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Version 2

Effective identification of DNA-bound protein complexes using Chromatin Immunoprecipitation V.2

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Protocol status: Working

This protocol has been used by The Tsiichlis Lab for both human and mouse cells. This technique has been used to our recent publication. 'Laliotis, G.I., Chavdoula, E., Paraskevopoulou, M.D., Kaba, A., La Ferlita, A., Anastas, V., Orlacchio, A., Taraslia, V., Vlachos, I., Capece, M. and Hatzigeorgiou, A., 2020. IWS1 phosphorylation promotes cell proliferation and predicts poor prognosis in EGFR mutant lung adenocarcinoma patients, through the cell cycle-regulated U2AF2 RNA splicing. bioRxiv.'

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Keywords: chromatin immunoprecipitation, effective identification of dna, bound protein complex, protein complex, dna, effective identification

Troubleshooting

Chemicals Required

1d

- 1 1. Cytosolic Lysis Buffer (200 ml) ; 5 mM PIPES (pH 8.0), 85 mM KCl, 0.5% NP40 + PI

PIPES 0.3 g ⇒ Adjust pH 8.0

2M KCl 8.5 ml

10% NP40 10 ml

2. Nuclear Lysis Buffer (50 ml) ; 50 mM Tris (pH 8.0), 10 mM EDTA, 0.5% SDS

1 M Tris (pH 8.0) 2.5 ml

0.5 M EDTA 1 ml

20% SDS 1.25 ml

3. IP Dilution Buffer (250 ml) ; 16.7 mM Tris (pH 8.0), 167 mM NaCl, 1.2 mM EDTA, 1.1% Triton X-100, 0.01% SDS

1 M Tris (pH 8.0) 4 ml

0.5 M EDTA 0.6 ml

5 M NaCl 8.5 ml

20% Triton X-100 12.5 ml

10% SDS 250 ul

4. Low Salt Wash Buffer (250 ml); 20 mM Tris(pH8.0), 2 mM EDTA, 150 mM NaCl, 1% Triton X-100, 0.1% SDS

1 M Tris (pH 8.0) 5 ml

0.5 M EDTA 1 ml

5 M NaCl 7.5 ml

20% Triton X-100 12.5 ml

10% SDS 2.5 ml

5. High Salt Wash Buffer (250 ml); 20 mM Tris(pH8.0), 2 mM EDTA, 500 mM NaCl, 1% Triton X-100, 0.1% SDS

1 M Tris (pH 8.0) 5 ml

0.5 M EDTA 1 ml

5 M NaCl 25 ml

20% Triton X-100 12.5 ml

10% SDS 2.5 ml



6. NS Buffer ; 50 mM Hepes, 500 mM NaCl, 1 mM EDTA, 1% Triton X-100, 0.1% Na-deoxycholate, 0.1% SDS

7. LiCl Wash Buffer (250 ml); 10 mM Tris (pH8.0), 1 mM EDTA, 250 mM LiCl, 1% NP40, 1% (w/v) deoxycholic acid

1 M Tris (pH 8.0)	5 ml
0.5 M EDTA	0.5 ml
1 M LiCl	72.5 ml
10% NP40	50 ml
Deoxycholic acid	0.25 g

8. Miscallaneous

1.25 M Glycine	9.38 g / 100 ml	
1 M NaHCO ₃	8.4 g / 100 ml	⇒ aliquote (0.5 ml) and keep at -20 °C

Cross-linking and Lysis of the cells

6h

2

- **For cell lines** (20-50×10⁶ cells)

For each Ab to be tested, 3 plates for each cell line must be used.

1. Add 270 ul of 37% Formaldehyde into 10 ml culture media (P100)
2. Incubate at 37 °C for 15 min
3. Add 1 ml of 1.25 M Glycine and incubate 5 min at RT
4. Wash with cold PBS (x2)
5. Wash with 1 ml of cold PBS (+ PI)
6. Scrap cells and collect into a new tube
7. Tip : Scrap each plate and place it in a different tube
8. Centrifuge at 14000 rpm for 1 min at 4 °C to remove PBS
9. Remove supernatant
10. Incubate lysis buffer in 37 deg. For a few minutes to dissolve precipitants
11. Add fresh 1x proteinase inhibitor-10ul from 100x stock
12. Add/Resuspend 1 ml of nucleic lysis buffer (+PI) per 3 P100 plates ⇒ 200ul for 1×10⁶
13. Manually shake tube to break pellet
14. Split the 1ml lysate in 2 tubes with 500ul-Helps the sonication process
15. Incubate on ice for 10'
16. Sonication : 15 sec on/45 sec off (60 sec x 6-7 times = 6-7 min on/each sample)
at 30% duty



17. Centrifuge at 14000 rpm for 15 min at 4 °C
18. Transfer supernatant into a new single tube
 - * can be stored at -80 °C
 - * keep 10% lysate (50ul-10% of 500ul Ab solution) for input-you can dilute it to 1% I put for qPCR analysis

Immunoprecipitation of Crosslinked protein/DNA complex

1d 6h

- 3
 1. Dilute 5 fold of lysate volume with IP dilution buffer in a 15 ml tube
 2. Add 1x protease inhibitors in the IP dilution buffers
 3. Dilute to 5ml from initial 1ml using 4ml IP dilution buffers
 4. Split in 2x tubes for Ab and 2 for normal IgG
 - **Caution!Each tube is HALF REACTION**
 - ⇒ final buffer concentration) 0.1% SDS of nucleic lysis buffer
 5. Pre-cleaning : Add 30 ul of protein G bead / Ab reaction for pre-clearing per tube
 6. Incubate for 1 hr at 4 °C with rotation
 7. Centrifuge at 3000 rpm for 2 min at 4 °C
 8. Transfer supernatant into a new 2 ml tube
 9. Add 2 ug of antibody or normal IgG per tube (for Normal Rabbit IgG add 2ul from 1mg/dL. In order to make that add 8.77ul from 11.4mg/dl stock and 92.23 ddH2O)
 10. Incubate overnight at 4 °C with rotation
 11. Add 25 ul of protein G agarose bead / Ab reaction per tube
 12. Incubate for 2 hrs at 4 °C with rotation
 13. Centrifuge at 3000 rpm for 2 min at 4 °C
 14. Place beads at least 5 minutes in magnetic rack
 15. Remove supernatant carefully with WB long tips gradually
 16. Add/Resuspend beads 500 ul cold low salt wash buffer/tube and combine tubes in 1
 17. Rotate for 5' at 4 deg
 18. Wash with wash buffer
 - Order : cold low salt wash buffer (x2)
 - cold high salt wash buffer (x2)
 - cold LiCl wash buffer (x2)
 - cold TE buffer (x3)
 19. Centrifuge at 3000rpm for 2'
 20. Place on magnetic rack for 5'
 21. Add 500ul of buffer
 22. incubate for 5 min at 4 °C with rotation
 23. Centrifuge at 3000 rpm at RT (or 4 °C) for 1 min
 24. Place on magnetic rack for 5'



25. Remove supernatant
 26. Wash with next one etc.
 27. Add 200 ul elution buffer (0.1M NaHCO₃ and 1% SDS)
- For 1.5ml :
- 1,2ml H₂O first
then, 150ul 10x SDS
finally, 150ul 1M NaHCO₃
28. Incubate for 15 min with shaking heating block (900 rpm) at 23 °C
 29. Centrifuge at 3000 rpm for 3 min
 30. Put in magnetic rack for 5'-Transfer supernatant into a new tube
 31. Repeat #16-19 (Total elution vol. will be 400 ul)

Reverse Crosslinking and Elution of Protein/DNA complexes

6h

- 4 32. Add 20 ul of 5M NaCl and 1 ul of 20 mg/ml RNase / 200 ul tube (remember the volume is 400ul)

* Don't forget input sample (10% lysate + 350ul Elution buffer)!!
 33. Mix well manually before putting into the cyclor
 34. Incubate at 65 °C in Thermo cyclor for 5 hrs or overnight with 450rpm rotation to prevent precipitation
 35. Add 10 ul of 0.5M EDTA, 20 ul of 1M Tris (pH 8.0), and 2 ul of 10 mg/ml Proteinase K/ tube
 36. Incubate at 45 °C for 1 hr
- QIAGEN PCR extraction kit (Or use P/C/I extraction method)
37. Add 5 vol. of PBI buffer (QIAGEN PCR extraction kit) and mix well-450ul ⇒ 2,25ml
Final volume
* Check PH ⇒ add 10 ul 3M sodium acetate if #23 turn orange or violet color.
 38. Add sample into a column-max 800ul
 39. Centrifuge at 14000 rpm for 1 min
 40. Add 750 ul of PE buffer
 41. Centrifuge at 14000 rpm for 1 min and remove liquid from a tube
 42. Centrifuge at 14000 rpm for 1 min again
 43. Add 60 ul of EB buffer
 44. Centrifuge at 14000 rpm for 1 min
 45. Store DNA elution at -20 °C
 46. Carry out qPCR using 2 ul elution/reaction

