

CO₂ Incubators

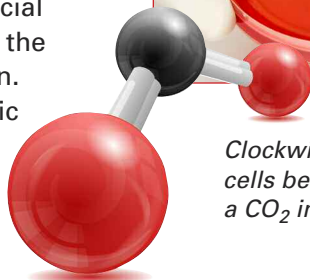
Incubators in general

Today many vaccines are made in cell cultures, such as vaccines for polio, measles, chickenpox and mumps.

'Cell culture' is the general term used for an amalgam of cells, tissues or organs from an animal or plant placed into an artificial environment that optimizes the cells survival or proliferation.

An incubator is a climatic chamber that creates an optimal growth atmosphere for microbiological cultures or cell cultures.

Incubators are used for various applications at universities, research institutes, clinics, hospitals and in certain industries.



Clockwise from left: a CO₂ molecule, cells being cultured, the interior of a CO₂ incubator.



Why the need to measure relative humidity, temperature and CO₂?

Basic environmental requirements for cells to grow optimally are:

- Temperature control
- Relative humidity control
- CO₂ control

A key element to establish the ideal growth environment is the correct pH level. The pH is controlled with the help of a CO₂ sensitive buffer solution that adapts the pH level accordingly. It is important to control all possible parameters.

A popular means of indicating the pH level is to use a culture media called phenol red. Phenol red allows a constant monitoring of pH based upon its color: yellow

for low pH levels; purple for high pH levels and bright red for the optimal level, pH 7.4.

In 95% of applications, the temperature is controlled at 37°C, the relative humidity between 90 and 95% and the CO₂ at 5%. This creates the optimal pH value of 7.4 and allows an optimal growth environment.

It is also possible to control the O₂ level in the incubators in order to test hypoxic behavior in cell culture. Hypoxia is the reduction or lack of oxygen in organs, tissues or cells. Hypoxia in the incubator can replicate real life situations such as insufficient blood vessel networks, defective blood vessels and anemia.

Facts & Figures

- Altitude sickness is a form of hypoxia where the symptoms include light-headedness, fatigue, numbness, tingling of extremities and nausea.
- The typical level of CO₂ in an incubator is controlled at 5% or 50,000 ppm. The CO₂ level in normal breathing air is about .04% or 400 ppm.
- A pH level less than 7 is said to be acidic and a pH level greater than 7 is said to be basic or alkaline. The healthy human body maintains a pH of 7.3 – 7.45.