

## 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.

	<b>M0268</b>	<b>M0275</b>	<b>M0446</b>	<b>M0643</b>	<b>M9288</b>	<b>M2279</b>	<b>M2414</b>
	[powder]	[10×]	[1×]	[powder]	[10×]	[1×]	[1×]
<b>COMPONENT</b>	g/L	g/L	g/L	g/L	g/L	g/L	g/L
<b>Inorganic salts</b>							
CaCl <sub>2</sub> • 2H <sub>2</sub> O	0.2	2.265	0.265	0.2	1.850	0.265	0.265
MgSO <sub>4</sub> (anhydrous)	0.09767	0.9767	0.09767	0.09767	0.9767	0.09767	0.09767
KCl	0.4	4.0	0.4	0.4	4.0	0.4	0.4
KH <sub>2</sub> PO <sub>4</sub>	—	—	—	—	0.6	—	—
NaHCO <sub>3</sub>	—	—	2.2	—	—	2.2	0.85
NaCl	6.8	68	6.8	6.8	80.0	6.8	6.8
Na <sub>2</sub> HPO <sub>4</sub> (anhydrous)	—	—	—	—	0.4788	—	—
NaH <sub>2</sub> PO <sub>4</sub> (anhydrous)	0.122	1.22	0.122	0.122	—	0.122	0.122
<b>Amino acids</b>							
L-Alanine	—	—	—	0.0089	—	—	—
L-Alanyl-L-Glutamine	—	—	0.4344	—	—	—	—
L-Arginine • HCl	0.126	1.26	0.126	0.126	1.26	0.126	0.126
L-Asparagine • H <sub>2</sub> O	—	—	—	0.015	—	—	—
L-Aspartic acid	—	—	—	0.0133	—	—	—
L-Cystine • 2HCl	0.0313	0.313	0.0313	0.0313	0.313	0.0313	0.0313
L-Glutamic acid	—	—	—	0.0147	—	—	—
L-Glutamine	0.292	—	—	0.292	—	—	—
Glycine	—	—	—	0.0075	—	—	—
L-Histidine • HCl • H <sub>2</sub> O	0.042	0.42	0.042	0.042	0.42	0.042	0.042
L-Isoleucine	0.052	0.52	0.052	0.052	0.52	0.052	0.052
L-Leucine	0.052	0.52	0.052	0.052	0.52	0.052	0.052
L-Lysine • HCl	0.0725	0.725	0.0725	0.0725	0.725	0.0725	0.0725
L-Methionine	0.015	0.15	0.015	0.015	0.15	0.015	0.015
L-Phenylalanine	0.032	0.32	0.032	0.032	0.32	0.032	0.032
L-Proline	—	—	—	0.0115	—	—	—
L-Serine	—	—	—	0.0105	—	—	—
L-Threonine	0.048	0.48	0.048	0.048	0.48	0.048	0.048
L-Tryptophan	0.01	0.1	0.01	0.01	0.1	0.01	0.01
L-Tyrosine • 2Na • 2H <sub>2</sub> O	0.0519	—	—	0.0519	—	0.0519	0.0519
L-Tyrosine	—	0.4176	0.04176	—	0.4176	0.04176	0.04176
L-Valine	0.046	0.46	0.046	0.046	0.46	0.046	0.046
<b>Vitamins</b>							
Choline chloride	0.001	0.01	0.001	0.001	0.01	0.001	0.001
Folic acid	0.001	0.01	0.001	0.001	0.01	0.001	0.001
myo-Inositol	0.002	0.02	0.002	0.002	0.02	0.002	0.002
Niacinamide	0.001	0.01	0.001	0.001	0.01	0.001	0.001
D-Pantothenic acid • ½Ca	0.001	0.01	0.001	0.001	0.01	0.001	0.001
Pyridoxal • HCl	0.001	0.01	0.001	0.001	0.01	0.001	0.001

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

	<b>M4642</b>	<b>M4655</b>	<b>M4780</b>	<b>M5650</b>	<b>M0325</b>	<b>M5775</b>	<b>M1018</b>	<b>51411C</b>
	[powder]	[1×	[1×	[1×	[1×	[1×	[powder]	[1×
<b>COMPONENT</b>	g/L	g/L	g/L	g/L	g/L	g/L	g/L	g/L
<b>Inorganic salts</b>								
CaCl <sub>2</sub>	0.2	0.265	0.185	0.265	0.265	0.185	0.1396	0.2
MgSO <sub>4</sub> (anhydrous)	0.09767	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	0.4
KH <sub>2</sub> PO <sub>4</sub>	0.06	—	0.06	—	—	0.06	0.06	—
NaHCO <sub>3</sub>	—	2.2	0.35	2.2	2.2	0.35	—	2.2
NaCl	8.0	6.8	8.0	6.8	6.8	8.0	8.0	6.8
Na <sub>2</sub> HPO <sub>4</sub> (anhydrous)	0.04788	—	0.04788	—	—	0.04788	0.04788	—
NaH <sub>2</sub> PO <sub>4</sub> (anhydrous)	—	0.122	—	0.122	0.122	—	—	—
NaH <sub>2</sub> PO <sub>4</sub> • H <sub>2</sub> O	—	—	—	—	—	—	—	0.14
<b>Amino acids</b>								
L-Alanine	—	—	—	0.0089	0.0089	—	0.0089	—
L-Alanyl-L-Glutamine	—	—	—	—	—	—	—	—
L-Arginine • HCl	0.126	0.126	0.126	0.126	0.126	0.126	0.126	0.127
L-Asparagine • H <sub>2</sub> 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	0.0313
L-Glutamic acid	—	—	—	0.0147	0.0147	—	0.0147	—
L-Glutamine	0.292	0.292	0.292	—	0.292	—	0.292	0.292
Glycine	—	—	—	0.0075	0.0075	—	0.0075	—
L-Histidine • HCl • H <sub>2</sub> O	0.042	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	0.052
L-Leucine	0.052	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	0.0725
L-Methionine	0.015	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	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	0.048
L-Tryptophan	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L-Tyrosine • 2Na • 2H <sub>2</sub> O	0.0519	—	—	—	—	—	0.0519	0.0519
L-Tyrosine	—	0.04176	0.04176	0.04176	0.04176	0.04176	—	—
L-Valine	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
<b>Vitamins</b>								
Choline chloride	0.001	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	0.001
<i>myo</i> -Inositol	0.002	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	0.001
D-Pantothenic acid • ½Ca	0.001	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	0.001
Riboflavin	0.0001	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	0.001
<b>Other</b>								
D-Glucose	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Phenol red • Na	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
<b>Add</b>								
L-Glutamine	—	—	—	0.292	—	0.292	—	—
NaHCO <sub>3</sub>	0.35	—	—	—	—	—	0.35	—

	51412C	51414C	51415C	51416C	51417C	56416C	56419C
	[1x]	[1x]	[1x]	[1x]	[1x]	[powder]	[powder]
COMPONENT	g/L	g/L	g/L	g/L	g/L	g/L	g/L
<b>Inorganic salts</b>							
CaCl <sub>2</sub>	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MgSO <sub>4</sub> (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 <sub>3</sub>	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 <sub>2</sub> PO <sub>4</sub> • H <sub>2</sub> O	0.14	0.14	0.14	0.14	0.14	0.14	0.14
<b>Amino acids</b>							
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 <sub>2</sub> 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 <sub>2</sub> 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 <sub>2</sub> 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
<b>Vitamins</b>							
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
<b>Other</b>							
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
<b>Add</b>							
L-Glutamine	0.292	0.292	0.292	0.292	—	—	—
NaHCO <sub>3</sub>	—	—	—	—	—	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).