



## What makes Biowest a serum specialist?

With more than 25 years of experience with serum as its main activity, Biowest is dedicated to quality and service; to vertical integration, and providing a wide range of origins.

## What makes Biowest unique?

Biowest takes full responsibility of ensuring a vertically integrated supply chain to the highest standard of quality, traceability and safety. In 2004, Biowest was acquired by the Viking/Serascandia group to become the first vertically integrated serum company. In the same year, Biowest denounced cases of misrepresentation to the authorities and informed the affected victims; highlighting the importance of serum industry traceability guidelines and oversight, and promoting the creation of the International Serum Industry Organization.

## How should I select my FBS supplier?

The choice of the FBS supplier is based on Quality, Traceability and Safety along the whole supply chain, endorsed by comprehensive documentation; backed up by audits of the supply chain back to the serum source; and covering several years.

## What is the OIE (World Organization for Animal Health)?

The OIE (World Organization for Animal Health) is an intergovernmental organization created in 1924. In 2011, the OIE totaled 178 Member Countries and Territories.

Its missions are:

- To ensure **transparency** in the global animal disease situation
- To collect, analyze and disseminate veterinary **scientific information**
- To provide expertise and encourage **international solidarity** in the control of animal diseases
- To **safeguard world** trade by publishing health standards for international trade in animals and animal products
- To improve the legal framework and resources of **National Veterinary Services Organization**

## What does USDA Approved mean?

The serum's source is from a USDA Approved country. This means that serum is produced from blood collected in countries that have been approved by the United States Department of Agriculture (USDA) to export ruminant serum products to the United States. Eligible countries that export fetal bovine serum into the U.S. include: Australia, Canada, Chile, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, New Zealand, Nicaragua, and Panama.

## What does ISIA mean?

[ISIA](#) is the [International Serum Industry Association](#). Its main objective is to establish traceability guidelines and harmonize international import rules, working with government and international authorities.

## What about bovine viruses?

Some cattle viruses can cross the placenta of the cow and infect the calf fetus, thus contaminating FBS and potentially making it unsuitable for use in cell culture. Some of these cattle viruses have a limited distribution and only exist in certain parts of the world. These are viruses of concern when importing FBS from infected countries – See [Table of Diseases of Importation Concern for FBS](#). Other cattle viruses exist in all countries, and regardless of country of origin, the FBS must be tested or treated to assure freedom from these and other viruses (See [USDA 9 CFR 113.53](#) and [EMEA-CPMP-BWP-1793-02](#)). The treatment of choice for most FBS is gamma irradiation at 25-45 kGy to guarantee freedom from viruses.

## Foot and mouth disease (FMD): Does it matter?

FMD is relevant for regulatory import purposes but not for cell growth. The USA and a few other countries only allow FBS imports from countries free from FMD, WITHOUT vaccination while most other countries also accept FMD-free WITH vaccination. Both types of FMD-free countries are free of FMD outbreaks and circulating FMD viruses, as verified by the OIE and declared equally safe.

## Are some FBS origins better quality than others?

The serum's origin has no influence on cell growth. Biowest has compared cell growth in FBS from seven different countries on three continents, and confirmed that regardless of the country of origin, all cell lines tested had the same average performance. One batch of FBS may work well for one specific cell line, but not for another. "Serum quality" is specific for each cell line. That is why testing of FBS is widely used when dealing with sensitive cell lines. Biowest performs the most extensive analysis of biochemical parameters and testing on cell lines in the industry, making available the results on the Certificates of Analysis.

## What is FBS global supply?

The availability of FBS is diminishing. Meat and calf prices are increasing as consumers in some countries increase the consumption of beef; and as cattle breeding techniques are permanently improving. These combined factors lead to a reduced frequency of pregnant cows at slaughter. The collection of FBS in new countries has, for many years, compensated for the decrease in supply; but now there are no more new producer countries available. The present world supply of FBS is short and will continue decreasing.

## Why is the demand for FBS increasing?

The demand for FBS is growing along with the latest research developments, including stem cells, cell therapy, new vaccines and proteomics.

## Is it necessary to heat inactive serum?

For most cell culture applications, heat inactivation of serum is not recommended. Heat inactivation degrades complement proteins that may interfere with immunological assays. Heating serum for prolonged periods of time can reduce or destroy growth factors, as well as increase the formation of deposits which are commonly mistaken for microbial contamination.

## What about animal welfare?

OIE's guidelines for animal welfare are respected in the countries where the FBS is collected ([OIE Terrestrial Code 7.5 Slaughter of Animals](#)).

## Why is traceability important?

Traceability is important because it provides a chain of identity of the product from the country and slaughterhouse of origin, to the processing, packaging and labeling facilities ready for sale and final distribution. As you can verify, traceability insure you that the product you buy was made respecting regulations at each level. Unbroken, this chain of informations means complete transparency and entire compliance.

## How do I select FBS for stem cells?

In addition to normal testing, Biowest also tests FBS for stem cell work suitability. However, it is recommended that batches used for stem cells be tested on specific cell lines for the specific conditions required. Dr Yamanaka in his [Nobel Prize](#) winning work related to stem cell research, selected Biowest FBS after testing our batches.

## Are Biowest products sterile?

Except where notified on product labels, Biowest sera and liquid media are sterile filtered. Sterility is not guaranteed after opening. The use of aseptic manipulation techniques is recommended.

## What is the best way to thaw serum?

Remove the serum from frozen storage and let it thaw overnight at room temperature. The following day, slightly agitate the serum to homogenize it without making it foam.

The agitation is the key to avoid the formation of crystalline or flocculent deposits.

If a deposit does appear, it is not toxic to cell cultures. It only affects the appearance and consistency of the serum.

## What is BSE?

Bovine spongiform encephalopathy (BSE), more commonly known as “mad cow” disease, is a fatal neurodegenerative disease (encephalopathy) in cattle.

## What is the risk of BSE in serum products?

According to the OIE (World Animal Health Organization), there is no risk of BSE being transmitted in several products, including: milk, hides and skins, deboned meat, blood and blood by-products, such as fetal bovine serum ([OIE Terrestrial Code 11.4 BSE](#)). Most OIE member countries have adopted this position, including the European Union and the United States (USDA).

For some time, BSE was an argument used in favor of certain origins. After the OIE has determined that BSE is not transmitted by blood products, these arguments have become obsolete.

## What makes Fetal Bovine Serum (FBS) unique?

FBS is essentially a natural product. All FBS batches are **unique**, with specific characteristics, different from all other batches.

## Are there alternatives to FBS?

There are some cell lines specific serum-free alternatives available, including Biowest FreeAdd (Catalogue Number [S6000](#)). In most cases, cell adaptation is needed, yields are lower and costs are higher.

## What is the recommended storage temperature for the serum?

The serum should be stored frozen and protected from light. The recommended storage temperature is -10°C to -40°C. At temperatures below -40°C, the bottles may become brittle increasing the risk of breakage.

## How long can the serum be stored between +2 and +8°C?

Serum may be stored between +2 to +8°C for up to 8 weeks without diminishing its performance (\*). Internal studies in Biowest have shown that during 26 weeks of storage (between +2 and +8°C) the serum's capacity to promote cell growth was not significantly altered.

(\* *Art to Science, Vol.19, No.2, "Serum Stability at Refrigerated Temperatures (2-8°C).*

## What are the deposits in the serum?

Turbidity and flocculent material may be present after thawing or after prolonged freezing and/or refrigeration. Our experience indicates these modifications do not affect the biological performance of the serum.

- Some deposits are due to fibrin:

Our collection procedures and rapid freezing may leave some fibrinogen in the serum. Fibrinogen is the soluble precursor of the clot-forming protein, fibrin. The fibrin may appear after thawing or heat inactivation. Fibrin does not alter the capacity of the serum to promote cell growth. It is recommended to use the serum without treatment (filtration or centrifugation).

- Some deposits are due to Calcium Phosphate:

Serum that is incubated at 37°C for extended periods will become cloudy and deposits may appear. They are composed of calcium and phosphorous. To the best of our knowledge, this does not alter the performance of the serum in cell cultures.

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## Why kill pregnant animals?

The slaughtering of pregnant animals is, in most cases, an unplanned event. The frequency depends on farming techniques. In most cases, the condition of gestation is unknown; especially where animals are produced naturally; in the case of cattle moving freely around, grass fed, heifers and steers together. No cows are killed with the main purpose of harvesting the fetal blood. The blood is collected as a by-product from cattle slaughter operations for the bovine meat. The pregnancy condition is unknown when an animal enters the slaughtering line. The percentage of pregnant cows going to slaughter is very low and decreasing year by year as cattle farming techniques constantly improve.

## Do the animals suffer?

The collection of the blood is done without causing pain to the fetus. The fetus's life ends through oxygen depletion, generally agreed to be a gentle method of life termination. Cell culture technology can reduce the use of live animals in science. Research is also being done to produce meat by cell culture, which could ultimately lead to the end of breeding animals for food.

## What are the ethics?

Given that the death of some pregnant animals is unavoidable, the fetus can be used to serve science, and generate jobs. This contribution benefits research and development and should not be underestimated.

## What about regulations and conformity?

Since the 1990s, from time to time, cases of illegal practices have been rumored. Only two cases are known to have been reported to authorities. In 2004, Biowest realized we had purchased and resold misrepresented origins; and in 2013, GE realized it had been selling misrepresented and adulterated FBS products, after acquiring the company PAA with activities in Austria, Canada and Australia. In both cases affected victims were informed, and product was recalled. Other cases are known to be under investigation. These cases illustrate the importance of having complete control of the supply chain.

## What about misrepresentation and smuggling?

“Misrepresentation” is when the product is mislabeled in terms of the declared origin, and can be total or partial: “Total” is when FBS from a less expensive origin is sold as if it were from a more expensive origin; “Partial” is when a less expensive origin and a more expensive origin are mixed e.g. in proportion 49-51, and only the more expensive 51%- origin is declared. This generates an illicit profit for seller, at the expense of the serum users; and may cause companies to unknowingly violate import regulations or product master files. The actual research results and end products are unlikely to be seriously affected, but falsified origins violate government, industry and consumer standards of honesty and traceability.

“Smuggling” is a way of misrepresentation, and can be in the form of importing a product under a false description; directly to a final destination, or via third country.

## What is adulteration?

“Adulteration” is the most damaging of the criminal activities that may affect serum users! FBS can be adulterated by the addition of water, growth factors and/or serum of other species. Unscrupulous companies in order to enhance performance and/or lower the cost of the product can carry out one or more of these or similar activities. These practices are extremely serious as they affect critical results of life science research, and the purity of final products obtained in biopharmaceuticals, diagnostics, or vaccines. When such cases are detected, victims having used adulterated product must be informed to make it possible to evaluate the damage and take corrective actions.