Cancer

4.2.2.7 · Biology · revision notes

Cancer is the result of changes in cells that lead to uncontrolled growth and division. You need to know the difference between benign and malignant tumours, how malignant tumours spread, and the lifestyle and genetic risk factors for cancer.

Key facts

- Cancer = changes in cells → uncontrolled growth and division
- Benign: contained in one area, usually within a membrane; does not invade other parts of the body
- Secondary tumour = a new tumour formed where spreading cancer cells settle
- Genetic risk factors: inherited alleles, e.g. faulty BRCA alleles and breast cancer
- Tumour = a mass of abnormal cells
- Malignant: cancer; invades neighbouring tissues; spreads in the blood
- Lifestyle risk factors: e.g. smoking, obesity, UV exposure, some viral infections

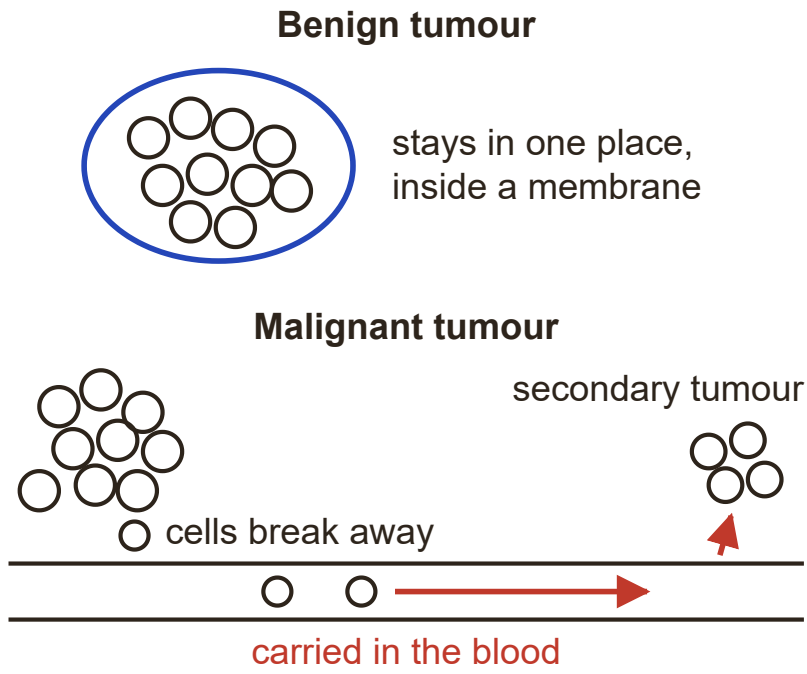
Notes

What cancer is

- Normally, cells divide by mitosis only when the body needs new cells, e.g. for growth or repair.
- **Cancer** is the result of changes in cells that lead to **uncontrolled growth and division**.
- The changes are mutations in the genes that control the cell cycle, so the cell keeps dividing when it should stop. Grade 7+ only
- A mass of abnormal cells formed by uncontrolled division is called a **tumour**. Benign and malignant tumours both form this way.

Benign and malignant tumours

- **Benign** tumours are growths of abnormal cells that are contained in one area, usually within a membrane. They do not invade other parts of the body. They are not cancer, but they can still cause harm by pressing on nearby organs.
- **Malignant** tumour cells are cancers. They invade neighbouring tissues and spread to different parts of the body in the blood, where they form **secondary tumours**.



Benign and malignant tumours

- Because they spread, malignant tumours are harder to treat and more likely to be fatal.

Risk factors for cancer

- Scientists have identified **lifestyle** risk factors for various types of cancer, e.g. smoking (lung, mouth and throat cancers), obesity (e.g. bowel, liver and kidney cancers), too much UV light from the Sun or sunbeds (skin cancer), and infection with some viruses (e.g. HPV and cervical cancer).
- Carcinogens, including ionising radiation, are also risk factors.
- There are **genetic** risk factors for some cancers: some people inherit alleles that make certain cancers more likely, e.g. faulty BRCA alleles greatly increase the risk of breast cancer.
- A risk factor increases the chance of developing cancer. It does not mean the person will definitely get it.

How to answer each type of question

Compare benign and malignant tumours

2 to 4 marks | Grade 5

1. Make each point a comparison: 'benign ... whereas malignant ...'.
2. Cover: contained in one area (in a membrane) or invades neighbouring tissue; stays put or spreads in the blood; secondary tumours or not.

Example. Describe **two** differences between a benign tumour and a malignant tumour.

Model answer. A benign tumour is contained in one area, usually within a membrane, whereas a malignant tumour invades neighbouring tissues (1). Malignant tumour cells spread in the blood to other parts of the body and form secondary tumours, whereas benign tumour cells do not spread (1).

Explain how a secondary tumour forms

3 marks | Grade 5

1. Cells break away from the malignant tumour.
2. They are carried in the blood to another part of the body.
3. They divide uncontrollably there, forming a secondary tumour.

Example. A patient had a malignant tumour in the bowel. Later, a tumour was found in the patient's liver.
Explain how the tumour in the liver developed.

Model answer. Cells broke away from the malignant tumour in the bowel (1). They were carried in the blood to the liver (1). There they divided in an uncontrolled way, forming a secondary tumour (1).

Suggest reasons for an increased cancer risk

2 marks | Grade 6

1. Look for clues in the question: family history suggests a genetic risk factor; habits suggest a lifestyle risk factor.
2. Name the factor and say it increases the chance of cancer.

Example. A woman's mother and sister both developed breast cancer. The woman does not smoke, is not overweight and rarely drinks alcohol.
Suggest why she may still have an increased risk of breast cancer.

Model answer. She may have inherited a faulty allele (e.g. BRCA) from her family (1). This is a genetic risk factor that increases the chance of developing breast cancer (1).

Explain how changes in a cell lead to a tumour 2 marks **Grade 7**

1. Say that the change (mutation) affects the control of cell division.
2. Say that the cell then divides by mitosis uncontrollably, forming a mass of cells.

Example. Explain how a change in the DNA of a skin cell can lead to a tumour.

Model answer. The change affects the genes that control cell division / the cell cycle (1), so the cell divides by mitosis uncontrollably, producing a mass of abnormal cells (a tumour) (1).

Don't lose marks

- Saying benign tumours are cancer. Only malignant tumour cells are cancers.
- Saying cancer cells simply divide 'too fast'. The key phrase is uncontrolled growth and division.
- Saying cancer spreads from person to person. Cancer is non-communicable; malignant cells spread within the body, in the blood.
- Saying a risk factor 'will' cause cancer. It increases the chance.
- Forgetting 'in the blood' when describing how malignant tumours spread.

More tips

Memory tricks

- Benign = Bound (stays in one place, in a membrane). Malignant = Moves (invades and spreads).
- Secondary tumour chain: break off → travel in the blood → settle in another organ → divide → new tumour.
- Lifestyle risk factors can be changed (smoking, diet, sunbathing); genetic risk factors cannot.

Exam technique

- Use the specification wording: uncontrolled growth and division; invade neighbouring tissues; secondary tumours.
- In comparison questions, use 'whereas' so that each point mentions both types of tumour.
- If the question mentions family members with the same cancer, think genetic risk factor; if it describes habits, name the lifestyle factor.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 — **Define cancer**
Cancer is the result of changes in cells that lead to uncontrolled growth and division.

Grade 4 — **Describe a benign tumour**
A growth of abnormal cells contained in one area, usually within a membrane, that does not invade other parts of the body.

Grade 5 — **Describe malignant tumours and secondary tumours**
Malignant tumour cells are cancers: they invade neighbouring tissues and spread in the blood to form secondary tumours.

Give lifestyle risk factors for cancer

Grade 5

For example smoking (lung cancer), obesity (e.g. bowel cancer), too much UV light (skin cancer) and some viral infections (e.g. cervical cancer).

Grade 5

Explain how a secondary tumour forms

Cells break off a malignant tumour, travel in the blood to another part of the body and divide there to form a new tumour.

Grade 5

Link cancer to the cell cycle

Changes to the genes that control cell division make cells divide by mitosis in an uncontrolled way.

Grade 6

Explain genetic risk factors for cancer

Some people inherit alleles, such as faulty BRCA alleles, that increase their risk of certain cancers.

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