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MANUSCRIPT CITATION: Coffroth, M. A., Lasker, H. R., Diamond, M. E., Bruenn, J. A., & Bermingham, E. (1992). DNA fingerprints of a gorgonian coral: a method for detecting clonal structure in a vegetative species. *Marine Biology*, 114(2), 317-325.

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🌐 2×CTAB Protocol for (simultaneous) DNA Isolation from Aiptasia and Symbiodinium

👤 In 1 collection

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Aiptasia Symbiodiniaceae Model System

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ABSTRACT

This protocol is kit-free and can be used to simultaneously isolate high quality genomic DNA of *Symbiodinium* and Aiptasia from symbiotic anemones which can be used e.g. as PCR template for genotyping.

It is based on the method described in Coffroth et al., 1992.

GUIDELINES

Make sure to use Phenol:Chloroform:Isoamyl alcohol (25:24:1) which is buffered with TE to a neutral to slightly basic pH (everything starting from 6.7 should work) since DNA stability decreases at acidic pH (the opposite is true for RNA).

Be sure not to exceed the maximal ×g for which your microcentrifuge tubes are certified otherwise they might get damaged during centrifugation and release all the hazardous substances (and the DNA of course) into the rotor. You don't want that!

If making your own stock solutions of RNase A from powder be aware that some products contain DNase impurities. If this should be the case you need to boil the stock solutions once for 15-20 min at 100°C and let cool down at room temperature to inactivate the DNases.

Keywords: DNA Isolation,
genomic DNA, Symbiodinium
genotyping

MATERIALS

MATERIALS

- ⊗ 0.5 mm Zirconia/Silica Beads **Bio Spec Products Inc. Catalog #11079105z**
- ⊗ Glass beads, acid-washed, 425-600 µm (30-40 U.S. sieve) **Sigma Aldrich Catalog #G8772-100G**
- ⊗ Ethyl alcohol, Pure 200 proof, for molecular biology **Sigma Aldrich Catalog #E7023**
- ⊗ 2-mercaptoethanol **Sigma-aldrich Catalog #M-6250**
- ⊗ Hexadecyltrimethylammonium bromide (CTAB) **Sigma Aldrich Catalog #H9151**
- ⊗ Water bath at 65°C **Contributed by users**
- ⊗ Microcentrifuge **Contributed by users**
- ⊗ Microcentrifuge tubes (1.5 or 2 ml, screw-cap or safe-lock) **Contributed by users**
- ⊗ 0.5 M EDTA Stock Solution (adjusted to pH 8.0 with NaOH) **Contributed by users**
- ⊗ 1 M Tris/HCl Stock Solution (dissolved Tris base adjusted to pH 8.0 with HCl) **Contributed by users**
- ⊗ Vortexer/Multivortexer (<=2000 rpm) **Contributed by users**
- ⊗ Proteinase K (20 mg/ml) **Contributed by users**
- ⊗ Phenol/Chloroform/Isoamyl alcohol (25:24:1), stabilized, saturated with 100 mM Tris-EDTA to pH 8.0 **Fisher Scientific Catalog #AC327111000**
- ⊗ Chloroform – isoamyl alcohol mixture **Sigma Aldrich Catalog #25666**
- ⊗ 70% Ethanol **Contributed by users**
- ⊗ Nuclease-free water (e.g. MilliQ or HPLC grade water) **Contributed by users**
- ⊗ RNase A (10 mg/ml stock) **Contributed by users**

SAFETY WARNINGS

! Safety Remarks: Be sure to follow chemical safety procedures. β -Mercaptoethanol and Phenol are very toxic if inhaled, ingested or by skin contact. So, read the safety data sheets, work under a hood for at least the Phenol and Chloroform steps, wear nitrile gloves (don't re-use them), safety glasses and a lab coat. If you never worked with Phenol:Chloroform before, ask someone who did about handling of it!

Waste Disposal: Follow guidelines of your institution for disposal. E.g. discard bottom organic layers in liquid Phenol-Chloroform waste container, the tubes and glass beads into solid Phenol-Chloroform waste container.

BEFORE START INSTRUCTIONS

Recipes:

2×CTAB Buffer

(Coffroth et al. (1992) Marine Biology 114: 317-325)

End concentrations: For 100 ml buffer mix:

1.4 M	NaCl	28 ml of a 5 M stock solution
20 mM	EDTA (pH 8)	4 ml of a 0.5 M stock solution
100 mM	Tris/HCl (pH 8)	10 ml of a 1 M stock solution
2% (w/v)	CTAB powder	2 g

Add after filter sterilization under a hood:

0.2% (v/v)	β -mercaptoethanol (TOXIC!!!)	200 μ l
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- Add ddH₂O to just under 100 ml.
 - Warm to 65°C under stirring to bring the CTAB into solution.
 - Once dissolved, bring final volume to 100 ml using a graduated cylinder.
 - Filter sterilize (0.2 μ m) into sterile 50 ml Falcon tubes and store at -20°C.
- Heat to 65°C before usage since freezing leads precipitation of the CTAB.

Sample Preparation

- 1 **Homogenize anemone with a rotor-stator in 500 μ l 2× CTAB buffer individually in screw-cap or safe-lock 1.5-2 ml microcentrifuge tubes.**

This is important for the Phenol extraction; simple tubes might leak! Make sure your tubes tolerate the chemicals and centrifugation forces!

Make sure to clean the rotor thoroughly afterwards.

Safety information

The 2-Mercaptoethanol in the CTAB buffer is toxic if inhaled, swallowed or at skin contact.
<https://chemicalsafety.com/sds1/sdsviewer.php?id=30038887&name=2-Mercaptoethanol>

2 Do 5 rounds of sheering through a 25-gauge needle.

Important: DNA in host-algae homogenate in SDS or water will degrade rapidly with every freeze-thaw cycle! If you want to perform DNA isolation from these samples later, freeze the samples after step 6.

DNA Isolation

3 Add ~200 µl of glass beads (0.5 mm).

4 Vortex for 1-5 min at ≥ 2000 rpm until no cell clumps are visible.

5 Add 3.6 µl of Proteinase K (20 mg/ml). Mix by inverting several times.

6 Incubate at 65°C for 30-60 min. Invert occasionally while incubating.

The suspension should become green and less opaque when the cells lyse. 20 min should be enough for less dense samples.

00:30:00 65°C incubation

7 Add 600 µl Phenol:Chloroform:Isoamyl alcohol (25:24:1, TE-buffered to pH ≥ 7 , very TOXIC!!!!), mix thoroughly by vortexing several seconds.

This should result in a milky emulsion with two phases starting to form.

Safety information

Phenol is carcinogenic and causes chemical burns at skin contact. Chloroform is a carcinogen and an irritant.

<https://chemicalsafety.com/sds1/sdsviewer.php?id=30148468&name=Phenol%20-%20chloroform%20-%20isoamyl%20alcohol%20mixture>

- 8 **Centrifuge for 10 min at 14,000 ×g to separate the phases.**
- 9 **Take ~550 µl of the aqueous, upper phase without disturbing the interphase and transfer to a new tube.**
- 10 **Add 8 µl of RNase A (10 mg/ml stock concentration) to the sample, mix well and incubate at 37°C for 30 min.**
During this step the RNA from the sample is degraded and removed during the next steps. If you started with a lot of sample material, prolong this step to 1 h.
00:30:00 RNase A treatment
- 11 **Add 600 µl Phenol:Chloroform:Isoamyl alcohol (25:24:1, TE-buffered to pH ≥ 7, very TOXIC!!!), mix thoroughly by vortexing several seconds.**
This should result in a milky emulsion with two phases starting to form.

Safety information

Phenol is carcinogenic and causes chemical burns at skin contact. Chloroform is a carcinogen and an irritant.

<https://chemicalsafety.com/sds1/sdsviewer.php?id=30148468&name=Phenol%20-%20chloroform%20-%20isoamyl%20alcohol%20mixture>

- 12 **Centrifuge for 10 min at 14,000 ×g to separate the phases.**
- 13 **Take ~500 µl of the aqueous, upper phase without disturbing the interphase and transfer to a new tube.**

- 14 Add 500 µl of Chloroform:Isoamyl alcohol (24:1), mix thoroughly by vortexing several seconds.**

You can also use plain Chloroform.

Safety information

Chloroform is a carcinogen and an irritant.

<https://chemicalsafety.com/sds1/sdsviewer.php?id=30148458&name=Chloroform%20-%20isoamyl%20alcohol%20mixture>

- 15 Centrifuge for 10 min at 14,000 ×g.**

- 16 Take ~450 µl of the aqueous, upper phase and transfer to a new tube.**

Do NOT disturb the interphase!

- 17 Add 1 ml of 100% ethanol (molecular biology grade) and mix well.**

- 18 Incubate for ≥30 min at RT.**

00:30:00 Incubation at room temperature

- 19 Centrifuge for ≥30 min at 14,000 ×g at RT.**

Be sure to orient all tubes in the same direction to know on which side the pellet will form.

- 20 Decant supernatant.**

You might not see any pellet at this step. Just be careful to not scratch off the DNA from the side where the pellet should be.

- 21 Add 500 µl 70% ethanol, don't mix, centrifuge for 5 min at 14,000 ×g.**

22 Remove the supernatant carefully with a pipet, without disturbing the pellet.

It helps to use a 1000 µl pipette with a respective tip and add a 200 µl tip.

23 Air-dry for 10 min or until no Ethanol is visible.

24 Add 30 µl ddH₂O or 10 mM Tris/HCl pH 8.5 to the pellet.

You can also use TE (Tris-EDTA) buffer but be aware that the EDTA might interfere with downstream enzymatic reactions.

25 Store the samples at –20°C indefinitely or use them directly.