In vitro - cell and tissue cultures

In Vitro

The term in vitro is translated from Latin and means "in glass". This method is used in biology, medicine and other related fields and is based on the cultivation of cell (or tissue) cultures outside the organism from which it originates. The development of this method was greatly contributed by the French doctor, Nobel Prize laureate, Alexis Carrel (1873-1944), whose experiments took place at the beginning of the 20th century.

In vitro cell culture

In order for cultivation to be successful, it is necessary to transfer the removed tissue or set of cells as quickly as possible into a nutrient solution or medium. This medium, with its chemical composition and physical properties, tries to be as close as possible to the natural environment in the body (in vivo), i.e. body fluids (lymph, blood plasma, cerebrospinal fluid, etc.). The concentration of salts and organic nutrients must be strictly controlled, the pH value, the temperature of the environment in which the sample is developed, and many other factors. Great emphasis must be placed on the sterility of the tools used to avoid infection of the given culture.

An essential part of the nutrient medium is serum (fetal bovine serum), which initiates the cells to divide and therefore the growth of the entire culture. Antibiotics are another part of this medium to prevent infection and thus the destruction of the entire culture.

In the case of successful cultivation, our cells begin to multiply and a cell (or tissue) culture is created. These cultures are usually grown in Petri dishes in a thermostat at a constant temperature of 37 °C. After a certain time, however, the nutrient medium is exhausted and it is necessary to remove part of the cells and transfer them to another culture vessel with fresh nutrient solution. This process is called cell passage and must be repeated regularly.

Cell culture growth curve

Lag-phase

The number of cells in the medium first decreases slightly, which is caused by adaptation to the culture environment. After this initial "shock", however, the population size begins to grow rapidly.

Log-phase (logarithmic or exponential phase)

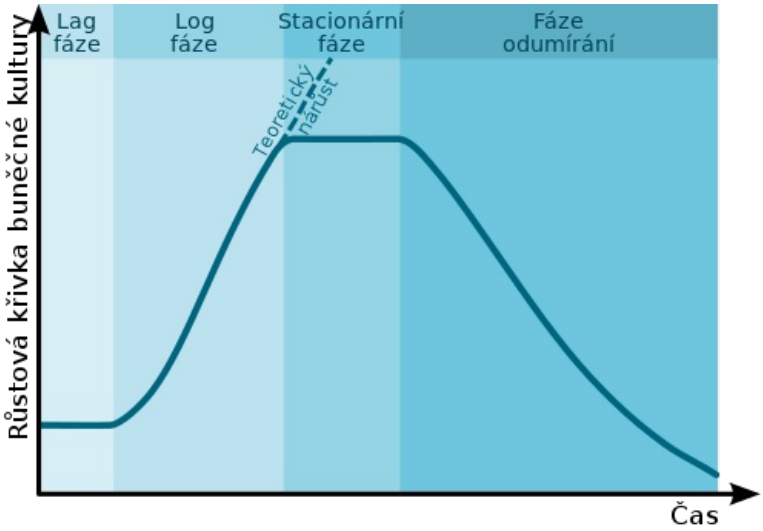
At this stage, the number of cells in the culture grows exponentially and it is possible to capture a high percentage of cells in mitosis (which can be used for karyotyping).

Stationary phase

Cells in culture stop multiplying. This is caused by inhibitory mechanisms (e.g. contact inhibition) and partly also by depletion of the nutrient medium.

Phase of cell loss

It occurs due to a lack of nutrients, a decrease in pH (due to an increase in CO_2), accumulation of toxic products of metabolism, etc.



Types of animal cell cultures

Primocultures (primary cultures)

These are cells or tissues freshly taken from the body. Of the entire population placed in the nutrient medium, only the part that best adapts to the new conditions survives. Cells that have adapted begin to divide. This culture only exists for a few days, because after that it has to be passed.

Cell lines

This is a cell culture of normal diploid cells that have already gone through the passage process at least once. These strains usually disappear after 40-50 divisions due to telomere shortening.

Cell lines (permanent cell lines)

They have the character of tumor cells, are fully adapted to in vitro conditions and divide indefinitely. Their "immortality" is due to the presence of telomerase. One of the most famous cell lines is HeLa (Henrietta Lacks).

Links

WS:In vitro - buněčné a tkáňové kultury

Related Articles

- In vitro cell and tissue culture
- Cultivation media
- Cell Culture

References

- - KOČÁREK, E., M. PÁNEK and D. NOVOTNÁ. *Clinical cytogenetics I: Introduction to clinical cytogenetics, investigation methods in cytogenetics.* 1st edition. Karolinum, 23006. ISBN 80-246-1069-8 .