***Cancer: Cell Division Gone Bad…. TedEd Video Sequence*** Name:

How do cancer cells grow? Rapid cell division is cancer’s "strength" -- and also its weakness. One of the biggest misconceptions regarding cancer is the idea that you can inherit cancer from your parents. Some people mistakenly say that cancer “runs in families” in the same way as hair color or freckles. In reality, cancer is an individual disease. You may inherit defective copies of genes from your parents, but in general, these genes simply increase your susceptibility for developing certain forms of cancer.

The purpose this activity and video series is to help you understand that cancer is due to an inability of a cell to regulate how fast it divides, and that this inability is due to mutations in specific genes in the cell. Almost one in three Americans will contract cancer during their lifetime, and almost all of us know someone who has had cancer. It is important that everyone has an understanding of how cancer develops and how it relates to the genetics of our individual cells.

**What Happens When Your DNA is Damaged**

[https://www.youtube.com/watch?v=vP8-5Bhd2ag](https://www.youtube.com/watch?v=vP8-5Bhd2ag%20)

1. Base mismatch is due to:

a. Substitution of a base with another one c. Nucleotides damage

b. Incorrect pairing of bases d. The cut of a few nucleotides

2. Base mismatches take place:

a. During DNA replication c. After DNA replication

b. During transcription d. During interphase

3. Tobacco smoke can cause:

a. Single strand breaks c. Double strand breaks

b. Chemical changes to nucleotides d. Homologous recombination

4. For homologous recombination to occur:

a. Cell needs a similar copy of damaged DNA c. Broken ends are fused together

b. Base excision repair takes place d. The cell must duplicate

5. Which DNA repair pathway deals with DNA damage that causes distortion of double-stranded helix?

a. Base excision repair c. Nucleotide excision repair

b. Mismatch repair d. Non-homologous end joining

6. Cancer is due to cells that lose control on their replication. Can you suggest how a mistake in DNA can cause cancer?

**The Immortal Cells of Henrietta Lacks**

[**https://www.youtube.com/watch?v=22lGbAVWhro**](https://www.youtube.com/watch?v=22lGbAVWhro)

7. Why do scientists need to be able to study cells in a laboratory environment?

a. So they won't endanger patients' lives c. So they can repeat experiments

b. Because they need a large supply of identical cells d. All of the above

8. What type of cancer killed Henrietta Lacks?

a. Colon b. Cervical c. Lung d. Brain

9. How do HeLa cells keep dividing while other cells die off?

a. HeLa ignore signals to stop dividing c. HeLa ignore accumulated mutations

b. HeLa avoids apoptosis d. All of the above

10. Research with HeLa cells lead to a vaccine for \_\_\_\_\_, which likely caused Henrietta’s cancer.

a. Polio b. HPV c. Mumps d. HIV

11. A disadvantage of working with HeLa cells in a laboratory is that:

a. HeLa cells die off after a few generations

b. HeLa cells do not survive well on different surfaces

c. HeLa cells spread easily and can infect other cell lines

d. HeLa cells are difficult to obtain

12. What are some of the characteristics of cancer cells like HeLa that help them evade death?

13. Why is it so important for scientists to have a tool like HeLa cells in order to study human disease?

14. Dr. Gey took a sample of the tumor cells from Henrietta Lacks without her or her family’s permission. He then gave away sample of HeLa cells to labs all over the world. While Dr. Gey did not profit from HeLa, the Lacks family was completely unaware of Henrietta’s contributions to science for decades. Do you think what Dr. Gey did was ethical, and do you think this type of situation would happen today? Why or why not?

**The Cancer Gene We All Have**

[https://www.youtube.com/watch?v=pOyKFgGKmHE](https://www.youtube.com/watch?v=pOyKFgGKmHE%20)

15. Cancer represents an inability of the body to control \_\_\_\_\_\_\_\_.

a. How tissues form c. How cells communicate

b. The speed at which cells divide d. The specialization of its cells

16. Which of the following occurs during the development of cancer?

a. Cells accumulate mutations c. Cells become less specialized

b. Cells divide to form tumors d. Tumors influence the operation of other body systems

e. All of the above

17. BRCA1 belongs to a class of genes called \_\_\_\_\_\_\_\_\_.

a. Oncogenes c. Susceptibility genes

b. Tumor suppressor genes d. Developmental genes

18. What is the specific role of BRCA1 in the cell?

a. Promote the development of cancer c. Assist in the specialization of cells

b. Prevent mutations from occurring in a cell d. Check for mutations in the DNA of a cell

19. Suppose that a cell has a mutation in one of its BRCA1 genes that inactivates the gene. What will this do to the rate at which the cell divides?

a. It will speed up the rate at which the cell divides

b. It will slow down the rate at which the cell divides

c. It will have no effect on the rate at which the cell divides

20. Another class of genes, called the proto-oncogenes, function to a similar manner to the gas pedal in a car. Only a single copy of a proto-oncogene needs to be mutated in a cell for it to lose control of cell division. Why would this be the case?

21. There may be hundreds of mutations in the BRCA1 gene that influence its ability to regulate cell division. Why might some of these mutations be more likely to result in the formation of cancer than others?

22. How might a cell use a combination of proto-oncogenes and tumor suppressor genes to regulate cell division? Under what conditions might a cell want to divide faster?

**Life in Miniature: Our Secret War Against Cancer** (Note: not TedEd-based)

<https://www.youtube.com/watch?v=XfyfcBEQkCk>

23. How often is it produced and what happens to p53 if not needed?

24. What role does p53 do with DNA?

25. How is the DNA repaired?

**How Does Cancer Spread Through The Body**

<https://www.youtube.com/watch?v=vP8-5Bhd2ag>

26. Which of the following is not a route where cancer cells can metastasize?

a. Transcoelomic b. Lymphatic c. Transdermal d. Hematogenous

27. In which of these mechanisms of spread can the cancer cell also metastasize to the blood?

a. Transcoelomic b. Lymphatic c. Transdermal d. Respiratory

28. Stephen Paget, an English neurosurgeon, was famous for which of the theories for metastasis?

a. Seed and soil theory c. Seed and plant theory

b. Soil and plant theory d. Anatomical drainage theory

29. Which of the following theories explains metastasis completely?

a. Seed and soil theory c. Neither A nor B

b. Anatomical drainage theory d. Both A and B. Still not yet fully understood

30. Which of the following is not a type of immunotherapy?

a. Training the immune cells to recognize cancer cells

b. Injecting man-made interleukins to stimulate growth and activity of immune cells

c. Training red blood cells to recognize cancer cells

d. Maturing white blood cells outside the body before transplanting them back into the body

31. Why are metastatic cancers so difficult to treat?