is ever identical to another. A batch of serum will last only a year before deteriorating. Changes in serum batches require extensive testing.

Because of the aforementioned disadvantages of serum-containing media, low-serum or serum-free media have been developed. Typical compositions of two defined media are listed in Table 12.3. Serum-free medium contains basal salts (inorganic salts, carbon, nitrogen compounds), vitamins, growth factors, and hormones (e.g., insulin, transferrin, hydrocortisone, progesterone, fibronectin). By using a serum-free medium, we can reduce the cost of media, eliminate some potential problems in product purification, improve the reproducibility of results, and reduce the chance of contamination. Different cell

TABLE 12.3 Examples of Composition of Serum-Containing and Serum-Free Media

Component	Eagle's Minimum Essential Medium (mg/l)	MCDS 170 (mg/l)
Amino Acids (L-enantiomers)		
Alanine	—	8.9
Arginine-HCl	126	63.3
Asparagine	—	132.0
Aspartic acid	—	13.3
Cysteine-HCl	—	35.2
Cysteine	—	8.5
Cystine	24	—
Glutamic acid	—	14.7
Glutamine	292	292
Glycine	—	7.5
Histidine-HCl-H_2O	42	21.0
Isoleucine	52	13.1
Leucine	52	39.3
Lysine-HCl	73	36.6
Methionine	15	4.5
Phenylalanine	33	5.0
Proline	—	5.8
Serine	—	31.5
Threonine	48	35.7
Tryptophan	10	6.1
Tryosine	36	9.1
Valine	47	35.1
Vitamins		
Biotin	—	0.0073
D-Ca pantothenate	1.0	0.48
Choline chloride	1.0	14.0
Folic acid	1.0	—
Folinic acid	—	0.0051
i-inositol	2.0	18.0
DL-α-lipoic acid	—	0.0026
Niacinamide	—	6.1
Nicotinamide	1.0	—
Pyridoxal HCl	1.0	0.06
Riboflavin	0.1	0.11