

Are there alternatives to bovine serum? What are the pros and cons?

This is a question that is most often posed in the context of the culture media that are used in the manufacture of medicinal products.

The expression “serum-free medium” is widely used, especially when the pros and cons of different types of media are debated. A serum-free medium is often taken to be the same thing as a “chemically-defined” medium, but this is frequently not the case. Many serum-free media contain other animal-derived materials. Each one would have to be carefully investigated for safety and utility in the same way as has been done for bovine serum.

“Chemically defined” media may contain no animal-derived materials at all. They are in use, but not all cell types can be adapted to grow, or to grow adequately and normally, using such media. When they can be adapted to do so, then using totally chemically defined media may offer advantages. Using only “chemicals” means that a medium can be prepared with absolute precision, so once a particular “formula” has been shown to work well for a particular cell type, it can be reproduced exactly, time after time, and should always perform in the same way. Using a medium containing only chemical components may also help to simplify the manufacturing process. But it may take a lot of development work to arrive (or not) at that formula, and it is likely that such development will have to be done on a product-specific basis. Furthermore, the best yield obtained from chemically defined media systems may still be inferior to that obtained with serum-supplemented media.

There are many different types of cells that are grown, for many different purposes, in cell culture. Most cell types grow well in media that contain bovine serum and vigorous cell growth and division may be a critical characteristic for some applications. Some cell types have, so far, resisted all attempts to get them to grow and divide satisfactorily in media that do not contain serum.

Serum, like all biological materials, is subject to a degree of variability in its composition. This cannot be avoided. The higher the quality of the material, the less will be the variability, but it will never be eliminated. There are potential advantages – some batches of serum may be found to perform particularly well in certain applications. But there are obvious potential downsides too. Not all batches may perform in the way that a particular process requires. However, this inherent variability and its consequences are recognised by both processors and customers. They will conduct the investigations necessary to ensure that each batch that is supplied will perform according to expectations.

The fact that often only serum will provide what is required is recognised and accepted by both scientists and regulatory bodies. And, reassuringly, the safety in use of bovine serum has been established over many years. This is why high quality processed bovine serum is, and will continue to be, such a vital commodity.