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Gibco®
invitrogen cell culture

www.invitrogen.com

Consider the source.

When it comes to selecting a provider of Foetal Bovine Serum, reliability is everything.

Reliable quality. Reliable supply.
Reliable consistency. Reliable support.

You'll get it all when you rely on Invitrogen, provider of Gibco® FBS.

B-12637-r1 EU 0904 0M

Foetal Bovine Serum

Gibco®
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For over 40 years, Gibco® brand cell culture products have set the global standard. As one of the leading suppliers of Foetal Bovine Serum (FBS), Invitrogen adds value to FBS raw material by ensuring its high quality through controlled collection, processing, filtration, testing and delivery, and by serving our customers better than any other supplier.

All lots of Gibco® FBS:

- Meet strict importation requirements of the EU
- Are manufactured under ISO certification in all manufacturing facilities
- Pass stringent quality control tests
- Are shipped with a Certificate of Analysis that identifies the country of origin
- Are never blended with FBS from other origins

In addition, all lots of Gibco® FBS from New Zealand, Australia and the USA:

- Are manufactured under cGMP
- Are available with Certificates of Origin on request
- Are available with European Directorate for the Quality of Medicines (EDQM), Transmissible Spongiform Encephalopathy (TSE) Certificates of Suitability on request
- Additionally, selected batches are specially tested to meet the requirements of the European Medicines Agency (EMEA) guidelines for the use of bovine serum in Biopharmaceutical applications

Global Supply: there's only so much FBS available

FBS raw material is a by-product of the beef industry, which drives its availability and cost to cell culture product manufacturers such as Invitrogen.

The availability and price of FBS worldwide are profoundly affected by many beef industry supply and demand factors:

- Global and local geographic and economic conditions—demand for beef, costs associated with the care of livestock.
- Climatic environment—drought, floods, animal disease states such as BSE, harsh winters, and agricultural failures.
- Government legislation—restrictions on trade, changes in requirements for importation and exportation, and changing regulations for drug manufacturing.
- Farmers' reactions to environmental and economic conditions regarding herd management.

Demand is up

Demand for FBS is strong as more research involves the use of cell culture, and as the production of protein-based drugs and vaccines increases.

Additionally, concerns about BSE and other adventitious agents potentially found in animal-origin raw materials strongly influence demand for specific origins of FBS products. This in turn, affects specific raw material availability and costs. For example, the recent global demand for Australian-sourced FBS caused the price of raw materials to climb, resulting in much higher costs of the final product.

Look to Invitrogen for innovative options and alternatives to FBS.

Multiple Origins

Invitrogen is making every effort to bring customers an uninterrupted supply of FBS.

As one of the leading suppliers of FBS Invitrogen obtains serum only from countries and regions meeting USDA import requirements and/or EU import rules. These include Australia, New Zealand, USA, Central America, Southern America, France and South Africa.

The selling price of FBS is dictated by its country of origin and is influenced by supply and demand. By obtaining sera from multiple locations, we can offer a selection of high-quality Gibco® FBS, allowing you to decide which is the best value for your requirements.

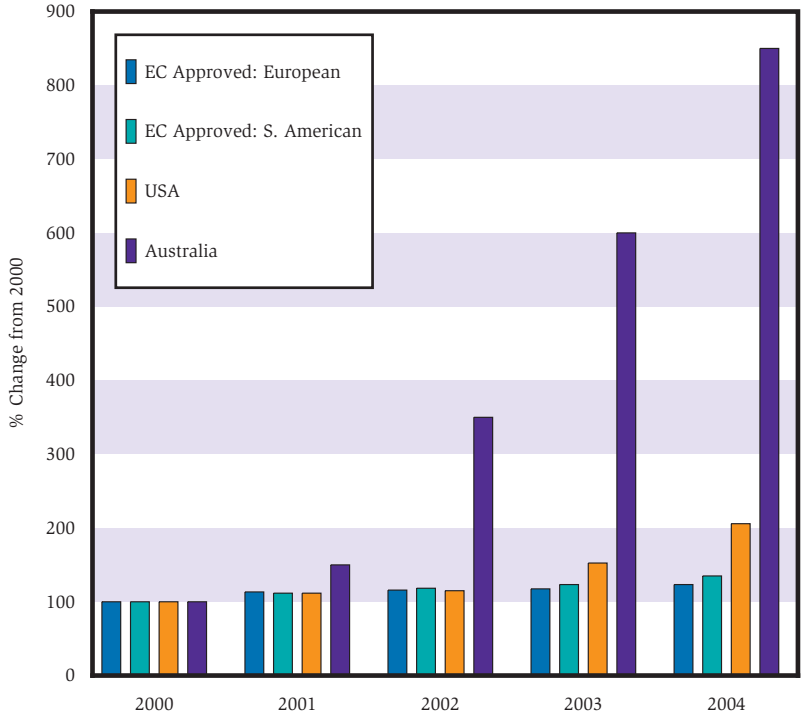
When you rely on us, you have choices. And an uninterrupted supply of FBS.

Alternatives

In addition, we offer several new ways for you to reduce or eliminate the use of FBS:

- New Advanced D-MEM, MEM, RPMI, and D-MEM/F12 may allow you to reduce FBS supplementation by up to 50-90% with no loss of performance.
- Our sera alternatives to FBS include newborn calf, bovine, horse, chicken, goat, lamb, porcine and rabbit sera.
- Innovative serum-free media, designed for a wide range of cell types, eliminate the need for FBS altogether.

Changes in FBS Raw Material Cost



Sera Descriptions, Applications and Sources

Product	Description/Usage Guidelines	Source	Cat. no.	Size	
Certified FBS	• Undergoes special biochemical/hormonal profile and bacteria tests. Guaranteed low endotoxin (≤ 10 EU/ml) and low haemoglobin (≤ 15 mg/dl). • Use with your most sensitive cells.	United States	16000-036 16000-044	100 ml 500 ml	IVD
Certified, Heat-Inactivated FBS	• Heated for 30 minutes at 56°C with mixing to inactivate the complement. • Especially suited to immunological work.	United States	10082-139 10082-147	100 ml 500 ml	IVD
Qualified FBS	• Suitable for general applications, especially those that do not require defined biochemical/hormonal profiles or bacteriophage testing.	United States	26140-087 26140-079	100 ml 500 ml	IVD
		Australia	10099-133 10099-141	100 ml 500 ml	IVD
		Countries that meet EU importation requirements (South America)	10270-098 10270-106	100 ml 500 ml	IVD
		Countries that meet EU importation requirement (Europe, South Africa)	10106-151 10106-169	100 ml 500 ml	IVD
Qualified, Heat-Inactivated FBS	• Heated for 30 minutes at 56°C with mixing to inactivate the complement. • Especially suited to immunological work.	United States	16140-063 16140-071	100 ml 500 ml	IVD
		Australia	10100-139 10100-147	100 ml 500 ml	IVD
		Countries that meet EU importation requirements (South America)	10500-056 10500-064	100 ml 500 ml	IVD
		Countries that meet EU importation requirement (Europe, South Africa)	10108-157 10108-165	100 ml 500 ml	IVD

Product	Description/Usage Guidelines	Source	Cat. no.	Size	
Dialysed FBS	• Dialysed by Tangential Flow filtration utilizing a 10,000 MW cutoff. • Performance tested for cloning and plating efficiency. • Ideal for radiolabelling assays.	United States	26400-036 26400-044	100 ml 500 ml	IVD
Ultra-low IgG FBS	• IgG levels are less than 5 µg/ml, and the BVD antibody titre is low or not detectable. • Suitable for monoclonal antibody production and veterinary applications.	United States	16250-086 16250-078	100 ml 500 ml	
ES Cell-Qualified FBS	• Specially tested for the ability to sustain undifferentiated cellular morphology of embryonic stem cells. • Crucial for the successful maintenance of embryonic stem cells.	United States	16141-061 16141-079	100 ml 500 ml	
Gamma Irradiated FBS, Standard	• Gamma irradiated by exposure to Cobalt 60. Dose Range 25–42 kGy. • Especially suited when it is important to reduce the risk of adventitious agents in research applications.	Countries that meet EU importation requirements	10109-155 10109-163	100 ml 500 ml	IVD
Gamma Irradiated FBS, Custom	• Gamma irradiated to your required dose specification • Especially suited for biopharmaceutical applications where it is important to minimise the risk of adventitious agents	United States – Certified United States – Qualified Australia	10083-137 10083-145 10086-130 10086-148 10101-137 10101-145	100 ml† 500 ml† 100 ml† 500 ml† 100 ml† 500 ml†	

All of the products listed here are packaged in E-Z Hold™ plastic bottles.

†Available upon request.

Products listed 'for *in vitro* diagnostic use' are indicated by the symbol IVD and are medical devices subject to the requirements of Directive 98/79/EC of the European Parliament and of the council of 27 October 1998 on *in vitro* diagnostic medical devices (Official journal L331 of 07.12.1998) and to the requirements of the Code of Federal Regulations Title 21, Part 820: Quality Systems Regulation. Label information will change to incorporate the "CE" mark 'for *in vitro* diagnostic use' products manufactured after 29 October 2003.

Meticulous collection and processing methods ensure high quality.

At Invitrogen, we maintain rigorous control of every step in the production of Gibco® FBS. This complete vertical integration, from collection to final product validation, ensures minimal risk of contamination with adventitious agents, lot-to-lot consistency, and superior performance.

Compliance

We manufacture FBS in compliance with the Food and Drug Administration's (FDA) Quality System Regulation (cGMP) at ISO-9001:2000 certified facilities in the USA, Australia and New Zealand. FBS from our ISO 9001:2000 certified German facility is manufactured in compliance with the IVD directive (Medical Device Directive 98/79/EC). Comprehensive documentation ensures traceability and control of our processes.

Collection and Processing Procedures

Using aseptic cardiac puncture procedures, we collect blood into bags specifically designed to improve clotting efficiency and serum yield.

We immediately refrigerate the raw material prior to separating the serum from the clotted blood. The raw serum is then frozen and samples evaluated to ensure it meets our exacting specifications.

The raw foetal bovine serum is then thawed and filtered by membrane filtration with the final sterile filter being 0.1 µm.

Following final filtration, which removes bacteria without removing critical serum components, we aseptically dispense the serum into sterile plastic bottles.

A typical batch is 800 L–1,600 L; some sources permit batch sizes up to 2,000 L.

Quality Control

We then label and freeze the final product, placing it in quarantine until all quality control tests have been completed.

All our processes are fully validated to ensure quality and reproducibility. Our Quality System department can trace raw materials back to the abattoir where they were collected.

Only FBS that meets all of our stringent manufacturing and finished product specifications is approved for sale.

Disease Status of Regions and Countries

List A Diseases**	Australia	New Zealand	USA
African horse sickness	•	•	•
African swine fever	•	•	•
Bluetongue		•	
Classical swine fever	•	•	•
Contagious bovine pleuropneumonia	•	•	•
FMD (foot and mouth disease)	•	•	•
Highly pathogenic avian influenza	•	•	•
Lumpy skin disease	•	•	•
Newcastle disease		•	
Peste des petits ruminants	•	•	•
Rift Valley fever	•	•	•
Rinderpest	•	•	•
Sheep pox and goat pox	•	•	•
Swine vesicular disease	•	•	•
Vesicular stomatitis	•	•	

• **Countries in which the disease has never been reported or diseases reported absent during 2002.**
In 2002, World Animal Health reports on the animal health status, disease control methods and tables of incidence of List A diseases. Office International des Epizooties, 2004

** List A diseases are transmissible diseases which have the potential for very serious and rapid spread, irrespective of national borders; which are of serious socio-economic or public health consequence; and which are of major importance in the international trade of animals and animal products. For more information on these diseases and on disease status of countries other than those detailed above, visit the web site of the Office International des Epizooties: www.oie.int.

Special programmes and services.

Performance Testing

While we dramatically reduce lot-to-lot variations of our Gibco® FBS through our carefully controlled and validated methods of serum performance and quality testing, we recognize that some cell types are sensitive to slight variations in serum. Therefore, we offer several additional ways to minimize the effect of these minor variations on your research:

Cloning Efficiency

We test FBS for ability to support cloning and growth of murine myeloma cells and derived hybridomas.

This is appropriate for most applications where low-density cloning of non-adherent cells or hybridoma development and monoclonal antibody (MAb) production are of primary interest.

Plating Efficiency

We employ transformed human cell lines to determine the suitability of FBS for attachment and proliferation of adherent cell lines compared to previously qualified FBS.

This is suggested for applications using continuous transformed cells at low or normal densities, and when performing clonal selections.

Growth Promotion

We test FBS for its ability to support the proliferation of fastidious human diploid fibroblasts through multiple subcultures.

This is useful in determining the lots that are most conducive to supporting growth and viability of difficult-to-grow, adherent, normal, primary, or established cell lines.

The results of these tests are reported on the Certificate of Analysis.

Reserve Serum Testing

Our reserve serum testing programme allows you to obtain a sample of FBS to test in your own application. While you are testing the sample, we will hold your specified quantity until your assessment is complete.

The minimum volume we will set up on reserve is:

- 40 x 100 ml
- 10 x 500 ml

We usually hold serum for four weeks. If you require a longer test period, please let us know at the time you make your reserve request.

Gamma-Irradiated Sera

Gamma radiation is the method of choice to reduce the risk of viral contaminants that are common in animal sera. Gamma irradiation will also inactivate mycoplasma.

In accordance with the draft European Pharmacopoeia (EP) Monograph and the current EMEA Guidelines covering the use of Bovine Sera for human and veterinary pharmaceutical applications, we have performed studies to demonstrate the inactivating effect of gamma irradiation on various types of viruses and mycoplasmas. These studies also demonstrated that physiochemical properties and cell culture performance of serum is not significantly altered by gamma irradiation at levels established by European and FDA guidelines for virus titre reductions[1, 2, 3].

Gibco® FBS Gamma Irradiated EU Approved Origin is available ex-stock. This has received a minimum dose of 25 kGy.

At your request, we will custom gamma irradiate FBS of any origin with the minimum dose you specify.

Our temperature-controlled, gamma radiation procedure ensures the serum not only receives the required minimum dose but also is held frozen throughout the process to maximise cell culture performance.

Heat Inactivated Sera

We have also performed studies on FBS to show the effect of heat inactivation on various viruses and mycoplasmas. The heat inactivation process ensured that the serum was held at 56°C for 30 minutes. We were able to demonstrate that mycoplasmas in FBS could be completely inactivated by this procedure, and that the infectivity of many of the viruses tested was significantly reduced.

Quality Control Tests

Performance	Certified FBS	Heat-Inactivated Certified FBS	Qualified FBS	Heat-Inactivated Qualified FBS	Dialysed FBS	Ultra-Low IgG FBS**	ES Cell-Qualified FBS**
Relative Cloning Efficiency Assay Confirms ability of FBS to support cloning and growth of murine myeloma cells and derived hybridomas.	💧	💧	💧	💧	💧	💧	💧
Relative Plating Efficiency Assay Confirms ability of FBS to grow continuous adherent cell lines using human transformed cells.	💧	💧	💧	💧	💧	💧	💧
Relative Growth Promotion Assay Confirms ability of FBS to support the proliferation of fastidious human diploid fibroblasts through multiple subcultures.	💧	💧	💧	💧	—	💧	💧
Sf9 Cell Growth Promotion Assay Ensures ability to grow Sf9 cells.	💧	💧	▲	▲	—	—	—

Embryonic Stem Cell Performance Assays	Certified FBS	Heat-Inactivated Certified FBS	Qualified FBS	Heat-Inactivated Qualified FBS	Dialysed FBS	Ultra-Low IgG FBS**	ES Cell-Qualified FBS**
Relative Plating Efficiency Assay Measures ability to initiate and support Embryonic Stem (ES) cell colonies when the ES cells are plated at a very low density in growth medium containing 10% FBS with no additional growth factors.	—	—	—	—	—	—	💧
Cytotoxicity Assay Measures ability of ES and feeder cells to grow when plated at a very low density in growth medium containing 30% serum.	—	—	—	—	—	—	💧
Relative Morphology and Differentiation Assay Measures ability to support the growth of undifferentiated ES cell colonies.	—	—	—	—	—	—	💧

Key

Symbol	Description
💧	Indicates test performed
💧R	Results available on request
❖	Tetracycline (TET) screened on selected lots
—	Indicates test not performed
▲	Indicates test performed on selected Australian, US, USDA-approved, and EU-approved origin products
C & R	Indicates check and record
*	Excluding EU-approved origin products
**	These products are for research use, and where appropriate, as raw material components in further cell culture manufacturing applications. They are not intended for human or animal diagnostic, therapeutic, or other clinical uses, unless otherwise stated.

Chemical and Physical	Certified FBS	Heat-Inactivated Certified FBS	Qualified FBS	Heat-Inactivated Qualified FBS	Dialysed FBS	Ultra-Low IgG FBS**	ES Cell-Qualified FBS**
Biochemical Profile 22 key biochemical levels are determined through chemical analysis.	●	●	—	—	—	—	—
Bovine IgG (≤ 5 µg/ml)	—	—	—	—	—	●	—
Electrophoretic Profile Tested for normal characteristic, which confirms serum identity and integrity.	●	●	●	●	●	●	●
Endotoxin (EU/ml) Determined for each lot using an automated limulus amoebocyte lysate (LAL) method.	≤ 10	≤ 10	≤ 50 C & R (EU-approved)	≤ 50 C & R (EU-approved)	≤ 50	≤ 50	≤ 50
Glucose (≤ 5 mg/dl)	—	—	—	—	●	—	—
Haemoglobin (mg/dl) Measured spectrophotometrically.	≤ 15.0	≤ 15.0	≤ 25.0 ≤ 30.0 (EU-approved)	≤ 25.0 ≤ 30.0 (EU-approved)	≤ 25.0	≤ 25.0	≤ 25.0
Determination of % Oxyhaemoglobin	≥ 70%	≥ 70%	—	—	—	—	—
Hormone Profile Five hormone levels are determined.	●	●	—	—	—	—	—
Osmolality (mOsm/kg) Tested using freezing point depression.	280–340	280–340	280–340	280–340	260–310	C & R	280–340
pH	6.9–7.8	6.9–7.8	6.9–7.8	6.9–7.8	6.9–7.8	6.9–7.8	6.9–7.8
Total Protein (g/dl) Used to confirm animal age.	3.0–5.0	3.0–5.0	3.0–5.0	3.0–5.0	3.0–5.0	C & R	3.0–5.0
Tetracycline (TET) Screened	❖	❖	❖	❖	—	—	—

Adventitious Agents	Certified FBS	Heat-Inactivated Certified FBS	Qualified FBS	Heat-Inactivated Qualified FBS	Dialysed FBS	Ultra-Low IgG FBS**	ES Cell-Qualified FBS**
Bacteria and Fungi Confirms absence of noted contamination as noted in the current edition of the *United States Pharmacopeia/ European Pharmacopoeia*.	●	●	●	●	●	●	●
Bacteriophage A quantitative bacteriophage plaque assay is performed using an appropriate *E. coli* strain.	●	●	—	—	—	—	—
Mycoplasma Tested by the method of Barile and Kern[4] (a large volume, direct inoculation method), and/or the Hoechst fluorescent DNA Stain[5].	●	●	●	●	●	●	●
Virus Testing is performed in full compliance with the Code of Federal Regulations (9 CFR, Section 113.53(c)[113.46, 113.47]).	●	●	●	●	●	●	●
Cytopathic Agents (*e.g.* Infectious Bovine Rhinotracheitis IBR)	●	●	●	●	●	●	●
Haemadsorbing Agents (*e.g.* Parainfluenza PI3)	●	●	●	●	●	●	●
Blue Tongue Virus Fluorescent Antibody Assay (FA)	●	●	●*	●*	●	●	●
Bovine Adenovirus FA	●	●	●*	●*	●	●	●
Bovine Parvovirus FA	●	●	●*	●*	●	●	●
Bovine Respiratory Syncytial Virus FA	●	●	●*	●*	●	●	●
Bovine Viral Diarrhoea Virus FA	●R	●R	●R	●R	●R	●R	●R
Bovine Viral Diarrhoea (BVD) Neutralization Assay	●R	●R	●R*	●R*	●R	●	●R
Reovirus FA	●	●	●*	●*	●	●	●
Rabies Virus FA	●	●	●*	●*	●	●	●

Reliability is everything.

Reliable quality. Reliable supply. Reliable consistency. Reliable support.

When you select a provider of Foetal Bovine Serum, reliability is undoubtedly your foremost consideration.

You and researchers everywhere agree. That's why Gibco® Foetal Bovine Serum is the FBS of choice—worldwide.

You know that Gibco® FBS provides excellent cell culture performance demonstrated by consistent, reproducible cell growth.

You trust Gibco® FBS to be of the highest quality. To be readily available. To be consistent lot-to-lot. To be supported by technical and regulatory expertise.

You have always relied on Gibco® FBS. And you can continue to do so with complete confidence.

Questions?

Contact you local FBS telesales group on:

Belgium: 0800 12195
France: 00 33 134 32 31 05
Germany: 0049 721 6189105
Netherlands: 0800 0232792
Scandinavia: 00 44 141 814 6111
Spain: 900 998 934
UK: 0141 814 6123

For countries not listed above, please call your local office as detailed on the back of the brochure.

References

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5. Chen, J.R. (1977) *Exp. Cell. Res.* 104, 255.