

## SOP: RP004

### Production of Recombinant ESat-6 Under Non-Denaturing Conditions SOP

#### Materials and Reagents:

1. His-Bind Resin (Novagen Cat# 69670)
2. Poly-Prep Chromatography Columns (BioRad Cat# 731-1550)
3. 15 ml Falcon Conical Tubes (Fisher Cat# 14-959-70C)
4. 10 ml pipets (VWR Cat# 12777-014)
5. Auto-Pipettor
6. 200  $\mu$ l pipet
7. 200  $\mu$ l sterile, pyrogen-free pipet tips
8. 96 well sterile plates
9. BCA Kit (Pierce Cat# 23225)
10. SDS-PAGE Gel supplies
11. LAL Kit (Bio-Whittaker Cat# 50-648U)
12. 37°C Shaking Incubator
13. 37°C Plate Incubator
14. Heat block with 96-well plate incubator
15. Optical Plate Reader with 405 and 550  $\lambda$  filters
16. Pyrogen-free tubes
17. Vortexer
18. IPTG
19. Ampicillin
20. Chloramphenicol
21. High-speed Centrifuge
22. Centrifuge Bottles
23. Burdick and Jackson Water (Cat#365-4)
24. 1X Binding Buffer (20 mM Tris-HCl, 500 mM NaCl, 5 mM Imidazole, pH 7.9)(Note 2)
25. 1X Charge Buffer (50 mM NiSO<sub>4</sub>, see Note 1) (Note 2)
26. 1X Wash Buffer (20 mM Tris-HCl, 500 mM NaCl, 60 mM Imidazole, pH 7.9)(Note 2)
27. 10 mM Tris-HCl, pH 8 made with Endotoxin free water (Note 2)
28. 1X Elution Buffer (10 mM Tris-HCl, 1M Imidazole, pH 8 made with endotoxin free water) (Note 2)
29. 0.5% ASB-14 (Calbiochem Cat# 182750) in 10 mM Tris-HCl (Note 3)
30. Lysozyme (10 mg/ml in Milli-Q Water)
31. DNase(3mg/ml in Milli-Q Water)
32. Complete protease inhibitors(Roche Cat#1873580 or 1836170)(Note 4)
33. Endotoxin free water
34. Dialysis Membrane 3500 MWCO (Spectra-Por cat# 132 724)
35. 1000 mL beaker
36. Dialysis chamber
37. magnetic stir-bar
38. stir plate
39. 4°C Cold Room
40. Ammonium Bicarbonate
41. 10 mM Ammonium Bicarbonate made with ET free water

#### Protocol:

1. \_\_\_\_\_ Inoculate 10 ml LB Amp<sup>100</sup> Cam<sup>34</sup> culture with target protein in the *E. coli* BL21 DE3 pLysS Star expression strain and grow overnight at 37°C with shaking.
2. \_\_\_\_\_ Autoclave 2L of LB broth in a 4L Erlenmeyer Flask. Allow media to cool and add Amp<sup>100</sup>Cam<sup>34</sup>.
3. \_\_\_\_\_ Centrifuge the overnight 10 ml culture to pellet the cells. Decant spent media and resuspend pellet in fresh LB Amp<sup>100</sup>Cam<sup>34</sup>.
4. \_\_\_\_\_ Inoculate the 2L broth with the resuspended pellet. Grow at 37°C with shaking to an OD<sub>600</sub> of 0.5

5. \_\_\_\_ Once culture has reached the proper OD, remove from the 37°C incubator.
6. \_\_\_\_ Allow the culture to cool to room temperature.
7. \_\_\_\_ Add sterile IPTG to a concentration of 0.25 mM.
8. \_\_\_\_ Place culture into a shaking incubator set at 25°C, allow to grow 12-14 hrs.
9. \_\_\_\_ Harvest cells by centrifugation at 10,000 x g in 450 ml centrifuge bottles.
9. \_\_\_\_ Resuspend the cell pellet in 15 mL 1X Binding Buffer (all buffers should be made with Burdick and Jackson water or Milli-Q water to minimize endotoxin levels in the buffers). Add appropriate protease inhibitors, DNase, and Lysozyme. (Note 5) Freeze at -20C or continue.
10. \_\_\_\_ Incubate at 30°C for 15 minutes (Or 2 hours if frozen).
11. \_\_\_\_ Break cells by sonication or French Pressure Cell. Sonicate on iced ethanol using probe sonicator with 60 second cycles followed by 90 second intervals to cool the lysate. Repeat until the viscosity of the lysate changes.
12. \_\_\_\_ Centrifuge the lysate at 16,000 x g for 90 minutes to remove cellular debris and to clarify. Cell pellet may contain protein in the form of Inclusion Bodies. If the pellet appears light mocha or whitish in color, store pellet at -20°C and see RP003b. (Note 8)
13. \_\_\_\_ Decant lysate into graduated 50 mL conical tube to record volume. Freeze at -20C or continue.
14. \_\_\_\_ Perform BCA to determine protein concentration.
15. \_\_\_\_ Perform SDS-PAGE analysis to estimate protein amount in total lysate. This will allow the number of His-Bind columns needed for purification to be calculated. Each 1.5 ml column is capable of binding approximately 12 mg of recombinant His-tagged protein. (Note 9)
16. \_\_\_\_ Equilibrate the appropriate number of His-Bind columns. (Note 6)
17. \_\_\_\_ Apply the lysate to the appropriate number of His-Bind columns by pipetting slowly.
18. \_\_\_\_ Collect Flow-through in 15 ml conical tubes.
19. \_\_\_\_ Apply 10 column volumes of 1X Binding Buffer, collect fraction in 15 ml conical tube.
20. \_\_\_\_ Apply 6 CV of 1X Wash Buffer to the columns, collect fraction as before.
21. \_\_\_\_ Apply 10 CV of 10 mM Tris-HCl in ET free water to remove residual salts from the columns. Collect fraction as before.
22. \_\_\_\_ Apply 10 CV of 0.5% ASB-14 in ET free 10 mM Tris-HCl. This is the endotoxin removal step. Collect fraction as before. (Note 7)
23. \_\_\_\_ Apply another 10 CV of the ET free 10 mM Tris-HCl to remove any excess detergent. Collect fraction as before.
24. \_\_\_\_ Apply 5 ml of the elution buffer, ET free 10 mM Tris-HCl, 1M Imidazole. Collect fraction. Freeze fraction at -20°C or continue with dialysis.

25. \_\_\_\_\_ Prepare 3500 MWCO dialysis membrane by sealing both ends with clips to prevent ET from reaching the inside of the membrane. Boil in 1000 mL beaker with Burdick and Jackson water.
26. \_\_\_\_\_ Prepare dialysis chamber with 4L of 10 mM Ammonium Bicarbonate.
27. \_\_\_\_\_ Cut ends off of dialysis membrane, tie off the bottom end and re-clamp. Add protein sample to the dialysis membrane. Tie off top end and clamp.
28. \_\_\_\_\_ Dialyze with slow stirring at 4°C for 8 hours, exchange buffer 3 more times to ensure complete removal of contaminants.
29. \_\_\_\_\_ Pat dry the dialysis membrane to remove any potential contaminating buffer containing endotoxin.
30. \_\_\_\_\_ Cut open the dialysis membrane at the top and carefully pour the sample into a clean. Sterile 50 mL conical tube.
31. \_\_\_\_\_ Rinse the dialysis membrane carefully with a small amount of 10 mM Ammonium Bicarbonate made with ET free water. Decant into the conical tube. Freeze at -20°C or continue with QC.
32. \_\_\_\_\_ Perform BCA analysis to determine protein concentration.
33. \_\_\_\_\_ If concentration is lower than .45mg/ml(for .5mg aliquots) or .9 mg/ml(for 1mg aliquots) lyophilize or concentrate on the savant.
34. \_\_\_\_\_ If concentrated make sure protein is fully suspended and uniform. Sonicate if necessary until suspended. If completely dried use ET free water to resuspend or 10mM ammonium bicarbonate.
35. \_\_\_\_\_ If concentrated repeat the BCA analysis to determine protein concentration. If concentration is adequate, proceed to the next step otherwise start at step 33.
36. \_\_\_\_\_ Perform SDS-PAGE analysis to determine protein purity.
37. \_\_\_\_\_ Perform LAL testing to determine endotoxin contamination.
38. \_\_\_\_\_ Protein can be lyophilized in desired aliquots.

**Notes:**

1. Don't adjust the pH of charge buffer. It will precipitate if you adjust it.
2. After mixing up solutions and adjusting the pH filter sterilize the buffers with a .2µm filter.
3. Add appropriate amount of ASB-14 to your already prepared 10mM Tris-HCl just before use.
4. Make sure to use EDTA-free complete as EDTA will interfere with protein binding to the nickel charged resin.
5. Add Complete EDTA-free protease inhibitor per instructions with Complete.  
Add 30µl stock DNase to 50 ml  
Add lysozyme to 200µg/ml
6. Equilibration:
  1. Add 3ml of resuspended resin(resin is in ethanol) to a poly-prep column(settled volume of 1.5ml)
  2. Allow it to flow through.
  3. Add 4ml of water to the column. Allow to flow through.
  4. Add 7ml of charge buffer to the column. Allow to flow through.
  5. Add 4ml of binding buffer to the column Allow to flow through.
  6. Column is ready to add sample to.

Columns can be stored for a day or two at 4°C with at least 1ml of binding buffer covering the top of the resin.

7. After the detergent removal step be very careful everything used from this point on is endotoxin free.
8. There will be at least an equal amount of ESat-6 in inclusion bodies, however using this protocol you should get at least 12.5mg per liter of media.
9. If the expression conditions were followed about 3 columns per 2L of culture should be about right.