

Product Handling Guidelines

Serum

PRODUCTS:

GeminiBio offers high-quality serum for your cell culture needs.

- Fetal bovine serum
- Animal serum
- Human Serum AB (research to clinical manufacturing)

How is my serum shipped?

Our serum is shipped with dry ice.

How should I store my serum?

Upon receipt, store at -20°C.

My serum arrived thawed. Is it still fine?

If it arrived partially thawed but still with dry ice, it is fine to use. Either refreeze or finish thawing the serum and aliquot the serum into convenient volumes for use. Typically, we suggest if the serum is more than 10% thawed, please finish thawing and aliquot.

Thawing Instructions:

When preparing serum for use, it should be allowed to thaw gradually, either at room temperature or in a refrigerator at a temperature of 2-8°C overnight to minimize thermodynamic stress to the material.

Appearance:

Product color range varies but will typically be yellow to orange in color. Some lots may be more cloudy than others. It may contain tiny precipitates, which will not impact the product performance (see our note below on precipitates for more information).

Preparation and Use:

After the product has been thawed, swirl the bottle gently to mix the serum well. Aliquot into convenient volumes and minimize freeze-thaw cycles.

Stability:

If stored frozen (-10 to -20°C), product expiration is 5 years from manufacture. We do not recommend storage at 4°C. If the product is stored at 4°C, we recommend using it within two weeks to avoid compromising effectiveness.

FREQUENTLY ASKED QUESTIONS

Should I heat inactivate my serum?

Historically, serum has been heat inactivated to inactivate complement activity. However, heat inactivation could destroy beneficial components in serum such as proteins, growth factors, cytokines, vitamins, and amino acids. In addition, heat inactivation could cause precipitates to form in the serum.

The same lot of serum that is heat inactivated and not heat inactivated could perform differently.

For more information on our further resources at the following links:

<https://www.geminibio.com/post/should-i-heat-inactivate-my-serum>

<https://www.geminibio.com/post/heat-inactivation-serum>

Why Is my serum cloudy? Is it contaminated? Is it still useable?

If you are using an unopened bottle of GeminiBio serum, the cloudiness in the serum is most likely due to precipitates. Precipitates are normal in serum and do not impact the serum quality or your cells— GeminiBio filters serum before bottling and tests the finished serum for bacteria, fungi, and mycoplasma.

What causes precipitates in serum?

Precipitates found in serum primarily consist of proteins and lipids that have precipitated out of serum during the temperature fluctuations of the serum manufacturing process. Precipitates found in serum are normal and will not affect your cells.

Because precipitates arise during temperature fluctuations of serum, heat inactivation can also cause precipitates to form.

Did my serum just gel?

This is a rare occurrence but possible if not handled properly. Serum is comprised of liquid and proteins. When left to sit for a prolonged period, the proteins will sediment at the bottom. When the serum is not adequately mixed, heating the serum will cause the sedimented protein to start denaturing and congealing, forming a gel-like structure. This is extremely rare and typically happens when FBS has been stored in a conical tube and heated above 37°C.

The serum clogged my filter?

The serum precipitates can clog filters. We do **not** recommend filtering the serum as the precipitates will not harm your cells; however, they will clog your filter.

If you feel uncomfortable with the precipitates, please thoroughly mix the serum, then centrifuge briefly at 400 x g.

To reduce the chance of precipitates, slowly thaw the serum and minimize temperature fluctuations.

Does each lot of FBS or human serum perform differently?

Each lot of serum will consist of different sources, so there may be lot-to-lot variation due to the biological nature of the serum source. However, that will also depend on the application of the serum. Cells that are more robust and easy to grow will likely not be affected by lot-to-lot variability. If you are unsure, we recommend contacting us to sample lots, free of charge.

PRECIPITATES

Introduction

Serum is an excellent supplement for cell culture media because it contains many components necessary for cell growth (proteins, electrolytes, lipids, minerals, vitamins, hormones, and many undefined growth

factors). Precipitates are not harmful to your cells and can be found in all serum, regardless of supplier. Various factors can cause precipitates and turbidity to develop in serum.

Serum components and manufacturing

Cryoprecipitate, high-molecular-weight plasma proteins, is a widespread source of serum turbidity. These proteins have solidified out of solution due to the low temperature serum collection, processing, manufacturing and storage.

Fibrinogen, a soluble protein, does not completely clot during early serum processing and is a significant component of the precipitate. During filtration, fibrinogen passes readily through even the finest of membranes. It is usually not until after sterile filtration and subsequent freeze/thaw cycles occur that fibrinogen aggregates and precipitates. At this point, the serum has typically been bottled. The aggregated fibrinogen in serum appears as larger flocculent masses, typically 1-2 mm. However, there is no evidence that visible precipitate in serum affects the performance of cells in the culture environment.

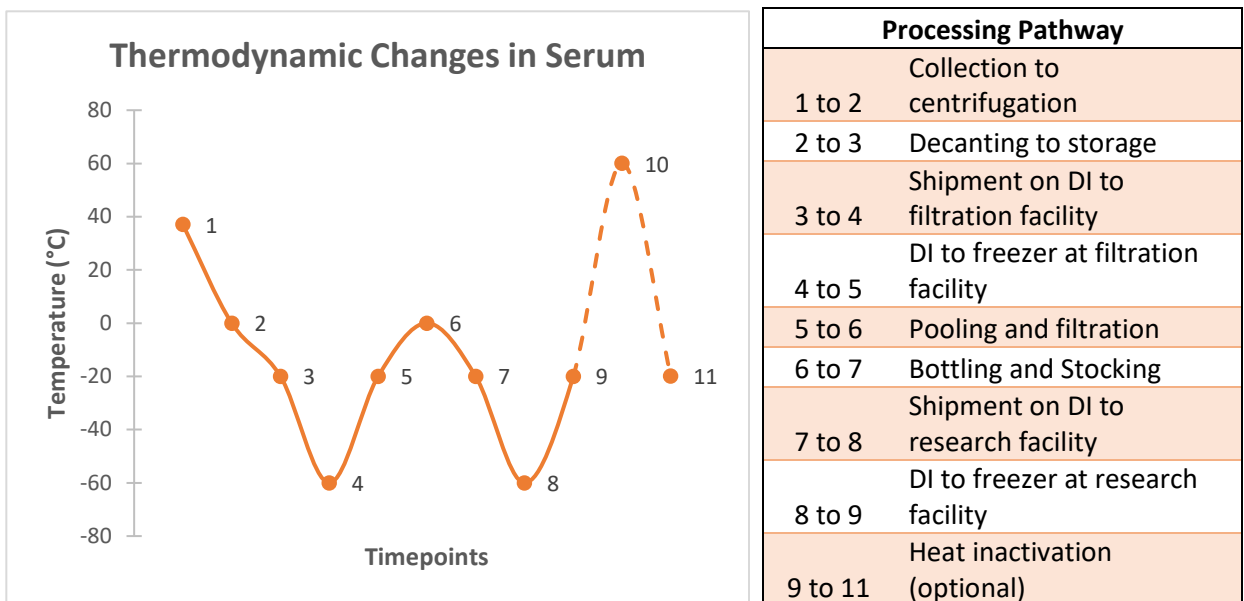
Temperature

Another source of turbidity is prolonged incubation at 37°C. Calcium phosphate will often precipitate and is seen as small opaque dots when viewed under a microscope. Again, there is no evidence that this precipitate has any impact on cultured cells.

Heat inactivation has been shown to cause turbidity in serum as more heat-sensitive proteins become denatured. Ask yourself if it is truly necessary to heat inactivate this material for your intended purpose.

Long-term storage at 2-8°C increases the likelihood that various proteins and lipoproteins will denature and precipitate out of the solution.

Turbidity of serum increases in direct proportion to the number of times it undergoes a significant thermodynamic change (i.e., freeze/thaw cycles). The graph below shows the typical freeze/thaw cycle pattern seen in serum.



How does one reduce the amount of precipitate in serum?

While these precipitates have not been shown to affect performance, it affects the aesthetics of the serum and photomicrographic documentation. The following recommendations are intended to minimize precipitation and turbidity

Key points

1. **Avoid repeated temperature changes** (i.e., freeze/thaw cycles).
2. **Properly store and thaw the serum.** The bottles should be stored at -20°C to ensure the integrity of the serum is maintained. To thaw the serum, remove the bottles from the freezer and thaw at 4-8°C or for accelerated thawing at room temperature. Then, place the bottle in an incubator or water bath at 30-37°C. Gently invert/swirl the bottles every 15 minutes until the serum is completely thawed.
3. **Re-think heat inactivation.** The protocol of heat inactivation originated before the advancements in serum processing of today were implemented. Unless it is vital to your research, consider skipping heat inactivation.

With over 35 years of cell culture experience, we are confident that every step of our processing will deliver the highest quality product from collection to the customers' receipt. The issue of precipitates in serum is very common to serum suppliers and will continue to be for the foreseeable future. It is important to understand what causes this turbidity and what steps can be taken to reduce it.