

# **The use of fetal bovine serum: ethical or scientific problem? (Alternatives to Laboratory Animals, 2002)**

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This publication by C. Jochems, J. van der Valk, F. Stafleu, and V. Baumans was summarized by Maya Kaul, with edits by Renee Cosme. [The original paper can be accessed here.](#)

## **Review**

This article advocates finding alternatives to fetal bovine serum (FBS) as nourishment for cell cultures, citing both moral and practical reasons. The information presented in this paper was collected using literature resources and questionnaire responses that were distributed to various institutions in Europe, North/Central/South America, Southern Africa, Australia, and New Zealand. Many of these institutions were government ministries involved in agriculture/animal experimentation, animal welfare organizations, academic research laboratories, and companies that manufacture/distribute FBS.

### **Moral: harvesting fetal bovine serum is cruel**

Fetuses are removed from their mothers in the slaughterhouse. Between 5 and 30 minutes after the mother's death, a needle is injected into the fetus' heart, and the blood is pumped out by vacuum or cardiac massage, which takes approximately 5 minutes. Fetuses have to be at least 3 months old to ensure that their heart is large enough to puncture.

The fetus must be alive during this operation, since blood starts clotting immediately after death, making extraction difficult. The article negates two claims: that underdevelopment dampens the pain, and that being cut off from the mother results in anoxia which acts as an anaesthetic. Both cases, undeveloped nervous system and anoxia, is more likely to increase the pain.

After extraction, the blood is allowed to clot, and the clot is removed from the serum. Only blood from the heart is clean enough to harvest, and removing the clot leaves only 50%. Altogether 150 mL can be collected from a 3 month old fetus, 350 mL from a 6 month old, and 550 mL from nearterm. In all, 500,000 liters of serum is extracted from 12 million fetuses every year.

### **Practical: fetal bovine serum is unpredictable**

The price of FBS is subject to change based on livestock figures and market demand for beef. This can make it difficult for research labs to obtain the serum.

FBS batches may contain varying levels of growth promoting/inhibition factors, and can even be contaminated with viruses, bacteria, yeast, and prions. Different FBS batches vary in composition and can cause unexpected genetic and metabolic changes in the cells, altering results of an experiment in the lab. Thus, FBS composition is not clearly known, so the influencing factors can't be identified and controlled.

The unknown components and effects also makes the serum difficult to replace. Other serumfree mediums often have to be tailored for specific cells, which can be either advantageous (ensures growth of only one type of cell), or disadvantageous (discourages growth of others). Jochems and colleagues argue that FBS is ethically and scientifically problematic, and thus, should be replaced with synthetic media.

### **As it pertains to cultured meat**

Ideally, the growth medium for cultured meat should be crueltyfree, reliable and controllable; for market purposes it should be low cost and “familiar” to the public. None of this describes fetal bovine serum.

More on the makeup of FBS can be found [here](#) and [here](#).

### **Summary**

Fetal bovine serum (FBS) is a common component of animal cell culture media. FBS is harvested from bovine fetuses taken from pregnant cows during slaughter. FBS is commonly harvested by means of a cardiac puncture without any form of anaesthesia. Fetuses are likely exposed to pain and/or discomfort and therefore current practice of fetal blood harvest is inhumane. Apart from moral concerns, several scientific and technical problems exist regarding the application of FBS in cell culture. Efforts should be made to reduce and preferably replace FBS by synthetic alternatives.