

OCR (B) Biology A-level

Topic 3.3 - Non-communicable Diseases

Definitions and Concepts

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3.3.1 The cellular basis of cancer and treatment

Anaphase - The third stage in mitosis where the chromosomes are pulled apart to the poles of the cell by the spindle fibres.

Asthma - A respiratory condition caused by inflammation, narrowing of the bronchi and increased mucus production. The restricted airflow causes shortness of breath, wheezing and chest tightness.

Biopsy - A medical procedure that involves taking a small sample of body tissue so it can be examined under a microscope.

BRCA1 gene - A tumour suppressor gene which codes for a protein that repairs damaged DNA.

Carcinogen - A substance that increases the risk of cancer.

Cell cycle - A regulated cycle of cell division with intermediate growth periods.

Cell cycle checkpoints - Steps at the transition between phases of the cell cycle which ensure that the cell can be successfully replicated.

Chemotherapy - A type of cancer treatment which uses drugs to disrupt stages of the cell cycle and prevent uncontrolled mitosis.

Complementary therapies - Treatments such as acupuncture or aromatherapy that may be offered alongside medical intervention to increase psychological wellbeing or pain relief.

Corticosteroids - Hormones produced by the adrenal cortex. Synthetic versions can be used for immunosuppression or to reduce inflammation, for example in the treatment of asthma, hay fever and COPD.

CT scan - A non-invasive imaging modality which uses X-rays to produce cross-sectional images. Denser structures absorb more radiation and appear lighter.

Cytokinesis - The division of the cytoplasm at the end of mitosis to produce two new daughter cells.

Epidemiology - Analysis of patterns of disease in defined populations. The World Bank publishes much of the data, e.g. related to HIV & tuberculosis.

Gap 1 (G₁) checkpoint - The first checkpoint in the cell cycle which occurs just before the end of G₁ phase and commits the cell to division under favourable conditions.

Gap 1 (G₁) phase - The first growth phase in interphase where the cell synthesises proteins and RNA, duplicates its organelles and increases in size before DNA replication in S phase.

Gap 2 (G₂) checkpoint - The second checkpoint in the cell cycle which occurs at the end of G₂ phase and checks that the DNA was correctly replicated during S phase before the cell enters mitosis.



Gap 2 (G₂) phase - The second growth phase of interphase where the cell continues to increase in size and synthesize biomolecules.

Hereditary nonpolyposis colorectal cancer (HNPCC) - An autosomal dominant condition caused by mutations in genes associated with DNA mismatch repair.

Hormone-related treatment - A cancer treatment which alters the level of a hormone in the body, e.g. the treatment for prostate cancer lowers testosterone levels.

Immunotherapy - Treatment with monoclonal antibodies.

Interphase - The largest part of the cell cycle where cells spend most of their time growing, synthesising biomolecules and preparing for mitosis.

Magnetic resonance imaging (MRI) - An imaging modality used for producing cross-sectional images of soft tissue. A powerful magnetic field causes protons from hydrogen atoms in water molecules to align. Radio waves then knock protons out of alignment. When protons realign after the radio waves turn off, they emit radiation to receivers.

Mammography - The use of X-rays to screen breast tissue for cancer.

Metaphase - The second stage in mitosis where the chromosomes attach to the spindle fibres and align in the centre of the cell along the metaphase plate.

Metaphase (M) checkpoint - The checkpoint occurring at the end of metaphase during mitosis which ensures all of the chromosomes have correctly attached to the spindle fibres and aligned at the metaphase plate.

Metastases - When a tumour loses cell adhesion proteins, cancerous cells can migrate to other parts of the body and form secondary tumours.

Mitosis - The division of a cell to produce two genetically identical daughter cells.

Monoclonal antibodies - Antibodies which have been produced by plasma cells that are identical clones of the same parent cell.

Mutagen - A chemical, biological or physical agent that increases the rate of gene mutations above normal level.

Myc - A group of proto-oncogenes which code for transcription factors.

Negative correlation - A relationship between two variables which change in different directions e.g. as one variable increases, the other decreases.

Non-communicable disease - A disease that cannot be transmitted by direct contact between individuals e.g. sickle cell anaemia or lung cancer.

Oncogene - Mutations of proto-oncogenes that are activated continuously, resulting in uncontrolled cell division.



p53 gene - A tumour suppressor gene which codes for a protein that repairs damaged DNA at the G1/S checkpoint.

PET scan - An imaging modality used to show tumours and amyloid plaques associated with Alzheimer's disease. A radioactive isotope e.g. of carbon is injected & used by the body to synthesise molecules. When the isotope decays, it emits gamma radiation to a detector. Active areas show higher radioactivity.

Positive correlation - A relationship between variables where both values change in the same direction as each other. For example, as one value increases, so does the other.

Prophase - The first stage in mitosis where the nuclear envelope breaks down, the centrosomes move to opposite poles of the cell, the mitotic spindle begins to form and the chromosomes condense.

Proto-oncogene - A gene that codes for proteins involved in promoting the progression of the cell cycle. Over-expression or mutation can cause it to become a permanently-activated oncogene.

Radiotherapy - A cancer treatment that uses ionising radiation to kill malignant cells.

Ras - A GTP-ase involved in signalling cascades in the presence of a growth factor.

Tumour - An abnormal mass of tissue caused by uncontrolled cell division.

Tumour suppressor gene - A gene which codes for a protein that stops the cell cycle for repair or apoptosis.

Ultrasound - A technique that uses the reflection of ultrasound waves at borders between tissues to form images.

UV rays - A type of electromagnetic radiation which increases the risk of some cancers.

X-ray - A type of high-energy electromagnetic radiation which can be used to image bone.

3.3.2 Respiratory diseases and treatment

Acute disease - Disease that has a sudden onset, can be treated and lasts a short period of time.

Asbestos - Silicate minerals with small fibres that can lodge in the lungs, creating scar tissue that thickens the diffusion pathway.

Aspirin - An analgesic derived from willow bark.

Asthma - A respiratory condition caused by inflammation, narrowing of the bronchi and increased mucus production which restricts airflow. Symptoms include shortness of breath, wheezing and chest tightness.



Beta agonist - A drug which relaxes muscles in the airways.

Chronic bronchitis - A respiratory disease caused by irritants which damage the bronchi, causing inflammation and excessive mucus production which paralyses the cilia. Symptoms include a cough lasting more than three months, mucus production and blood-stained sputum.

Chronic disease - Disease that has a gradual onset, may be difficult to treat and lasts a long time.

Chronic obstructive pulmonary disease (COPD) - Refers to a group of lung conditions which cause breathing difficulties, including emphysema and chronic bronchitis.

Clinical trial - Testing a new drug on healthy volunteers then a small group of patients for safety and efficacy before testing it on a larger group of patients.

Double-blind trial - Neither the patient nor the doctors know who has the placebo and who has the real drug. This eliminates any possible bias.

Emphysema - A respiratory disease caused by damage to elastic tissue and alveoli, which makes air difficult to remove. Symptoms include shortness of breath, shallow breathing, barrel chest, lung infections.

Fungal spores - A reproductive unit dispersed by fungi which can cause lung irritation.

Lung cancer - A respiratory disease often caused by smoking as well as exposure to radiation and carcinogens. Symptoms include a cough, blood-stained sputum, shortness of breath and weight loss.

Placebo - A replica of the drug being tested that is indistinguishable from the real drug yet it exerts no effects on the patient whatsoever.

Quinine - An antimalarial drug obtained from the cinchona tree.

Randomisation - Participants are randomly assigned to groups to equalise their baseline characteristics.

Sample - A subsection of a population that can be considered representative of the whole population.

The National Institute for Health and Care Excellence (NICE) - An organisation which provides guidelines on clinical practice, health technologies, and public health after assessing the cost and limitations of treatments.

Theophylline - A drug derived from tea and cocoa that treats COPD and asthma.

Tobacco smoke - Cigarette smoke which damages cilia, resulting in a build-up of dirty mucus.

Topotecan - An anti-cancer drug obtained from the Camptotheca tree.

