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# BSB1163

# CELL AND MOLECULAR BIOLOGY

## Cancer

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*Cancer*

*by Noor Suhana Binti Adzahar*

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# CANCER



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# WHO Statistics

- 2020; 15 million people will die from cancer
- Causes
  - Ageing population
  - Obesity
  - Smoking



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# The burden of cancer

- hospital expenditure
- millions spent on research
- Substantial financial burdens upon families and carers
- Physical and emotional burden



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# What is Cancer?

- uncontrolled cell division
- formation of a lump or large numbers of abnormal white cells in the blood
- changes to how the cell is viewed by the immune system
- ability to move within the body



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# DEFINITION

- Uncontrol cell growth cancerous mass = tumor or neoplasm
- Natural selection: cells which grow faster than others will take up more and more space.
  - Our cells have multiple defenses against cells overgrowing their allotted locations.
  - Cancer occurs when those defenses have been removed.
  - starts with one transformed cell



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# Basic types of cancer

- Sarcoma is derived from mesodermal tissue such as bone, muscle.
- Carcinoma is derived from ectoderm or endoderm such as skin, nerves.
- Leukemia is derived from white blood cells (WBC) from bone marrow.
- Lymphoma is derived from WBCs from lymph glands.



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# Normal Cell vs Cancer Cell?



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# Cancer cells features

- Large number of dividing cells
- Large, variable shaped nuclei
- Small cytoplasmic volume relative to nuclei
- Variation in cell size and shape
- Loss of normal specialised cell features
- Disorganised arrangement of cells
- Poorly define tumor boundary



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# Cell Division:

## Normal VS Cancer?



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# Benign VS Malignant?



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# STAGES OF CANCER

**0: carcinoma in situ**

**I: The primary tumour is small but invasive into surrounding tissues, has not spread**

**II: The primary tumour is larger, no evidence of spread yet**

**III: The tumour has spread to lymph nodes**

**IV: The cancer has spread beyond the region it initiated to a distant tissue or organ**



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# CAUSES OF CANCER?

- Heredity
- Immunity
- Chemical
- Physical
- Viral
- Bacterial
- Lifestyle



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# Heredity

- Genes isolated for several cancer:
  - RB1 (retinoblastoma)
  - APC (familial polyposis)
  - Human Non Polyposis Colon Cancer (HNPCC)
  - BRCA 1&2 (breast cancer)
  - p53 (many cancers)



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# Immunity

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- Immunosuppression



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# Virus

- Hepatitis B
- Human T-cell Leukaemia virus
- Epstein Barr Virus
- Polyomaviruses
- Human Papilloma Virus (HPV)



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# Bacterial

- *H. pylori*
- Schistosoma spp
- Clonorchis sinensis



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# Chemical

- Alcohol
- Asbestos
- Rubber, plastics, dyes
- Tar / bitumen
- Aflatoxin
- Alkylating agents
- Tobacco



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# Physical causes

- Ultraviolet radiation
  - Sunlight
  - Certain industrial sources
  
- Radiation
  - Radon
  - Cancer treatment



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# Obesity

## Lifestyle:

- Highly caloric diet, rich in fat, refined carbohydrates and animal protein
- Low physical activity



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# GENES INVOLVED IN CANCER?

- Oncogenes
- Proto-oncogenes
- Tumor-suppressor genes



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