

West and McBride's Modified ES Medium

West and McBride 1999

This medium is derived from ES Medium (Provasoli 1968) and Modified ES Medium (McLachlan 1973) (see ES Medium). The primary modification is the absence of TRIS buffer, which is of questionable value in earlier versions. West and McBride's recipe also has lower nitrate, phosphate and trace metal levels as well as higher iron-EDTA and vitamin levels. West and McBride (1999) do not specify the amount of enrichment, but the correct addition is 10 mL of enrichment stock for each liter of natural seawater (John West, pers. comm.). The stock solution quantities (but not final molar concentrations) have been adjusted for the recipe below.

First, prepare the iron-EDTA, trace metals solution and the vitamin stock solutions; the vitamin stocks should be filter sterilized and stored frozen. To prepare the enrichment stock solution, begin with 800 mL of dH₂O, add the following components and bring the final volume to 1 liter with dH₂O. Pasteurize the enrichment stock solution. To prepare the final ES Medium, aseptically add 10 mL of the enrichment stock solution to 990 mL of filtered natural seawater that has been sterilized by pasteurization.

Enrichment Stock Solution

Component	Primary Stock Solution	Quantity	Molar Concentration in Final Medium
NaNO ₃	---	3.85 g	4.53 x 10 ⁻⁴ M
Na ₂ b-glycerophosphate	---	0.4 g	1.31 x 10 ⁻⁵ M
5 H ₂ O			
Fe-EDTA Solution	(see recipe below)	100 mL	---
trace metal solution	(see recipe below)	20 mL	---
thiamine (vit. B ₁)	500 mg L ⁻¹ dH ₂ O	8.0 mL	1.19 x 10 ⁻⁷ M
biotin (vit. H)	50 mg L ⁻¹ dH ₂ O	8.0 mL	1.78 x 10 ⁻⁸ M
cyanocobalamin (vit. B ₁₂)	25 mg L ⁻¹ dH ₂ O	3.5 mL	6.46 x 10 ⁻¹⁰ M

Iron-EDTA Solution

To prepare, add the components to 950 mL of dH₂O, bring final volume to 1 liter with dH₂O. Pasteurize, store in refrigerator.

Component	Stock Solution	Quantity	Molar Concentration in Final Medium
Na ₂ EDTA 2H ₂ O	---	6.00 g	1.61 x 10 ⁻⁴ M
Fe(NH ₄) ₂ (SO ₄) ₂ 6H ₂ O	---	7.00 g	1.78 x 10 ⁻⁴ M

Trace Metals Solution

The trace metals solution is referred to as PII trace metals in West and McBride (1999), but it varies substantially from Provasoli's original PII trace metal solution (see Provasoli 1958, 1963) as well as his formulation for ES Medium (Provasoli 1968). Na₂EDTA 2H₂O was substituted for Na₂EDTA (adjusted to same molarity EDTA). Into 900 mL of dH₂O, dissolve the EDTA and then individually add and dissolve the remaining components. Bring the final volume to 1 liter with dH₂O.

Component	Primary Stock Solution	Quantity	Molar Concentration in Final Medium
Na ₂ EDTA 2H ₂ O	---	2.548 g	1.37 x 10 ⁻⁵ M
H ₃ BO ₃	---	2.240 g	7.25 x 10 ⁻⁵ M
MnSO ₄ 4H ₂ O	---	0.240 g	2.15 x 10 ⁻⁶ M
ZnSO ₄ 4H ₂ O	---	0.044 g	3.06 x 10 ⁻⁷ M
CoSO ₄ 7H ₂ O	---	0.010 g	7.11 x 10 ⁻⁸ M

References

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