

Elaboration exercises

For exercise 1a and b)

Using your school book or the Internet, find out about the term “oncogene” and write down the essential information:

For exercise 2)

At the beginning of this video clip (from 3:42), Nobel Prize winner Howard Temin explains that tumour viruses can produce a cancer cell in just a single step compared to the “usual multi-stage nature of carcinogenesis”.

Find out about the “usual multi-stage nature of carcinogenesis” using the information box and then find an explanation for Temin’s statement.

Information box: The “usual multi-stage nature of carcinogenesis”

Many cell repair mechanisms continuously prevent a cell from mutating into a cancer cell because of a mutation. However, if damage to the DNA cannot be repaired, the cell often reacts with self-destruction (apoptosis). If apoptosis does not occur, the immune system can recognise and destroy this kind of diseased cell. It is only when this mechanism does not work that the cell can divide undisturbed and without any kind of control since the cancer cell cannot be recognised by the immune system. But even then the body can still defend itself: It overruns the growing cell cluster with healthy cells and therefore cuts off the oxygen supply to the cancer cells. Unfortunately that does not always help: if some cancer cells are able to detach from the cell cluster and penetrate the bloodstream, cancer can form new tumours at different points of the body. It has now *spread* and is called “malignant”. Now the body hardly has any chance of controlling the cancer cells.

For exercise 3a and b)

There is no *one* therapy or any *one* medication affective against cancer. Instead, decoding the human genome opens up prospects for a personalised form of therapy. 2013 Nobel laureate Aaron Ciechanover comments on this in a section of his speech “Are We Going to Cure All Diseases?” at the Lindau Nobel Laureate Meetings, which can be seen using the following link: <http://www.mediatheque.lindau-nobel.org/topic-clusters/cancer#page=5>

Watch this section of his speech at the Lindau Nobel Laureate Meetings and discuss why there cannot be *one* therapy and how decoding the individual genome could help instead.

Additional information

For exercise 2)

Tumour viruses can change a normal cell into a cancer cell in just one step. This can happen via various effect mechanisms. One possibility is that passive oncogenes (“cancer genes”) in the host cell are activated by the introduction of the viral genome. Another possibility would be that the virus infects proteins or genes into the host cell, which itself has a carcinogenic effect. The viral genome is then integrated into the genome of the host cell and read. RNA viruses must first supplement their single-stranded RNA into a double-stranded DNA with a reverse transcriptase.