

Product Information

Minimum Essential Medium Eagle (MEM)

Minimum Essential Medium (MEM), developed by Harry Eagle, is one of the most widely used of all synthetic cell culture media. Early attempts to cultivate normal mammalian fibroblasts and certain subtypes of HeLa cells revealed they had specific nutritional requirements that could not be met by Eagle's Basal Medium (BME). Subsequent studies using these and other cells in culture indicated additions to BME could be made to aid growth of a wider variety of fastidious cells.

MEM, which incorporates these modifications, includes higher concentrations of amino acids so the medium more closely approximates the protein composition of cultured mammalian cells. MEM has been used for cultivation of a wide variety of cells grown in monolayers. Optional supplementation of non-essential amino acids to the formulations that incorporate either Hanks' or Earle's salts has broadened the usefulness of this medium. The formulation has been further modified by optional elimination of calcium to permit growth of cells in suspension culture.

	M0268	M0275	M0446	M0643	M1018	M2279	M2414
	[powder]	[10·]	[1·]	[powder]	[powder]	[1·]	[1·]
COMPONENT	g/L	g/L	g/L	g/L	g/L	g/L	g/L
Inorganic salts							
CaCl ₂ • 2H ₂ O	0.2	2.265	0.265	0.2	0.1396	0.265	0.265
MgSO ₄ (anhydrous)	0.09767	0.9767	0.09767	0.09767	0.09767	0.09767	0.09767
KCl	0.4	4.0	0.4	0.4	0.4	0.4	0.4
KH ₂ PO ₄	—	—	—	—	0.06	—	—
NaHCO ₃	—	—	2.2	—	—	2.2	0.85
NaCl	6.8	68	6.8	6.8	8.0	6.8	6.8
Na ₂ HPO ₄ (anhydrous)	—	—	—	—	0.04788	—	—
NaH ₂ PO ₄ (anhydrous)	0.122	1.22	0.122	0.122	—	0.122	0.122
Amino acids							
L-Alanine	—	—	—	0.0089	0.0089	—	—
L-Alanyl-L-Glutamine	—	—	0.4344	—	—	—	—
L-Arginine • HCl	0.126	1.26	0.126	0.126	0.126	0.126	0.126
L-Asparagine • H ₂ O	—	—	—	0.015	0.015	—	—
L-Aspartic acid	—	—	—	0.0133	0.0133	—	—
L-Cystine • 2HCl	0.0313	0.313	0.0313	0.0313	0.0313	0.0313	0.0313
L-Glutamic acid	—	—	—	0.0147	0.0147	—	—
L-Glutamine	0.292	—	—	0.292	0.292	—	—
Glycine	—	—	—	0.0075	0.0075	—	—
L-Histidine • HCl • H ₂ O	0.042	0.42	0.042	0.042	0.042	0.042	0.042
L-Isoleucine	0.052	0.52	0.052	0.052	0.052	0.052	0.052
L-Leucine	0.052	0.52	0.052	0.052	0.052	0.052	0.052
L-Lysine • HCl	0.0725	0.725	0.0725	0.0725	0.0725	0.0725	0.0725
L-Methionine	0.015	0.15	0.015	0.015	0.015	0.015	0.015
L-Phenylalanine	0.032	0.32	0.032	0.032	0.032	0.032	0.032
L-Proline	—	—	—	0.0115	0.0115	—	—
L-Serine	—	—	—	0.0105	0.0105	—	—
L-Threonine	0.048	0.48	0.048	0.048	0.048	0.048	0.048
L-Tryptophan	0.01	0.1	0.01	0.01	0.01	0.01	0.01
L-Tyrosine • 2Na • 2H ₂ O	0.0519	—	—	0.0519	0.0519	0.0519	0.0519
L-Tyrosine	—	0.519	0.0519	—	—	0.519	0.0519
L-Valine	0.046	0.46	0.046	0.046	0.046	0.046	0.046
Vitamins							
Choline chloride	0.001	0.01	0.001	0.001	0.001	0.001	0.001
Folic acid	0.001	0.01	0.001	0.001	0.001	0.001	0.001
myo-Inositol	0.002	0.02	0.002	0.002	0.002	0.002	0.002
Niacinamide	0.001	0.01	0.001	0.001	0.001	0.001	0.001
D-Pantothenic acid • ½Ca	0.001	0.01	0.001	0.001	0.001	0.001	0.001
Pyridoxal • HCl	0.001	0.01	0.001	0.001	0.001	0.001	0.001

Riboflavin	0.0001	0.001	0.0001	0.0001	0.0001	0.0001	0.0001
Thiamine • HCl	0.001	0.01	0.001	0.001	0.001	0.001	0.001
Other							
Glucose	1.0	10.0	1.0	1.0	1.0	1.0	1.0
Phenol red • Na	0.011	0.11	0.011	0.011	0.011	0.011	0.011
Add			—				
L-Glutamine	—	0.292 at 1·	—	—	—	0.292	0.292
NaHCO ₃	2.2	2.2 at 1·	—	2.2	0.35	—	—

	M4642	M4655	M4780	M5650	M5775	M9288	51411C
	[powder]	[1·]	[1·]	[1·]	[1·]	[10·]	[1·]
COMPONENT	g/L	g/L	g/L	g/L	g/L	g/L	g/L
Inorganic salts							
CaCl ₂	0.2	0.265	0.185	0.265	0.185	1.396	0.2
MgSO ₄ (anhydrous)	0.09767	0.09767	0.09767	0.09767	0.09767	0.9767	0.09767
KCl	0.4	0.4	0.4	0.4	0.4	4.0	0.4
KH ₂ PO ₄	0.06	—	0.06	—	0.06	0.6	—
NaHCO ₃	—	2.2	0.35	2.2	0.35	—	2.2
NaCl	8.0	6.8	8.0	6.8	8.0	80.0	6.8
Na ₂ HPO ₄ (anhydrous)	0.04788	—	0.04788	—	0.04788	0.4788	—
NaH ₂ PO ₄ (anhydrous)	—	0.122	—	0.122	—	—	—
NaH ₂ PO ₄ • H ₂ O	—	—	—	—	—	—	0.14
Amino acids							
L-Alanine	—	—	—	0.0089	—	—	—
L-Alanyl-L-Glutamine	—	—	—	—	—	—	—
L-Arginine • HCl	0.126	0.126	0.126	0.126	0.126	1.26	0.127
L-Asparagine • H ₂ O	—	—	—	0.015	—	—	—
L-Aspartic acid	—	—	—	0.0133	—	—	—
L-Cystine • 2HCl	0.0313	0.0313	0.0313	0.0313	0.0313	0.313	0.0313
L-Glutamic acid	—	—	—	0.0147	—	—	—
L-Glutamine	0.292	0.292	0.292	—	—	—	0.292
Glycine	—	—	—	0.0075	—	—	—
L-Histidine • HCl • H ₂ O	0.042	0.042	0.042	0.042	0.042	0.42	0.042
L-Isoleucine	0.052	0.052	0.052	0.052	0.052	0.52	0.052
L-Leucine	0.052	0.052	0.052	0.052	0.052	0.52	0.052
L-Lysine • HCl	0.0725	0.0725	0.0725	0.0725	0.0725	0.725	0.0725
L-Methionine	0.015	0.015	0.015	0.015	0.015	0.15	0.015
L-Phenylalanine	0.032	0.032	0.032	0.032	0.032	0.32	0.032
L-Proline	—	—	—	0.0115	—	—	—
L-Serine	—	—	—	0.0105	—	—	—
L-Threonine	0.048	0.048	0.048	0.048	0.048	0.48	0.048
L-Tryptophan	0.01	0.01	0.01	0.01	0.01	0.1	0.01
L-Tyrosine • 2Na • 2H ₂ O	0.0519	—	—	—	—	—	0.0519
L-Tyrosine	—	0.0519	0.0519	0.0519	0.0519	0.519	—
L-Valine	0.046	0.046	0.046	0.046	0.046	0.46	0.046
Vitamins							
Choline chloride	0.001	0.001	0.001	0.001	0.001	0.01	0.001
Folic acid	0.001	0.001	0.001	0.001	0.001	0.01	0.001
myo-Inositol	0.002	0.002	0.002	0.002	0.002	0.02	0.002
Niacinamide	0.001	0.001	0.001	0.001	0.001	0.01	0.001
D-Pantothenic acid • ½Ca	0.001	0.001	0.001	0.001	0.001	0.01	0.001
Pyridoxal • HCl	0.001	0.001	0.001	0.001	0.001	0.01	0.001
Riboflavin	0.0001	0.0001	0.0001	0.0001	0.0001	0.001	0.0001
Thiamine • HCl	0.001	0.001	0.001	0.001	0.001	0.01	0.001
Other							
D-Glucose	1.0	1.0	1.0	1.0	1.0	10.0	1.0
Phenol red • Na	0.011	0.011	0.011	0.011	0.011	0.11	0.011
Add							
L-Glutamine	—	—	—	0.292	0.292	0.292 at 1·	—
NaHCO ₃	0.35	—	—	—	—	0.35 at 1·	—

	51412C	51414C	51415C	51416C	51417C	56416C	56419C
	[1·]	[1·]	[1·]	[1·]	[1·]	[powder]	[powder]
COMPONENT	g/L	g/L	g/L	g/L	g/L	g/L	g/L
Inorganic salts							
CaCl ₂	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MgSO ₄ (anhydrous)	0.09767	0.09767	0.09767	0.09767	0.09767	0.09767	0.09767
KCl	0.4	0.4	0.4	0.4	0.4	0.4	0.4
NaHCO ₃	2.2	2.2	2.2	2.2	0.84	—	—
NaCl	6.8	6.8	6.8	6.8	6.8	6.8	6.8
NaH ₂ PO ₄ • H ₂ O	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Amino acids							
L-Alanine	—	—	—	0.0089	0.0089	0.0089	—
L-Arginine • HCl	0.127	0.127	0.127	0.127	0.127	0.127	0.127
L-Asparagine • H ₂ O	—	—	—	0.015	0.015	0.015	—
L-Aspartic acid	—	—	—	0.0133	0.0133	0.0133	—
L-Cystine • 2HCl	0.0313	0.0313	0.0313	0.0313	0.0313	0.0313	0.0313
L-Glutamic acid	—	—	—	0.0147	0.0147	0.0147	—
L-Glutamine	—	—	—	—	0.292	0.292	0.292
Glycine	—	—	—	0.0075	0.0075	0.0075	—
L-Histidine • HCl • H ₂ O	0.042	0.042	0.042	0.042	0.042	0.042	0.042
L-Isoleucine	0.052	0.052	0.052	0.052	0.052	0.052	0.052
L-Leucine	0.052	0.052	0.052	0.052	0.052	0.052	0.052
L-Lysine • HCl	0.0725	0.0725	0.0725	0.0725	0.0725	0.0725	0.0725
L-Methionine	0.015	0.015	0.015	0.015	0.015	0.015	0.015
L-Phenylalanine	0.032	0.032	0.032	0.032	0.032	0.032	0.032
L-Proline	—	—	—	0.0115	0.0115	0.0115	—
L-Serine	—	—	—	0.0105	0.0105	0.0105	—
L-Threonine	0.048	0.048	0.048	0.048	0.048	0.048	0.048
L-Tryptophan	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L-Tyrosine • 2Na • 2H ₂ O	0.0519	0.0519	0.0519	0.0519	0.0519	0.0519	0.0519
L-Valine	0.046	0.046	0.046	0.046	0.046	0.046	0.046
Vitamins							
Choline chloride	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Folic acid	0.001	0.001	0.001	0.001	0.001	0.001	0.001
<i>myo</i> -Inositol	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Niacinamide	0.001	0.001	0.001	0.001	0.001	0.001	0.001
D-Pantothenic acid • ½Ca	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Pyridoxal • HCl	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Riboflavin	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Thiamine • HCl	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other							
D-Glucose	1.0	1.0	1.0	1.0	1.0	1.0	1.0
HEPES free acid	—	—	5.958	—	4.7664	—	—
Phenol red • Na	0.011	—	0.011	0.011	0.011	0.011	0.011
Add							
L-Glutamine	0.292	0.292	0.292	0.292	—	—	—
NaHCO ₃	—	—	—	—	—	2.2	2.2

References

1. Eagle, H., et al., *myo*-Inositol as an Essential Growth Factor for Normal and Malignant Human Cells in Tissue Culture. J. Biol. Chem., **214**, 845-847(1956).
2. Eagle, H., Media for Animal Cell Culture. Tissue Culture Association Manual, **3**, 517-520 (1976).
3. Eagle, H., Amino Acid Metabolism in Mammalian Cell Cultures. Science, **130**, 432-437(1959).
4. Eagle, H., Nutrition Needs of Mammalian Cells in Culture. Science, **122**, 501 (1955).