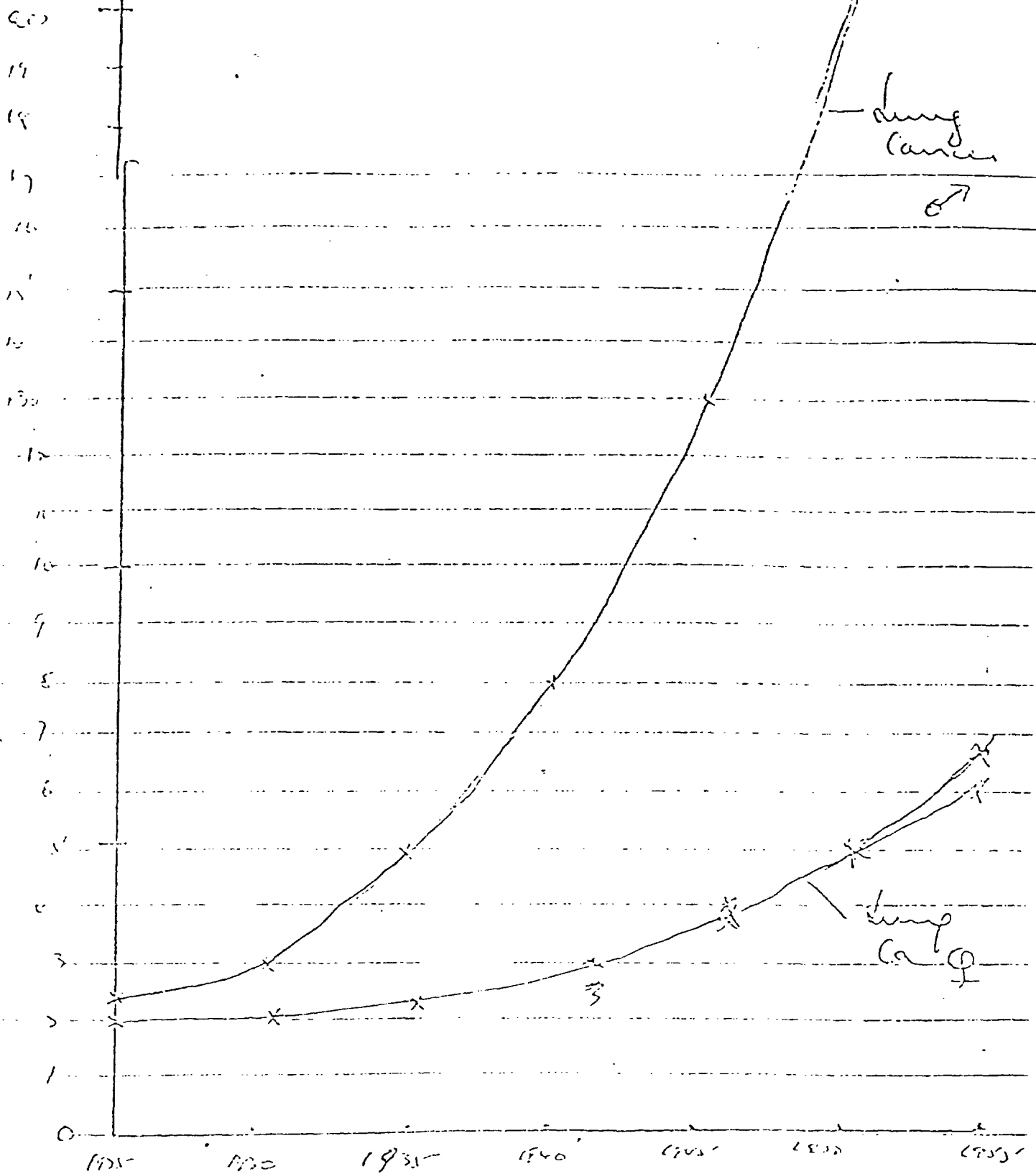
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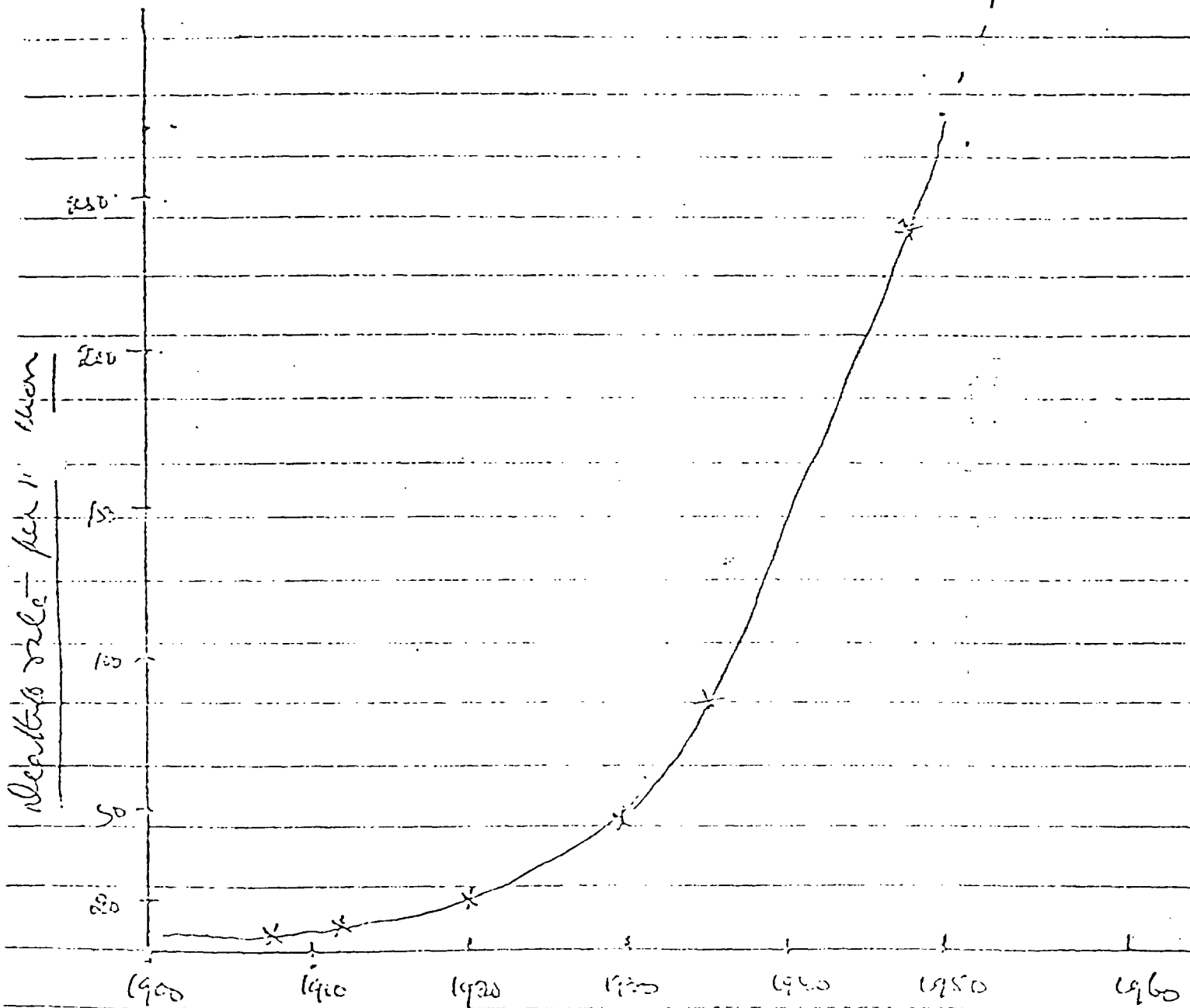
21.

(50) 37 ♂ 15 ♀ ∴ ♂:♀:: 2.5:1

(51) McKelvey 266 cases of asbestosis (1984)
= 31 cases of Ca = 13.2%
6884 - Elixioris
= 91 Case = 1.32%
∴ 10 X as great a risk of asbestosis

Deaths per 100,000





Lung Cancer Death Rates
England & Wales