Fetal Bovine Serum, or Fatal Bovine Serum

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Fetal Bovine Serum

In vitro research

Development in vitro meat

In Vitro Fertilization
Why FBS?

1. hormonal factors that stimulate cell growth and proliferation, and promote differentiated functions
2. transport proteins that carry hormones, minerals and trace elements, and lipids
3. attachment and spreading factors
4. stabilizing and detoxifying factors
Why FBS

Universal cell and tissue culture supplement
Blood collection procedure

Diagram summarizing the fetal blood collection process:

1. Slaughter of pregnant cow
2. Reproductive tract with fetus removed from carcass and transported to calf processing area
3. Calf removed, cleaned and disinfected
4. Blood collection by heart puncture through vacuum extraction, or through gravity and massage
5. Less commonly, blood is collected by umbilical cord puncture
6. Blood clotting, serum separation

Jochems et al, 2002, ATLA 30, 219-227
Blood collection methods

• suspended from an A-frame with application of an external device that simulates the pumping action of the heart while blood is drained from catheterised umbilical vessels,

• insertion of a 12–16 gauge needle between the 4\textsuperscript{th} and 5\textsuperscript{th} rib into the fetal heart.
Conclusions Jochems et al.

Fetuses are likely exposed to pain and/or discomfort and therefore current practice of fetal blood harvest is inhumane.

Fetal Bovine Serum
Fatal Bovine Serum
In vitro method: alternative?

FBS should NOT be used in an *in vitro* method when that method is developed to replace experimental animals!!
Scientific problems

• Composition of FBS unknown
• Qualitative and quantitative variations between serum batches
• May contain different amounts of endotoxins, haemoglobin and other adverse factors
• May be contaminated with viruses, bacteria, fungi, mycoplasmas and prions

Reproducibility of experiments
Safety of products
Consequences

When considering supplementing cell and tissue culture media with animal serum the “No, unless...” principle should be applied.

Preferentially, the medium should not contain any animal-derived component, unless it was proved to be an absolute requirement.

Van der Valk et al, 2010
“For methods forwarded to ECVAM for validation/prevalidation where [the use of nonanimal alternatives to FBS] is not fulfilled a justification for future use must be provided, including measures taken to seek non-animal alternatives to fetal calf serum”

(ECVAM Scientific Advisory Committee (ESAC), 2008)
Chemically-defined media

Advantages of serum-free cell culture media

- Chemically defined/control
- Low qualitative and quantitative variability
- Simplified isolation of synthetic products/metabolites
- Avoids animal use (3R principles)

☑ Medium is selective for specific cell types.

**but**: not suitable for every cell type
Welcome to the Fetal Calf Serum-Free Database

About

Fetal Calf Serum (FCS, also known as Fetal Bovine Serum, or FBS) is a common supplement of animal cell culture media. However, moral and scientific concerns demonstrate the urgency to switch to an FCS-free medium. The FCS-free Database, part of the 3Rs Database Programme, provides an overview of FCS-free media for cell culture. A forum function for each record allows

Quicklinks

› FCS-free Database
› References and reviews
› Make a donation

How to use this website

You have free access to the entire database. Choose between the different cell types, products, sources (i.e. companies or literature), and specified parameters and compare these with each other in order to choose the best medium for your research.
647 records. 260 different cell types.

- commercially available (172)
- modifications of commercially available media (235)
- formulations of media described in the literature (240).
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Summary

- Animal welfare is likely at stake when fetal calf blood is collected for production of FBS
- Scientific problems
- Preference for chemically-defined media
- Serum-free database (fcs-free.org)
Final conclusion

Serum-free media are:

• Better for the animals

• Better for research

AWARENESS !!
Thank You!
Fcs-free database

- Received support for establishment website
- Received support update website
- As yet, no sustained funding
- Funding mainly from NGO’s concerned about animal welfare