
# Five reasons

## Why your next $CO_2$ incubator should be 100% pure copper



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5

# Natural properties of copper

Recognizing copper's natural ability to destroy fungi, bacteria and viruses [1] more cell culture professionals are choosing Thermo Scientific™ incubators with 100% pure copper interiors.

Learn how copper can help maximize your productivity and minimize the threat of contamination, surrounding your cells with an environment you can trust.

Here are **5 reasons** for 100% pure copper interiors of your $CO_2$ incubator.

"We like the Heracell copper incubator because we just don't experience any problems, from entry level to post-docs with 20-30 papers, none of our team has any contamination problems at all. It's just so easy."

—Lab Manager with 11 years experience with Thermo Scientific™ Heracell™ Copper $CO_2$ Incubators

1 2 3 4 5

1 Natural effect

2 Easy to maintain

3 Always working

4 Improves with time

5 Safe for cells

# 1 Natural effect

## 100%

**copper is more effective than lower copper content**

The 100% naturally effective capabilities of pure copper eliminate microbial contaminants quickly and effectively. Research measuring the viability of methicillin resistant *Staphylococcus aureus* on various copper alloys and stainless steel [Figure A] demonstrates that nothing matches the contamination fighting efficiency of 100% pure copper [2].

Similar results have been documented against typical incubator contaminants. Low copper content alloys and copper plated stainless steel are less effective. Thermo Scientific $CO_2$ Incubators featuring 100% pure copper offer an excellent solution for prevention of surface contamination.

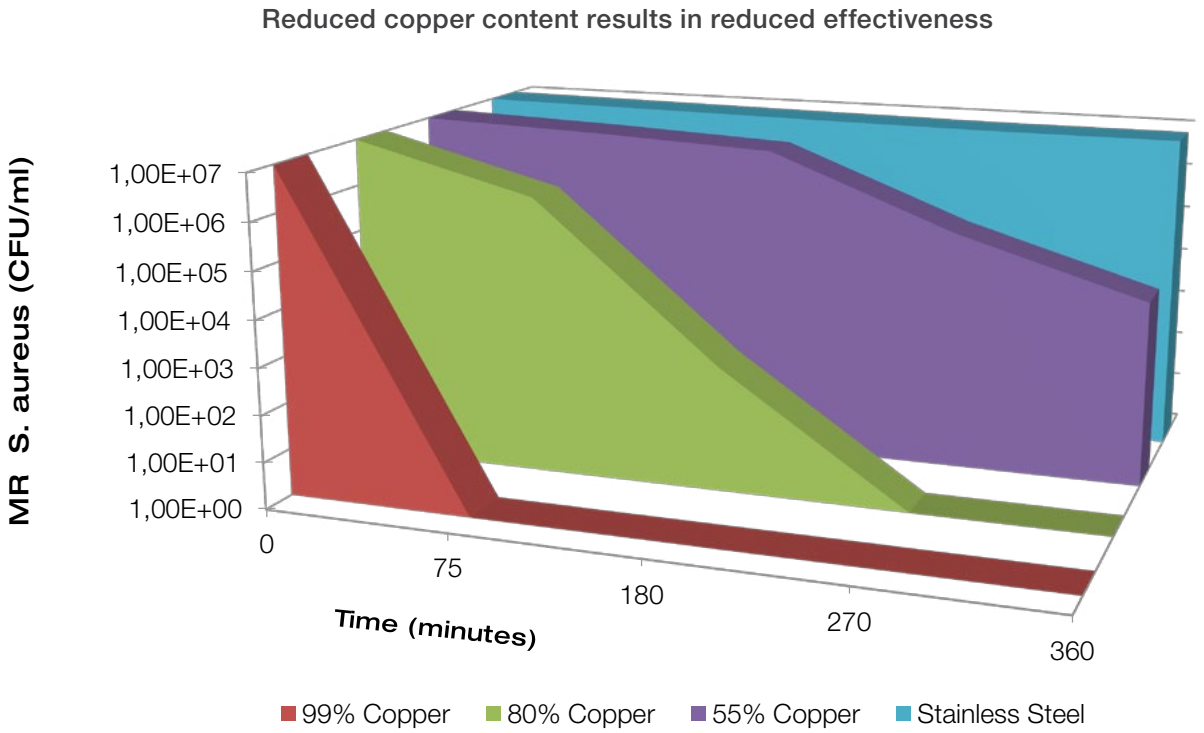


**Figure A.** Adapted from Michels HT, Wilks SA, Nocye JO and Keevil CW. Copper alloys for human infection disease control. Materials Science and Teaching Conference, 2005.

# 2 Easy to maintain

No special handling is required for copper, and maintenance is minimal. There is no need to risk exposure of cultures or personnel to toxic chemical disinfectants or UV light, which is not effective in a $CO_2$ incubator with high humidity [3].

Simply use a mild cleaner such as dish soap to remove any drips or spills, and clean the incubator periodically. Do not use any chemical disinfectants, because they could react with the 100% pure elemental copper and are not needed.

Smart Note | $CO_2$ incubators

ThermoFisher SCIENTIFIC

Cell culture

**Question: How should I clean, disinfect, and maintain the 100% pure copper inner chamber in my $CO_2$ incubator?**

**Answer:**

Thermo Scientific™ $CO_2$ incubators featuring a 100% pure copper chamber provide continuous and reliable protection for valuable cultures, as they have since 1976. Research demonstrates that nothing matches the efficiency of this pure element[1]. No special handling is required for copper, and maintenance is minimal. It is not necessary to use a chemical disinfectant, due to copper's inherent properties. We recommend using only mild soap and water for cleaning the copper, followed by 70% ethanol to remove any remaining residues. These recommendations should be strictly followed, to retain the copper's integrity and natural properties.

A $CO_2$ incubator with a 100% copper chamber should be maintained and cleaned following the manufacturer recommended procedures, to retain its integrity and natural properties. It is entirely natural and normal for the copper surface inside the incubator to change after a certain amount of time. You will see it transition from the gleaming, uniform orange-red color (Figure 1) to a mix of black, green and/or blue colors (Figure 2). This is a natural oxidation process, inherent to the copper surface and a normal part of the development of a visible patina or tarnish of the pure elemental copper[2]. The presence of water normally speeds up the process, and this is why oxidation occurs fastest on the areas which are in contact with water. As copper ages, the surface oxidation that creates the patina makes the copper stronger and more effective[3,4]. The surface will feel smoother, and the tarnishing effect also results in an increased amount of cupric ions to accelerate the natural properties that help protect cultured cells. This process should not cause any concerns, as copper ions do not become airborne and are not analogous to corrosion. Rather, the oxidation layer adheres strongly to the copper surface creating no threat to precious cells incubated in culture vessels.

Thermo Scientific $CO_2$ incubators undergo our "end of line" testing procedure. This includes complete operation of the high temperature decontamination or sterilization cycle. The heat from the cycle will initiate the oxidation process and accelerate the development of the patina. This is normal behavior, inherent to natural copper, and a reflection of the testing that we perform on every unit that we produce.

The copper can be affected by materials that come into contact with its surface. In this respect, any dirt or spills should be cleaned immediately to ensure the copper can keep working its best. Any chemicals or salts other than those naturally in air or water that contact the copper surface may produce a precipitate. The composition of these copper compounds is dependent on the procedures used in the incubator and on the type of water or disinfecting agents used.



Figure 1. Thermo Scientific™ Heracell™ VIOS™ $CO_2$ incubator with 100% copper interior, before use



Figure 2. Appearance of a pure copper incubator after several years of activity.

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**SmartNote:** How should I clean, disinfect, and maintain the 100% pure copper inner chamber in my $CO_2$ incubator?

# 3 Always working

The 100% naturally effective properties of pure copper provide continuous protection against contamination on contact, all day every day.

Over time, the 100% pure copper will react with oxygen in the air to develop a natural patina, or tarnish, in a process called passivation. The resulting copper oxide coloring can vary. The presence of water normally speeds up the process, and this is why oxidation occurs fastest on the areas which are in contact with water.

The patina (or tarnish) does not wipe off: this is because the oxidation is inherent to the copper surface. It is the same process that occurs with good quality silver or brass, and this passivation actually strengthens the copper, increases efficacy, and results in a smoother surface [4].

"With copper, you have no contamination. The lab next door has contamination in their stainless steel incubator, but we have not had any. Before we had to clean the incubator all the time. Copper is saving us time and money."

—Principal Investigator working with stem cells

# 4 Improves with time

The natural efficiency of 100% pure copper interiors improves as the surface oxidizes over time, visible as tarnishing. Figure B demonstrates that as copper ages the tarnishing effect provides an increased amount of cupric ions to attack contaminating microorganisms [2]. Tarnished and untarnished 1 $cm^2$ copper and copper alloy samples were tested for their inhibitory effect.

*E.coli* bacteria were applied to each coupon and air dried. At several time points, the bacteria were collected and the number of viable organisms determined. Only tarnished, high copper content carriers exhibited increased performance with age. Untarnished alloys with limited copper content had almost no effect.

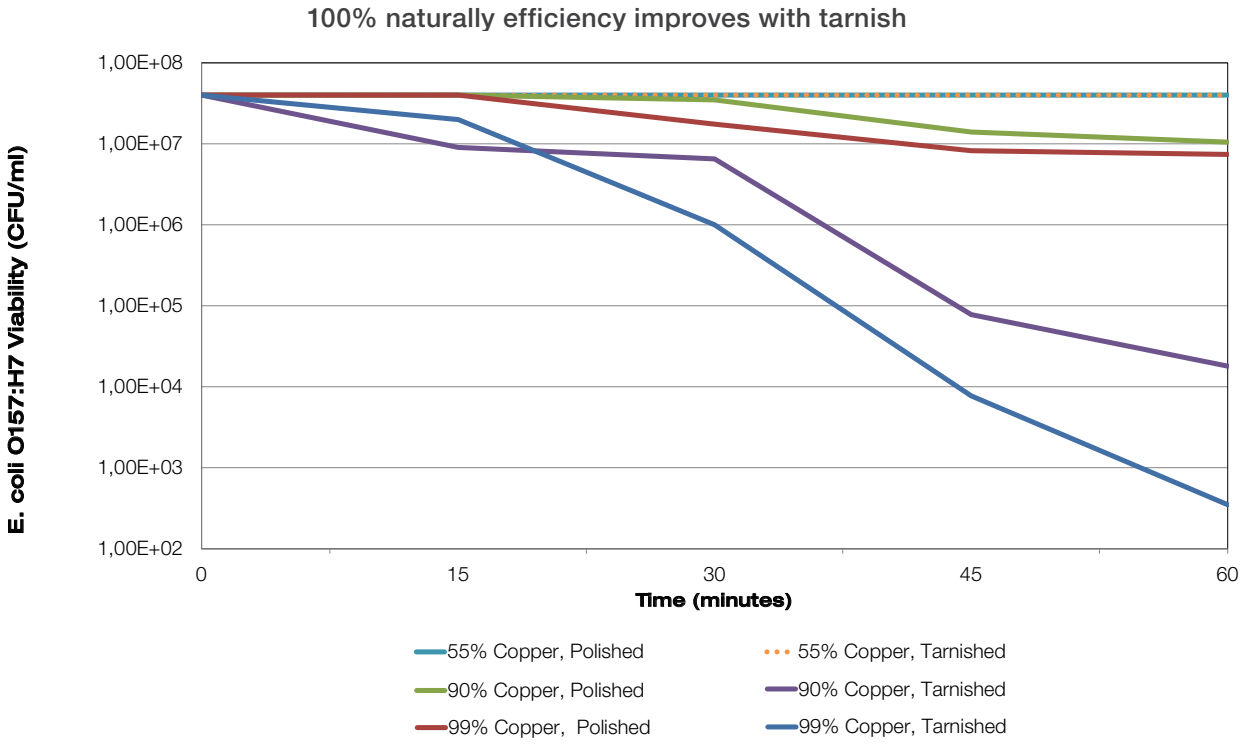
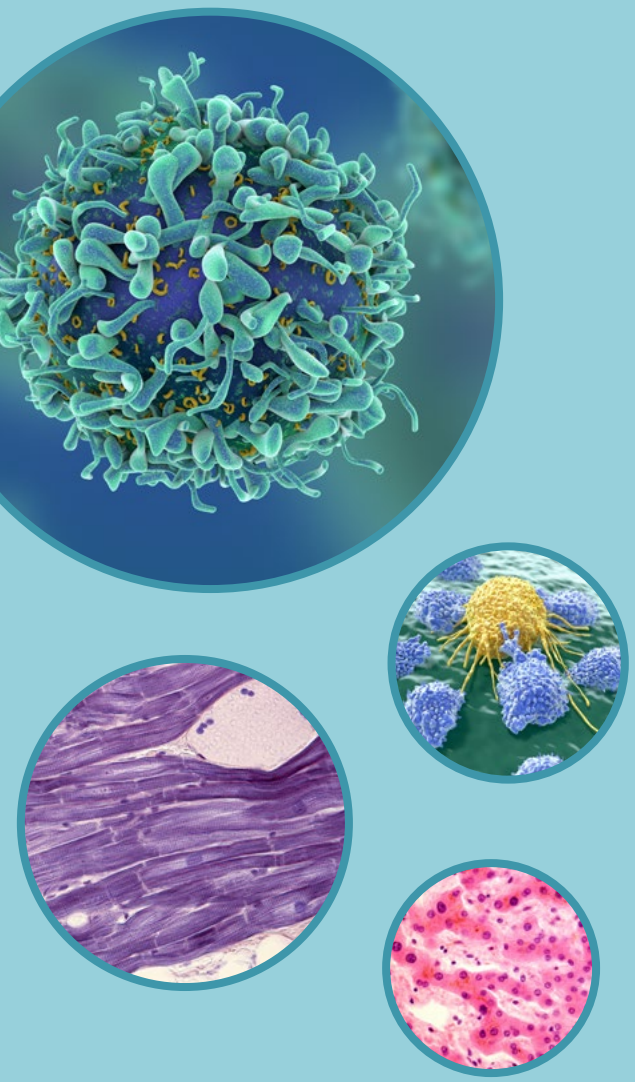
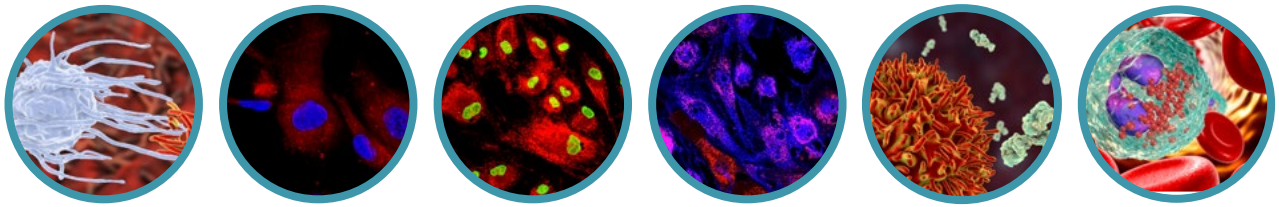



**Figure B.** Adapted from Michels HT, Wilks SA, Nocye JO and Keevil CW. Copper alloys for human infection disease control. Materials Science and Teaching Conference, 2005.

# 5 Safe for cells



Thermo Scientific $CO_2$ incubators have offered 100% pure copper interiors since 1976. Legions of cell biologists have produced valuable results in sensitive cells grown in these incubators. Many scientists feel their cells grow better when incubated in a pure copper chamber. Because copper ions do not become airborne, they pose no threat to precious cells incubated in culture vessels on copper shelves. 100% pure copper surfaces help protect the entire incubator chamber, including walls, shelves and humidity water reservoir, to help provide you peace of mind that your cells are safe from contamination introduced by routine door openings and sample access.



"Everything we do is cell based. The main thing I've noticed is my ability to maintain my cells. There is just no comparison since we got the copper. I've had stainless steel incubators before but the comfort level you can have with the copper is simply amazing."

– Laboratory Manager with 14 years experience working with all types of mammalian cell lines, including adherent, suspension, hybridomas and transformed stem cells

# Summary
## 5 reasons

Thermo Scientific $CO_2$ Incubators featuring a 100% pure copper chamber help provide continuous and reliable protection for valuable cultures, as they have since 1976. Research demonstrates that nothing matches the efficiency of this pure element [1]. Here is a short summary of the five reasons for 100% pure copper interiors:

- Natural effect – higher copper contents increase effectiveness
- Easy to maintain – no special handling required, use mild cleaner, no chemical disinfectant
- Always working – continuous protection, oxidation does not minimize the effect
- Improves with time – tarnished copper even increases the natural effectiveness
- Safe for cells – copper ions do not become airborne and therefore are no threat to cells


**References:**

1. Grass G, Rensing C, Solioz M. Metallic copper as an antimicrobial surface. Appl Environ Microbiol 77(5) 2011.
2. Michels HT, Wilks SA, Nocye JO and Keevil CW. Copper alloys for human infection disease control. Materials Science and Teaching Conference, 2005.
3. Burgener J. Position paper on the use of ultraviolet lights in biological safety cabinets. Applied Biosafety 11(4) 2006.
4. Hilden J, Laitinen T, Maekelae K, Saario T, Bojinov M. Surface films and corrosion of copper. Swedish Nuclear Poer Inspectorate (SKI), SKI Project Number 97153, 1999.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