

EPIDEMIOLOGY OF NEOPLASIA

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Epidemiology of Neoplasia

Incidence of cancer :

- Overall incidence of cancer in a population or a country is known by registration of all cancer cases (cancer registry) and
- Rate of death from cancer- 20 % of all deaths
- In US
 - I. Heart disease
 - II. Cancer

Most common primary cancers in the world

Men	Women	Children < 20
Lung (oral cavity in India)	Breast (Cervix in India)	Acute Leukemia
Prostate	Lung	CNS Tumors
Colorectal	Colorectal	Bone Sarcoma
Urinary bladder	Endometrial	Endocrine
Lymphoma	Lymphoma	Soft tissue sarcoma

Epidemiological Factors

- Remarkable difference in incidence and death rate of cancers.
- ✓ death rate from Ca stomach 7-8 times higher in Japan than US.
- ✓ death rate from Ca Lung twice more common in US than Japan.

Geographic differences due to

1. racial predisposition
2. environmental factors

Epidemiological Factors

I. **Familial & genetic factors**

a) Autosomal dominant inherited cancer syndromes

rare, inherited predisposition to cancer
tumor suppressor gene involved

- Retinoblastoma
- Familial Adenomatous Coli (APC gene)
- Neurofibromatosis I & II
- MEN I & II

INHERITED CANCER SYNDROMES (AUTOSOMAL DOMINANT)

<i>Gene</i>	<i>Inherited Predisposition</i>
<i>RB</i>	Retinoblastoma
<i>p53</i>	Li-Fraumeni syndrome (various tumors)
<i>p16/INK4A</i>	Melanoma
<i>APC</i>	Familial adenomatous polyposis/colon cancer
<i>NF1, NF2</i>	Neurofibromatosis 1 and 2
<i>BRCA1, BRCA2</i>	Breast and ovarian tumors
<i>MEN1, RET</i>	Multiple endocrine neoplasia 1 and 2
<i>MSH2, MLH1, MSH6</i>	Hereditary nonpolyposis colon cancer
<i>PTCH</i>	Nevoid basal cell carcinoma syndrome
<i>PTEN</i>	Cowden syndrome (epithelial cancers)
<i>LKB1</i>	Peutz-Jegher syndrome (epithelial cancers)
<i>VHL</i>	Renal cell carcinomas

INHERITED AUTOSOMAL RECESSIVE SYNDROMES OF DEFECTIVE DNA REPAIR

Xeroderma pigmentosum

Ataxia-telangiectasia

Bloom syndrome

Fanconi anemia

FAMILIAL CANCERS

Familial clustering of cases, but role of inherited predisposition not clear for each individual

Breast cancer

Ovarian cancer

Pancreatic cancer

Retinoblastoma

- 40 % cases – familial
- RB gene on chromosome 13
- familial form – absent / mutations in RB gene
- Absent/Mutant RB gene – predisposes to an individual to Retinoblastoma.

BUT Retinoblastoma develops only when the other copy of RB gene is also defective.

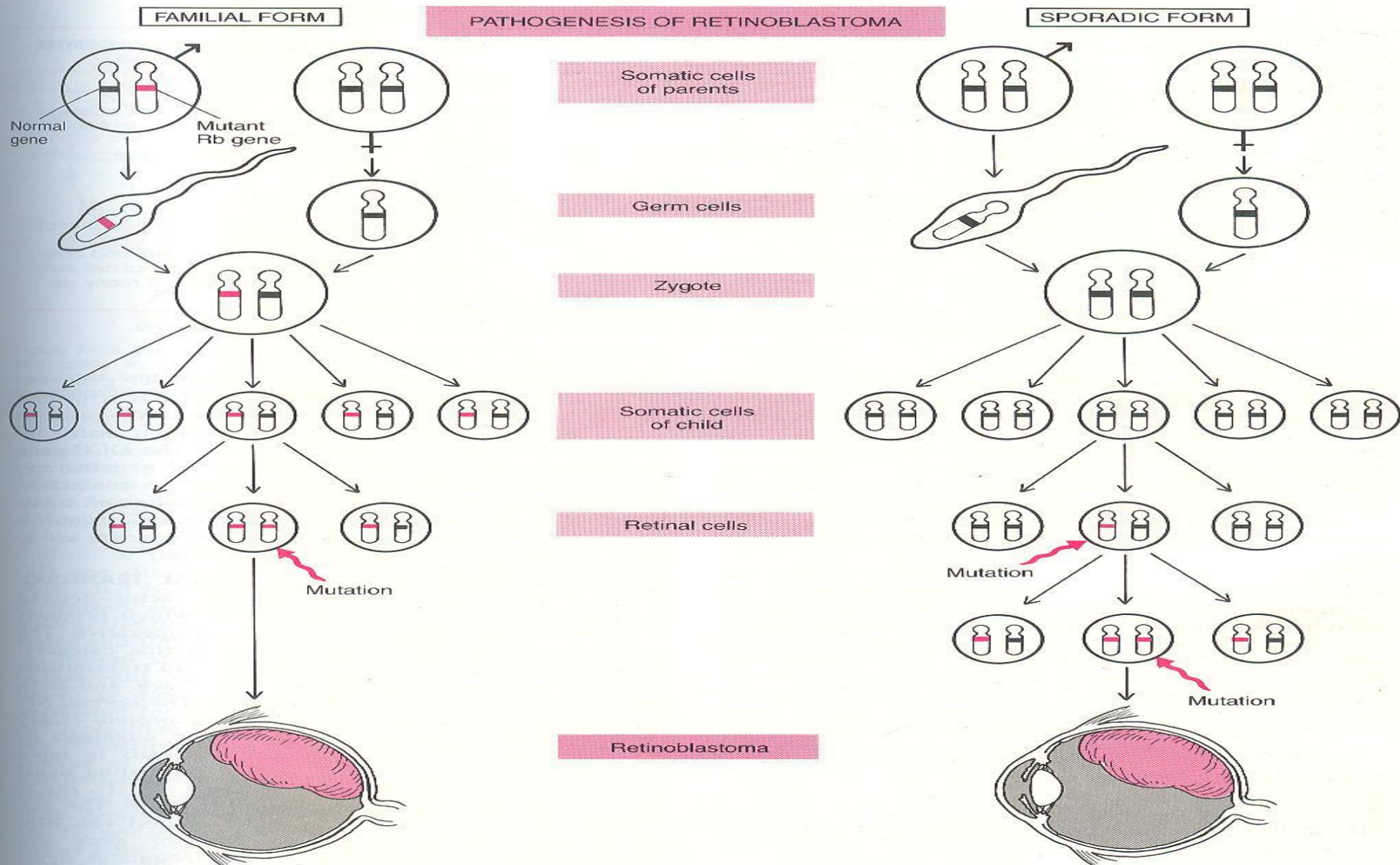
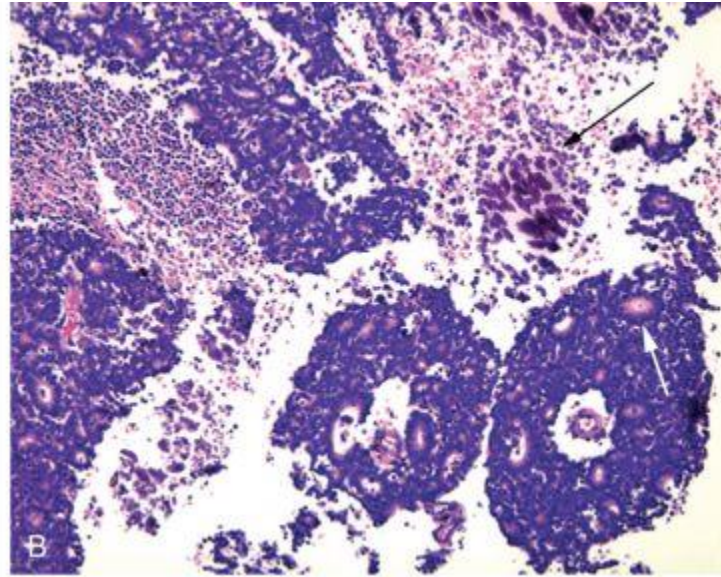


Figure 7-27. Pathogenesis of retinoblastoma. Two mutations at the Rb locus on chromosome 13q14 lead to neoplastic proliferation of the retinal cells. In the familial form, all somatic cells inherit one mutant Rb gene from a carrier parent. The second mutation affects the Rb locus in one of the retinal cells after birth. In the sporadic form, on the other hand, both mutations at the Rb locus are acquired by the retinal cells after birth.

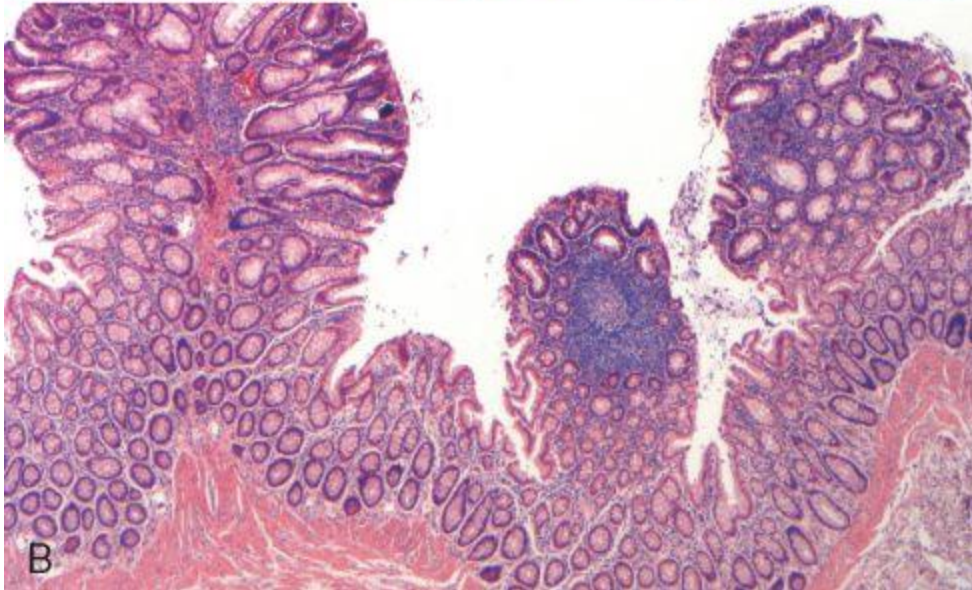
gene may affect cell growth are discussed later (see section on biochemical functions of *p53* gene). The loss of the APC gene is not restricted to colonic neoplasms; it is also mutated in several gastric and pancreatic cancers.³²

The neurofibromatosis type 1 (NF-1) gene behaves much like the APC gene. Individuals who inherit a mutant allele develop numerous benign neurofibromas, some of which progress to neurofibrosarcomas.



Familial Polyposis Coli

- Polypoid Adenomas may be seen at birth or early age.
- By the age of 50 yrs almost 100 % cases develop Ca Colon.



B. Defective DNA Repair syndromes

Defects in DNA repair & DNA instability

- Xeroderma pigmentosum
- Ataxia – telangiectesia
- Bloom syndrome
- Fanconi's anaemia

C.Familial cancers

familial clustering of cases but role of inherited predisposition not clear .

- ✓ early age at onset.
- ✓ in 2 or more relatives of the index case.
- ✓ multiple or bilateral tumors.

e.g. Breast cancer

Colon cancer

Ovarian cancer

Pancreatic cancer

II. Racial & Geographic factors

Soil, water, nutritional factors, habits & customs.

- White Europeans & Americans
 - Ca Lung, Ca Breast & Ca Colon
- Black Africans
 - Ca Skin, Ca Penis, Ca Cervix, Ca Liver
- Indians - Ca oral cavity, upper GIT
- Jew – low incidence of Ca Penis due to custom of circumcision

III. Environmental factors

Occupational

Industrial & environmental substances are carcinogenic & are occupational hazard.

Latent period - 5-50 yrs

Physical agents

1. Solar radiation

SCC, BCC

2. X ray radiation

Leukemia in radiologists

Ca Skin in medical & technical persons

3. Radio active dust

Inhalation -- Ca Lung in mining industries for Nickel

Swallowing – Osteogenic Sarcoma

Atomic bomb survivors - Leukemia

Chemical agents

i) Soot cancer –

Ca of scrotal skin in chimney sweeps.

1st occupational cancer described by

Pott in 1975.

soot contains a by product of incomplete combustion of coal.



ii) Coal tar –

Ca of skin of exposed area in workers engaged in manufacture of coal tar.

inhalation of fumes – Ca Lung

carcinogen - Benzpyrine

iii) Aniline dyes –

Rubber industry

Ca of Urinary bladder

Benzidine, β naphthylamine

iv) Mineral oils –

Ca of Skin

Mule spinners – Ca of skin of scrotum,
penis, abdomen & thigh

v) Arsenic –

Ca of Skin – palms & soles

paints, ink, dyes,

electro polishing, enamelling

vi) Asbestos –

Ca of Lung & Mesothelioma of pleura

vii) Wood & Leather industry –

Adeno carcinoma of nasal sinuses

IV Cancers due to habits & customs (cultural factors)

A) Cancer of skin

Kangri cancer – Kashmiri people

- lower abdomen

kangri – pot containing burning charcoal
chemical carcinogen in smoke
or repeated thermal injury

B) Oral cancer

i) Chutta cancer – SCC of hard palate

Andhra Pradesh

habit of smoking chutta with
burning end inside the mouth.

ii) Ca of base of tongue & tonsil – Gujarati Hindus

habit of smoking bidis & chewing tobacco.

iii) Khaini cancer – SCC of lower lip

Uttar Pradesh & Bihar

Khaini – powdered tobacco & lime & kept in
gingivo – labial groove

iv) Ca of mucosa of cheek & gingival groove
- coastal zone of India
chewing of pan.

C) Ca Penis

incidence low in Moslems & Jews

custom of circumcision

D) Ca Cervix –

rare in virgins & nuns, early age at marriage

parity ,multiplicity of partners

E) Ca Breast

Fertility & custom of prolonged breast feeding
protects against breast cancer.

Inadequacy of progesterone & unopposed action
of Oestrogen.

V. Age

Most cancers in later years of life. (> 55yrs)

- alteration of cells of host
- longer exposure of carcinogen
- ↓ host immune response

Childhood tumors

Neuroblastoma, Wilm's Tumor, Retinoblastoma,
Acute Leukemia

Bimodal incidence – two peaks

Acute Leukemia

VI. Sex

Generally more common in males EXCEPT

Ca of Gall Bladder, Thyroid & Hypo pharynx.

Broadly speaking

Ca Breast – commonest Ca in females

Ca Lung – commonest Ca in males

VII Chronic Inflammation

Chronic inflammatory conditions of GIT

↑ risk of cancer

Ulcerative Colitis,
Crohn's disease,
H.Pylori Gastritis,
Viral Hepatitis &
Chronic Pancreatitis

VIII. Premalignant conditions

A group of conditions which predispose to the subsequent development of cancer.

- important to recognize so as to prevent subsequent occurrence of an invasive cancer.

i) Ca In Situ (Intraepithelial Neoplasia)

Uterine Cervix at junction of ecto & endocx

Bowen's disease of Skin

Actinic or solar keratosis

Oral Leukoplakia

ii) Some benign tumors

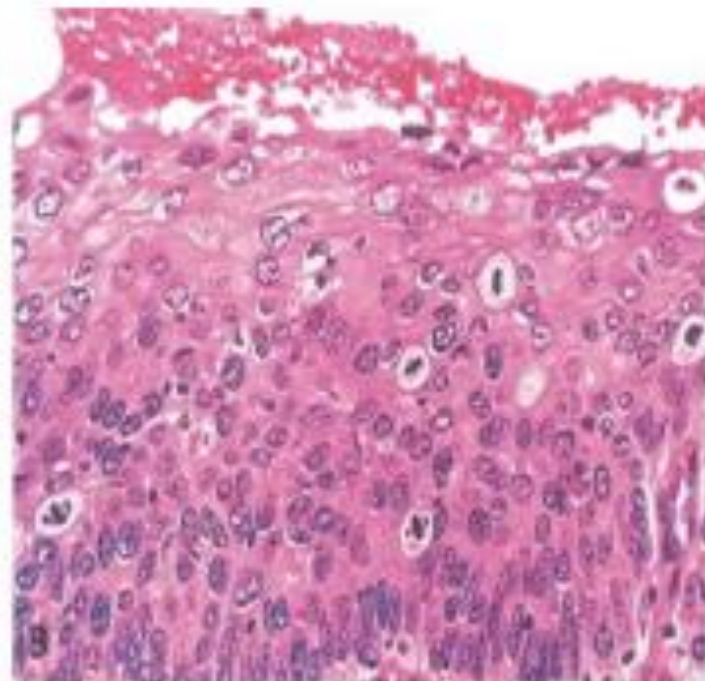
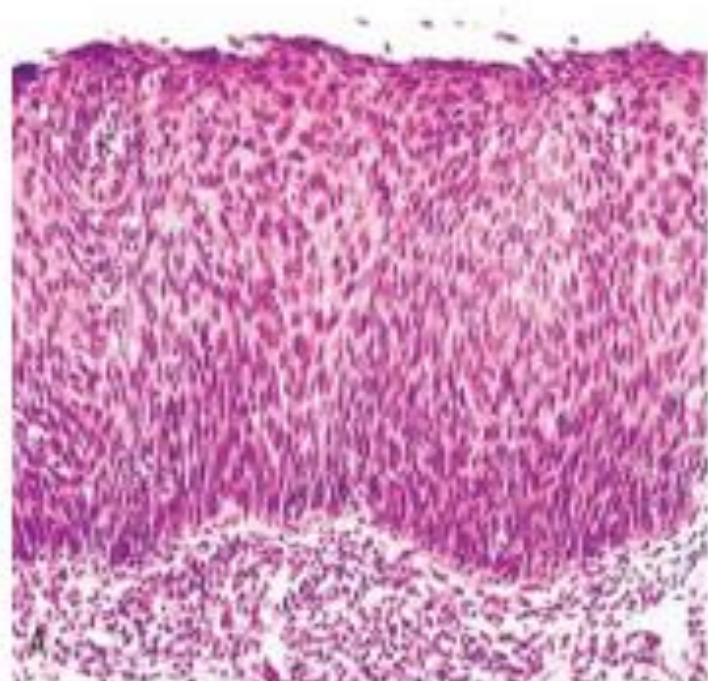
Multiple villous Adenomas of Small Intestine –
AdenoCa

Neurofibromatosis -- Sarcoma

Preneoplastic disorders

- **Persistent regenerative cell replication-**
Squamous cell carcinoma in the margins of a long unhealed skin wound.
- **Hyperplastic and dysplastic proliferations:** Endometrial carcinoma in atypical endometrial hyperplasia, bronchogenic carcinoma in the dysplastic bronchial mucosa of habitual cigarette smokers

- **Chronic atrophic gastritis-** gastric carcinoma in pernicious anaemia
- **Chronic ulcerative colitis-** increased incidence of colorectal carcinoma in long standing disease
- **Leukoplakia of oral cavity, vulva or penis**(increased risk of squamous cell carcinoma)
- **Villous adenoma of the colon:** high risk of transformation to colorectal carcinoma



IX . Hormones

Hormone induced

Oestrogen -- ↑ Endometrial Carcinoma,
Adult Granulosa Cell Tumor

Contraceptive hormones – Ca Breast,
benign tumors of Liver

Anabolic Steroids – benign & malignant
tumors of Liver

Hormone dependent – Prostate Ca & Breast Ca

What causes Cancer ?



I'm giving you Cancer

Have a nice day

