BINDER

6 THINGS TO CONSIDER WHEN BUYING CO_2 INCUBATORS

BUYER´S GUIDE

CO_2 incubators should provide the ideal conditions for the cell cultures to be examined so as to prevent any risk of contamination. With that in mind, it is important to ask yourself the following questions before buying a CO_2 incubator:

1. **Contamination prevention** – Which measures are in place to prevent any risk of contamination?
2. **Use** – What is the ideal design for a CO_2 incubator to ensure that it is user-friendly?
3. **Design of the interior** – What are the features of a well-designed unit?
4. **Humidity management** – What is the best way to stop cell cultures from drying out?
5. **CO_2 supply** – What is the safest and most effective way to supply CO_2?
6. **Cost-effectiveness** – Which investment will pay off in the long term?

This guide provides detailed answers to all of these questions and tells you the main features you should be looking out for.

1. Contamination prevention

Which measures are in place to prevent any risk of contamination?

Contamination from fungi, viruses, and bacteria poses a high risk for cell samples. Germs and bacteria can also spread to other cultures, which may have serious consequences. On this basis, it is always important to ensure that CO_2 incubators have effective contamination control measures.

Three unit features that can reduce the risk of contamination:

1. A lack of places where contamination can be hidden, such as fans and grooves in the incubator interior.
2. Rounded edges and corners that enable disinfectant to be sprayed on and wiped off with ease.
3. The option to perform full hot-air sterilization throughout the interior.

According to a study by Health Economist Prof. Dietmar W. Hutmacher (Chair in Regenerative Medicine, Institute of Health and Biomedical Innovation, Queensland University of Technology, Kelvin Grove, Australia), an average four-week in vitro experiment with cell cultures costs approximately EUR 9000.

This investment would be worth nothing at all in the event of contamination. At EUR 9000, an experiment that has failed can therefore cost significantly more than a new incubator.

	Costs
Cell culture	EUR 528
Hydrogel	EUR 462
Proliferation	EUR 660
Active agents	EUR 132
Imaging	EUR 660
Immunohistochemistry	EUR 660
Gene expression analysis	EUR 2310
Personnel	EUR 3775
Total	**EUR 9187**

2. Use and cleaning

What is the ideal design for a CO2 incubator to ensure that it is user-friendly?

The cultivation of mammal cells is a complex process that demands the full attention of users. With this in mind, it makes sense that the units are at least straightforward and easy to use.

Intuitive navigation makes processes simpler and ensures there are no barriers hindering work. It is also important that **CO_2 incubators are easy to dismantle**, as they have to be cleaned and reloaded on a regular basis. This value can vary between manufacturers.

- Hot-air sterilization should be easy to perform at the press of a button. In order to comply with standards, it should be possible to decontaminate the entire interior at 180°C.
- The CO_2 incubator has the interfaces required for Ethernet and external storage media so data can be saved for analysis at a later stage.

Less time is consequently spent on assembly and downtime is avoided.

Ease of use saves on the time spent on dismantling by some considerable margin.

Dismantling time approx. 52 seconds.

Dismantling time approx. 20 seconds.

Dismantling time approx. 8 seconds.

3. Design of the interior

What are the features of a well-designed unit?

The principle of "less is more" should apply at least to the interior of your CO_2 incubator.
The ideal unit is designed to have a **low height**, so that the CO_2 incubators are even **easy to use** when stacked on top of one another.

Points to bear in mind for the interior:

1. There should not be any unnecessary places where contamination could be hidden, such as filters, air ducts, and screws.
2. The surfaces should be easy to clean, which can be achieved through as few uneven surfaces as possible and a suitable material, such as stainless steel.
3. It should be possible to insert shelves with flexibility.

Integrated flanges forming a shelf support system are really easy to clean and there is nowhere for contamination to be hidden.

4. Humidity management

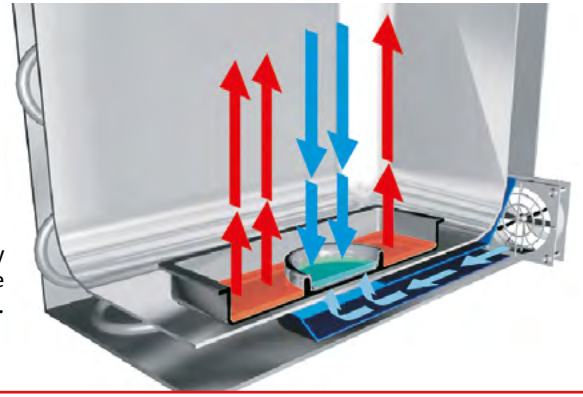
What is the best way to stop cell cultures from drying out?

The answer is an effective humidification system that guarantees consistently high humidity levels in the atmosphere in the interior. This is achieved by placing a water pan inside, which should be easy to remove, provide a high relative humidity (RH) of between 90 and 95%, and guarantee a short humidity recovery time.

Humidity management as a key factor:
In practice, it is impossible to avoid the door being opened during the observation period. What is more important is that the cells are not damaged in any way in the process.

The results of effective humidity management are that:

- evaporation of the medium is kept to a minimum thanks to the high humidity.
- dry interior walls are maintained through humidity limitation.



A double pan with active humidity limitation is an incredibly effective element of humidity management.

5. CO_2 supply

What is the safest and most effective way to supply CO_2?

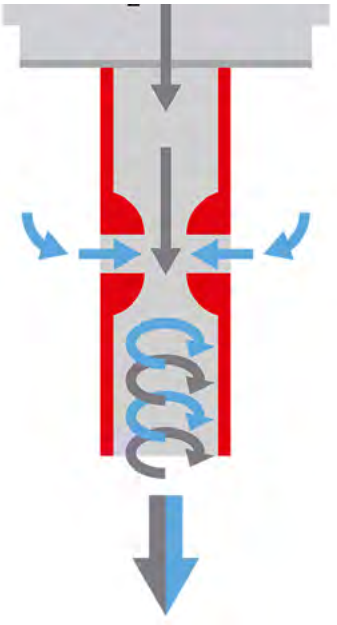
A steady **pH value** is the only way to guarantee optimum conditions for cell growth. For this reason, it is crucial that the correct CO_2 supply system is selected. A gas mixer nozzle is always a preferable option over an interior fan because the latter provides places where contamination can be hidden in the interior.

A CO_2 sensor with a clever design reacts quickly to changes in the gas concentration, thereby ensuring it is stable in the long term. CO_2 incubators are available with their CO_2 sensor either outside or inside the incubation chamber.

Advantages of the sensor being inside the incubation chamber:

- Reacts quickly to fluctuations in the concentration of CO_2
- Does not provide any places where contamination can be hidden

On that basis, the **sensor should be located inside the incubation chamber**, but it is essential that it is also protected against high temperatures.



A Venturi nozzle allows for quick atmospheric mixing when CO_2 is injected.

6. Cost-effectiveness

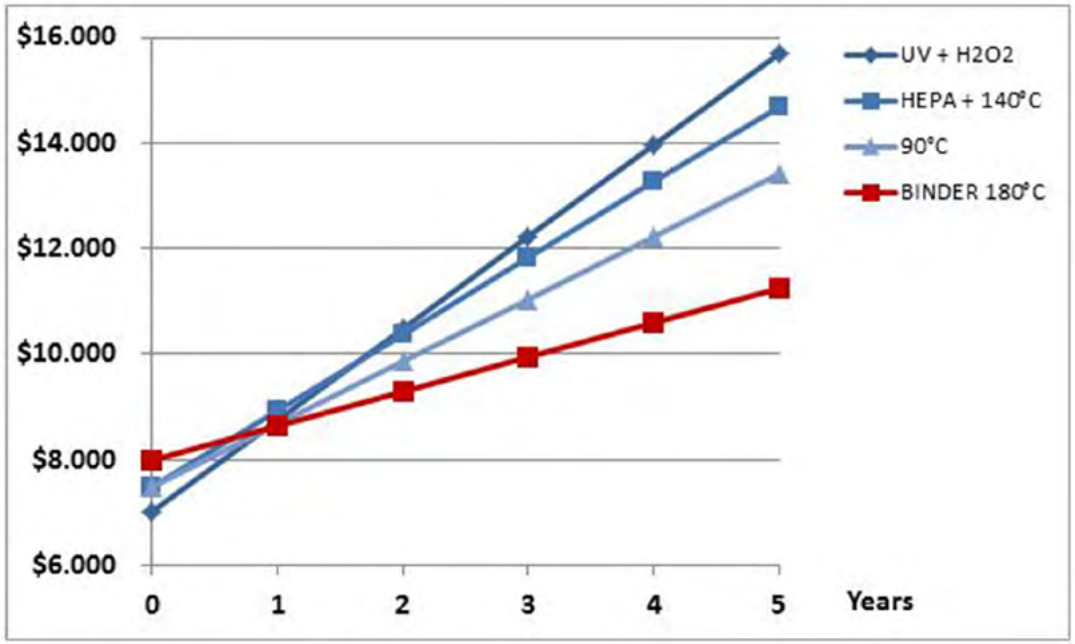
Which investment will pay off in the long term?

The running costs absolutely must be included as part of your considerations. A relatively reasonable price might seem tempting at first glance, but there will often be **unexpected additional costs** involved, such as maintenance costs.

The running costs will determine how cost-effective the decision you make is.
These costs include:

- **consumables and wearing parts**
- **cleaning agents**
- **personnel costs**

To name one example, cleaning various CO_2 incubators properly can take between one hour and a whole five hours, which also involves huge personnel costs.



In the diagram, the total costs of different CO_2 incubators are shown in direct comparison. The acquisition costs are applied in year zero. For each subsequent year, the total costs increase by the amount of the running costs.

Summary

So, now it is time for the big decision… which CO_2 incubator is the one for you?

As a key tool in biomedical research, CO_2 incubators are of huge significance.
Optimum conditions for growth and maximum protection against contamination must be matters of top priority.

Contamination prevention	The risk of contamination should be reduced to a minimum through hot-air sterilization and disinfection.
Use	Intuitive navigation can make processes much simpler. Plus, if units are easy to dismantle, downtimes can be reduced.
Design of the interior	When it comes to the interior, less is more: it should be simple, clear, easy to clean, and low-maintenance.
Humidity management	A smart humidity management system ensures that humidity levels are high, with evaporation of the medium kept to a minimum and, where possible, no risk of contamination.
CO_2 supply	A suitable CO_2 supply system is one that guarantees a steady pH value in the incubation chamber at all times so as to provide the ideal conditions for cell growth.
Cost-effectiveness	It is only possible to determine whether buying a particular unit model will still be a worthwhile investment after years of use by factoring in the running costs.

Be sure to take all of these factors into account when making your decision and select the best CO_2 incubator to suit the scope of your applications.

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