

Insulin-Transferrin-Selenium (ITS)

Serum is a complex supplement containing proteins, growth factors, hormones, amino acids, sugars, trypsin inhibitors, and lipids. Although the major constituents of serum are known such as albumin and transferrin, some of the minor components and their effect on cell growth have not been fully determined. These minor components include nutrients such as amino acids, nucleosides, and sugars, growth factors, hormones, minerals, and lipids.¹

Downstream purification is the leading disadvantage to using serum in cell culture media. For example, monoclonal antibody production and recombinant protein secretion both require purification to remove serum-derived gamma-globulin from the media.

Insulin-Transferrin-Selenium (ITS), 100X, is a growth supplement that should be added at 10 mL/L medium. Supplementation enables a reduction in the FBS requirements of the culture. The components of ITS are required for optimal performance of cells in serum-free culture.

Insulin is a hormone that promotes glucose and amino acid uptake by the cell. It is thought that the mitogenic effects of insulin are due to the insulin-like growth factor receptor, IGF-1 receptor.

Transferrin is an iron transport protein that functions to transport iron into the cell. The protein also serves to detoxify the medium from oxygen radicals and peroxides.

Selenium is an enzyme cofactor that activates glutathione peroxidase, a player in the detoxification of oxygen radicals.

Insulin-Transferrin-Selenium

25-800-CR
1 x 10 mL
Storage: 2°C to 8°C
Shipping: 15°C to 30°C

Formula:

Selenious Acid: 0.00067 g/L
Insulin (bovine pancreas): 1.00 g/L
Human transferrin (iron poor): 0.55 g/L

Media Supplemented with Serum²

Advantages:

1. Important source of nutrients, growth factors, hormones, attachment factors, and protection agents.
2. Contains trypsin inhibitors
3. Important as a cryoprotectant in cryopreservation

Disadvantages:

1. Undefined
2. Lot-to-lot variability; extensive testing required to ensure as much lot consistency as possible
3. Substantial cost
4. Presence of animal-derived components
5. Supply and demand creates industry shortages
6. Presents an obstacle with purification of products from downstream processing of culture medium
7. Source of adventitious agents
8. Contains growth-inhibitory and growth-promoting activity resulting in an unpredictable inhibition and promotion of cell growth
9. Standardization of protocols difficult

References:

¹Freshney, R. Ian. *Culture of Animal Cells: A Manual of Basic Technique*. 3rd. ed. New York: Wiley-Liss, 1994: 93

²Freshney, R. Ian. 90-91.

³Freshney, R. Ian. 91-94.

Serum-Free Media³

Advantages:

1. Defined
2. Usually free of animal-derived components
3. Effect of defined components and/or additions to media on cell growth may be examined
4. Greater consistency between experiments
5. Purification of a desired secreted protein product simplified
6. Easier purification of monoclonal antibody production

Disadvantages:

1. Slower cell growth often observed
2. Must examine the requirements for cell growth
3. Cells must be slowly weaned from medium containing serum
4. Requires manipulation of the normal maintenance medium to allow for serum-free conditions
5. Identification and determination of the concentration of required components found in serum necessary