NIHR | University College London Hospitals Biomedical Research Centre

Keywords

divide **DNA** **cancer** **glitches** **blood**

evolution **errors** **duplicating** **engineered**

A. Fill in the blanks with the correct word from the keywords above:

Nearly every cell in the body contains all of the _____ needed to make a whole new human. Each cell is like a little robot, that has its own tasks that keep the body working. When it comes to the DNA code, important tasks for the cell include; safeguarding the code, _____ the code and passing it on. Because the DNA code is so long, _____ happen every time that the code is copied. Most of these errors result in no change to the function of a cell. Sometimes they can make the cell less good, or even, better at surviving. The passing on of errors, or _____ in the code that makes an organism better off is called _____. Sometimes a copying error causes a cell to _____ uncontrollably, multiplying into a _____. CAR T-Cells are an exciting new way to destroy cancer cells. These CAR T-cells are _____ by synthetic biologists to recognise a patient's own cancer cells, and are proving to be an excellent treatment for _____ cancers and potentially others in the future.

B. Biohacker checklist:

The biohackers have copied down their instructions for generating CAR-T cells into boxes, but have got them arranged in the wrong order! Draw a line connecting the boxes to put them right:

:

Insert the engineered genetic code into the patients T-Cell using a vector

Inject the patient with the CAR T-Cells

Generate the genetic code using a DNA printer

Collect a patient's T-Cells
START HERE

Identify and kill the patient's cancer cells

Rewrite the T-Cell genetic code to be able to recognise the patient's specific tumor antigens

Model what the newly engineered genetic code will do on a computer

C. Biohacker pop-quiz:

Team up with the 4 billion year old meat robot next to you, and answer the following questions:

1/ Each human body (or meat robot) contains how many cells? Circle the correct answer:

- 50 million
- 2 billion
- 30 trillion
- 700 trillion

2/ Two important white-blood cell types are T-cells and B-cells. These are a critical part of the body's defence barrier against invading pathogens. What is this system called?

3/ Can you name two types of pathogen that attack humans?

4/ What are the protein fragments on the surface of pathogens that B and T-cells recognise called?

5/ Why are our normal B and T-cells not very good at recognising and identifying cancer cells?

6/ What are two common approaches that doctors and surgeons use to attack cancer?

7/ CAR T-Cells have their DNA changed by biohackers to give them new genetic code, or instructions.

These new instructions allow them to recognise a patient's own cancer cells, divide once they find a cancer cell, but also:

8/ CAR T-cells can be thought of as a living drug. What is one advantage of CAR T-cells over conventional approaches?

9/ Can you name a current disadvantage of CAR T-cell therapy?

10/ CAR T-cell therapy has lead to patients going into remission and staying in remission. This means that they are likely to survive for:
(circle the correct answer)

as long as they would without therapy
longer than they would otherwise

Bonus Questions:

1.. The technologies that biohackers can use to engineer bespoke CAR T-Cells are constantly advancing. How do you think that breakthroughs in artificial intelligence and robotics might affect CAR T-Cell therapy?

2. CAR-T cells are an example of a chimeric (chimera) cell. In ancient Greek mythology, a chimera was a fire-breathing monster that had three parts. The head of a …….. body of a ……. and the tail of a …….