Applications	Reactivity	Sensitivity	MW (kDa)	Source
W IHC-P	H M R (B)	Endogenous	28, 70	Rabbit

Applications Key: W=Western Blotting IHC-P=Immunohistochemistry (Paraffin)

Reactivity Key: H=Human M=Mouse R=Rat B=Bovine

Species cross-reactivity is determined by western blot. Species enclosed in parentheses are predicted to react based on 100% sequence homology.

Protocols

Flow Cytometry Protocol

A. Solutions and Reagents

NOTE: Prepare solutions with purified water.

1. **1X Phosphate Buffered Saline (PBS):** Dissolve 8 g NaCl, 0.2 g KCl, 1.44 g Na_2HPO_4 and 0.24 g KH_2PO_4in 800 ml dH_2O. Adjust the pH to 7.4 with HCl and the volume to 1 L. Store at room temperature.
2. **Formaldehyde** (methanol free).
3. **100% Methanol**
4. **Incubation Buffer:** Dissolve 0.5 g bovine serum albumin (BSA) in 100 ml 1X PBS. Store at 4 ℃.

B. Fixation

1. Collect cells by centrifugation and aspirate supernatant.
2. Resuspend cells briefly in 0.5–1 ml PBS. Add formaldehyde to a final concentration of 2–4% formaldehyde.
3. Fix for 10 min at 37 ℃.
4. Chill tubes on ice for 1 min.
5. For extracellular staining with antibodies that do not require permeabilization, proceed to Section D, Step 1 or store cells in PBS with 0.1% sodium azide at 4 ℃; for intracellular staining, proceed to permeabilization (Section C, Step 1).

C. Permeabilization

1. Permeabilize cells by adding ice-cold 100% methanol slowly to pre-chilled cells, while gently vortexing, to a final concentration of 90% methanol. Alternatively, to remove fix prior to permeabilization, pellet cells by centrifugation and resuspend in 90% methanol.
2. Incubate 30 min on ice.
3. Proceed with immunostaining (Section D, Step 1) or store cells at –20 ℃ in 90% methanol.

D. Immunostaining

NOTE: Account for isotype matched controls for monoclonal antibodies or species matched IgG for polyclonal antibodies. Count cells using a hemocytometer or alternative method.

1. Aliquot 0.5–1x10^6 cells into each assay tube (by volume).
2. Add 2–3 ml Incubation Buffer to each tube and rinse by centrifugation. Repeat.
3. Resuspend cells in 100 µl Incubation Buffer per assay tube.
4. Block in Incubation Buffer for 10 min at room temperature.

5. Add the unconjugated, biotinylated, or fluorochrome-conjugated primary antibody at the appropriate dilution to the assay tubes (see individual antibody datasheet for the appropriate dilution).
6. Incubate for 1 hr at room temperature.
7. Rinse as before in Incubation Buffer by centrifugation.
8. If using a fluorochrome-conjugated primary antibody, resuspend cells in 0.5 ml PBS and analyze on flow cytometer; for unconjugated or biotinylated primary antibodies, proceed to immunostaining (Section D, Step 9).
9. Resuspend cells in fluorochrome-conjugated secondary antibody or fluorochrome-conjugated avidin, diluted in Incubation Buffer at the recommended dilution.
10. Incubate for 30 min at room temperature.
11. Rinse as before in Incubation Buffer by centrifugation.
12. Resuspend cells in 0.5 ml PBS and analyze on flow cytometer; alternatively, for DNA staining, proceed to optional DNA stain (Section E, Step 1).

E. Optional DNA Stain

1. Resuspend cells in 0.5 ml of DNA dye (e.g. Propidium Iodide (PI)/RNase Staining Solution #4087).
2. Incubate for at least 5 min at room temperature.
3. Analyze cells in DNA stain on flow cytometer.

Immunohistochemistry Protocol – Paraffin for SignalStain® Boost Detection Reagent

***IMPORTANT:** See product datasheet for the appropriate antibody diluent, dilution, and antigen unmasking procedure.

A. Solutions and Reagents

NOTE: Prepare solutions with purified water.

1. **Xylene**
2. **Ethanol**, anhydrous denatured, histological grade (100% and 95%).
3. **Deionized water** (dH_2O).
4. **Hematoxylin** (optional).
5. **Wash Buffer:**

- **1X TBS/0.1% Tween-20 (1X TBST):** To prepare 1 L, add 100 ml 10X TBS to 900 ml dH_2O. Add 1 ml Tween-20 and mix.
- **10X Tris Buffered Saline (TBS):** To prepare 1 L, add 24.2 g Trizma® base ($C_4H_{11}NO_3$) and 80 g sodium chloride (NaCl) to 1 L dH_2O. Adjust pH to 7.6 with concentrated HCl.

6. ***Antibody Diluent:**

a. **SignalStain® Antibody Diluent #8112**

b. **TBST/5% normal goat serum:** To 5 ml 1X TBST, add 250 µl normal goat serum (#5425).

c. **PBST/5% normal goat serum:** To 5 ml 1X PBST, add 250 µl normal goat serum (#5425).

1X PBS/0.1% Tween-20 (1X PBST): To prepare 1 L, add 100 ml 10X PBS to 900 ml dH_20. Add 1 ml Tween-20 and mix.

10X Phosphate Buffered Saline (PBS): To prepare 1 L, add 80 g sodium chloride (NaCl), 2 g potassium chloride (KCl), 14.4 g sodium phosphate, dibasic (Na_2HPO_4) and 2.4 g potassium phosphate, monobasic (KH_2PO_4) to 1 L dH_2O. Adjust pH to 7.4.

7. ***Antigen Unmasking:**

a. **Citrate:** 10 mM Sodium Citrate Buffer: To prepare 1 L, add 2.94 g sodium citrate trisodium salt dihydrate ($C_6H_5Na_3O_7•2H_2O$) to 1 L dH_2O. Adjust pH to 6.0.

b. **EDTA:** 1 mM EDTA: To prepare 1 L add 0.372 g EDTA ($C_{10}H_{14}N_2O_8Na_2•2H_2O$) to 1 L dH_2O. Adjust pH to 8.0.

c. **TE:** 10 mM Tris/1 mM EDTA, pH 9.0: To prepare 1 L, add 1.21 g Trizma® base ($C_4H_{11}NO_3$) and 0.372 g EDTA ($C_{10}H_{14}N_20_8Na_2$) to 950 ml dH_2O. Adjust pH to 9.0, then adjust final volume to 1 L with dH_2O.

d. **Pepsin:** 1 mg/ml in Tris-HCl, pH 2.0.

8. **3% Hydrogen Peroxide:** To prepare, add 10 ml 30% H_2O_2 to 90 ml dH_2O.

9. **Blocking Solution:** TBST/5% normal goat serum: to 5 ml 1X TBST, add 250 µl normal goat serum (#5425).

10. **Detection System:** SignalStain® Boost IHC Detection Reagents (mouse #8125, rabbit #8114).

11. **Substrate:** SignalStain® DAB Substrate Kit (#8059).

B. Deparaffinization/Rehydration

NOTE: Do not allow slides to dry at any time during this procedure.

1. **Deparaffinize/hydrate sections:**

a. Incubate sections in three washes of xylene for 5 min each.

b. Incubate sections in two washes of 100% ethanol for 10 min each.

c. Incubate sections in two washes of 95% ethanol for 10 min each.

2. Wash sections twice in dH_2O for 5 min each.

C. Antigen Unmasking*

NOTE: Consult product datasheet for specific recommendation for the unmasking solution.

1. **For Citrate:** Bring slides to a boil in 10 mM sodium citrate buffer, pH 6.0; maintain at a sub-boiling temperature for 10 min. Cool slides on bench top for 30 min.

2. **For EDTA:** Bring slides to a boil in 1 mM EDTA, pH 8.0: follow with 15 min at a sub-boiling temperature. No cooling is necessary.

3. **For TE:** Bring slides to a boil in 10 mM Tris/1 mM EDTA, pH 9.0: then maintain at a sub-boiling temperature for 18 min. Cool at room temperature for 30 min.

4. **For Pepsin:** Digest for 10 min at 37 ℃.

D. Staining

NOTE: Consult product datasheet for recommended antibody diluent.

1. Wash sections in dH_2O three times for 5 min each.

2. Incubate sections in 3% hydrogen peroxide for 10 min.

3. Wash sections in dH_2O twice for 5 min each.

4. Wash sections in wash buffer for 5 min.

5. Block each section with 100–400 µl blocking solution for 1 hr at room temperature.
6. Remove blocking solution and add 100–400 µl primary antibody diluted in recommended antibody diluent to each section*. Incubate overnight at 4 ℃.
7. Equilibrate SignalStain® Boost Detection Reagent to room temperature.
8. Remove antibody solution and wash sections in wash buffer three times for 5 min each.
9. Cover section with 1–3 drops SignalStain® Boost Detection Reagent as needed. Incubate in a humidified chamber for 30 min at room temperature.
10. Wash sections three times with wash buffer for 5 min each.
11. Add 1 drop (30 µl) SignalStain® DAB Chromogen Concentrate to 1 ml SignalStain® DAB Diluent and mix well before use.
12. Apply 100–400 µl SignalStain® DAB to each section and monitor closely. 1–10 minutes generally provides an acceptable staining intensity.
13. Immerse slides in dH_2O.
14. If desired, counterstain sections in hematoxylin per manufacturer's instructions.
15. Wash sections in dH_2O two times for 5 min each.
16. **Dehydrate sections:**

a. Incubate sections in 95% ethanol two times for 10 sec each.

b. Repeat in 100% ethanol, incubating sections two times for 10 sec each.

c. Repeat in xylene, incubating sections two times for 10 sec each.

17. Mount coverslips.

Immunoprecipitation Protocol / (For Analysis By Western Immunoblotting)

For **shorter assay times** please try our Immunoprecipitation Protocol Utilizing Magnetic Separation / (For Analysis By Western Immunoblotting).

A. Solutions and Reagents

NOTE: Prepare solutions with Milli-Q or equivalently purified water.

1. 1X Phosphate Buffered Saline (PBS)
2. **1X Cell Lysis Buffer:** (#9803) 20 mM Tris (pH 7.5), 150 mM NaCl, 1 mM EDTA, 1 mM EGTA, 1% Triton X-100, 2.5 mM Sodium pyrophosphate, 1 mM β-glycerophosphate, 1 mM Na_3VO_4, 1 µg/ml Leupeptin

   NOTE: Add 1 mM PMSF immediately prior to use.
3. **Protein A or G Agarose Beads:** (Protein A #9863) Please prepare according to manufacturer's instructions. Use Protein A for rabbit IgG pull down and Protein G for mouse IgG pull down.
4. **3X SDS Sample Buffer:** (#7722) 187.5 mM Tris-HCl (pH 6.8 at 25 ℃), 6% w/v SDS, 30% glycerol, 150 mM DTT, 0.03% w/v bromophenol blue

B. Preparing Cell Lysates

1. Aspirate media. Treat cells by adding fresh media containing regulator for desired time.
2. To harvest cells under nondenaturing conditions, remove media and rinse cells once with ice-cold PBS.

3. Remove PBS and add 0.5 ml ice-cold 1X cell lysis buffer to each plate (10 cm) and incubate the plates on ice for 5 minutes.
4. Scrape cells off the plates and transfer to microcentrifuge tubes. Keep on ice.
5. Sonicate samples on ice three times for 5 seconds each.
6. Microcentrifuge for 10 minutes at 14,000 X g, 4 ℃, and transfer the supernatant to a new tube. If necessary, lysate can be stored at –80 ℃.

C. Immunoprecipitation

Optional: It may be necessary to perform a lysate pre-clearing step to reduce non-specific binding to the Protein A/G agarose beads (See section below).

1. Take 200 µl cell lysate and add primary antibody. Incubate with gentle rocking overnight at 4 ℃.
2. Add either protein A or G agarose beads (20 µl of 50% bead slurry). Incubate with gentle rocking for 1–3 hours at 4 ℃.
3. Microcentrifuge for 30 seconds at 4 ℃. Wash pellet five times with 500 µl of 1X cell lysis buffer. Keep on ice during washes.
4. Resuspend the pellet with 20 µl 3X SDS sample buffer. Vortex, then microcentrifuge for 30 seconds.
5. Heat the sample to 95–100 ℃ for 2–5 minutes and microcentrifuge for 1 minute at 14,000 X g.
6. Load the sample (15–30 µl) on SDS-PAGE gel (12–15%).
7. Analyze sample by Western blotting (see Western Immunoblotting Protocol: Western BSA, Western Milk).

Cell Lysate Pre-Clearing (Optional)

1. Take 200 µl cell lysate and add to either Protein A or G agarose beads (20 µl of 50% bead slurry).
2. Incubate at 4 ℃ for 30 – 60 minutes.
3. Spin for 10 minutes at 4 ℃. Transfer the supernatant to a fresh tube.
4. Proceed to step 1 of Immunoprecipitation.

NOTE: For proteins with molecular weights of 50 kDa, we recommend using Mouse Anti-Rabbit IgG (Light-Chain Specific) (L57A3) mAb #3677 or Mouse Anti-Rabbit IgG (Conformation Specific) (L27A9) mAb #3678 as a secondary antibody to minimize masking produced by denatured heavy chains. For proteins with molecular weights of 25 kDa, Mouse Anti-Rabbit IgG (Conformation Specific) (L27A9) mAb #3678 is recommended.

Western Immunoblotting Protocol (Primary Ab Incubation In Milk)

For Western blots, incubate membrane with diluted antibody in 5% w/v nonfat dry milk, 1X TBS, 0.1% Tween-20 at 4 ℃ with gentle shaking, overnight.

Products available from Cell Signaling Technology are linked by their respective catalog numbers.

A. Solutions and Reagents

NOTE: Prepare solutions with Milli-Q or equivalently purified water.

1. **1X Phosphate Buffered Saline (PBS).**
2. **1X SDS Sample Buffer:** (#7722, #7723) 62.5 mM Tris-HCl (pH 6.8 at 25 ℃), 2% w/v SDS, 10% glycerol, 50 mM DTT, 0.01% w/v bromophenol blue or phenol red.
3. **Transfer Buffer:** 25 mM Tris base, 0.2 M glycine, 20% methanol (pH 8.5).

4. **10X Tris Buffered Saline (TBS):** (#9997) To prepare 1 liter of 10X TBS: 24.2 g Tris base, 80 g NaCl; adjust pH to 7.6 with HCl (use at 1X).
5. **Nonfat Dry Milk:** (#9999) (weight to volume [w/v]).
6. **Blocking Buffer:** 1X TBS, 0.1% Tween-20 with 5% w/v nonfat dry milk; for 150 ml, add 15 ml 10X TBS to 135 ml water, mix. Add 7.5 g nonfat dry milk and mix well. While stirring, add 0.15 ml Tween-20 (100%).
7. **Wash Buffer:** 1X TBS, 0.1% Tween-20 (TBS/T).
8. **Primary Antibody Dilution Buffer:** 1X TBS, 0.1% Tween-20 with 5% nonfat dry milk; for 20 ml, add 2 ml 10X TBS to 18 ml water, mix. Add 1.0 g nonfat dry milk and mix well. While stirring, add 20 µl Tween-20 (100%).
9. **Phototope®-HRP Western Blot Detection System:** (#7071 anti-rabbit) or (#7072 anti-mouse) Includes biotinylated protein ladder, secondary (#7074 anti-rabbit) or (#7076 anti-mouse) antibody conjugated to horseradish peroxidase (HRP), anti-biotin antibody conjugated to HRP, LumiGLO® chemiluminescent reagent and peroxide.
10. **Prestained Protein Marker, Broad Range (Premixed Format):** (#7720).
11. **Biotinylated Protein Ladder Detection Pack:** (#7727).
12. **Blotting Membrane:** This protocol has been optimized for nitrocellulose membranes, which CST recommends. PVDF membranes may also be used.

B. Protein Blotting

A general protocol for sample preparation is described below.

1. Treat cells by adding fresh media containing regulator for desired time.
2. Aspirate media from cultures; wash cells with 1X PBS; aspirate.
3. Lyse cells by adding 1X SDS sample buffer (100 µl per well of 6-well plate or 500 µl per plate of 10 cm diameter plate). Immediately scrape the cells off the plate and transfer the extract to a microcentrifuge tube. Keep on ice.
4. Sonicate for 10–15 seconds for complete cell lysis and to shear DNA (to reduce sample viscosity).
5. Heat a 20 µl sample to 95–100 ℃ for 5 minutes; cool on ice.
6. Microcentrifuge for 5 minutes.
7. Load 20 µl onto SDS-PAGE gel (10 cm x 10 cm).

   NOTE: CST recommends loading prestained molecular weight marker (#7720, 10 µl/lane) to verify electrotransfer and biotinylated protein ladder (#7727, 10 µl/lane) to determine molecular weights.
1. Electrotransfer to nitrocellulose or PVDF membrane.

C. Membrane Blocking and Antibody Incubations

NOTE: Volumes are for 10 cm x 10 cm (100 cm^2) of membrane; for different sized membranes, adjust volumes accordingly.

1. (Optional) After transfer, wash nitrocellulose membrane with 25 ml TBS for 5 minutes at room temperature.
2. Incubate membrane in 25 ml of blocking buffer for 1 hour at room temperature.
3. Wash three times for 5 minutes each with 15 ml of TBS/T.
4. Incubate membrane and primary antibody (at the appropriate dilution) in 10 ml primary antibody dilution buffer with gentle agitation overnight at 4 ℃.

5. Wash three times for 5 minutes each with 15 ml of TBS/T.
6. Incubate membrane with **appropriate** HRP-conjugated secondary antibody (1:2000) and HRP-conjugated anti-biotin antibody (1:1000) to detect biotinylated protein markers in 10 ml of blocking buffer with gentle agitation for 1 hour at room temperature.
7. Wash three times for 5 minutes each with 15 ml of TBS/T.

D. Detection of Proteins

1. Incubate membrane with 10 ml LumiGLO® (0.5 ml 20X LumiGLO®, 0.5 ml 20X Peroxide and 9.0 ml Milli-Q water) with gentle agitation for 1 minute at room temperature.

   NOTE: LumiGLO® substrate can be further diluted if signal response is too fast.

1. Drain membrane of excess developing solution (do not let dry), wrap in plastic wrap and expose to x-ray film. An initial 10-second exposure should indicate the proper exposure time.

   NOTE: Due to the kinetics of the detection reaction, signal is most intense immediately following LumiGLO®incubation and declines over the following 2 hours.

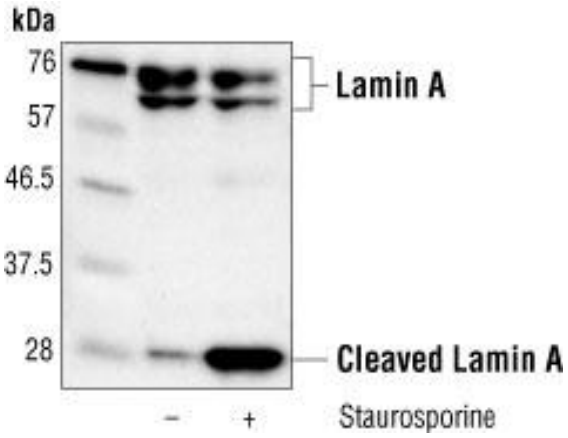
Specificity / Sensitivity

Lamin A/C Antibody detects endogenous levels of total full length lamin A (and lamin C) (70 kDa), as well as the small fragment of lamin A (and lamin C) resulting from cleavage at aspartic acid 230 (28 kDa).

Source / Purification

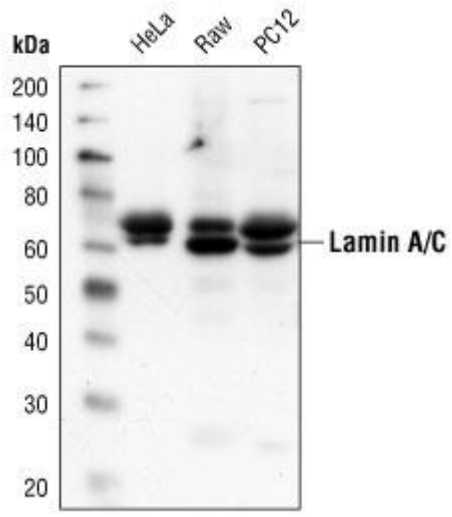
Polyclonal antibodies are produced by immunizing animals with a synthetic peptide corresponding to residues surrounding Asp230 of human lamin A. Antibodies are purified by protein A and peptide affinity chromatography.

Western Blotting



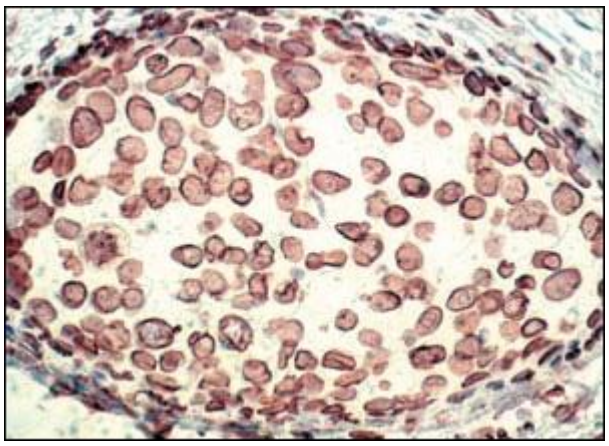
Western blot analysis of extracts from HeLa cells, untreated or staurosporine-treated (1 µM), using Lamin A/C Antibody.

Western Blotting



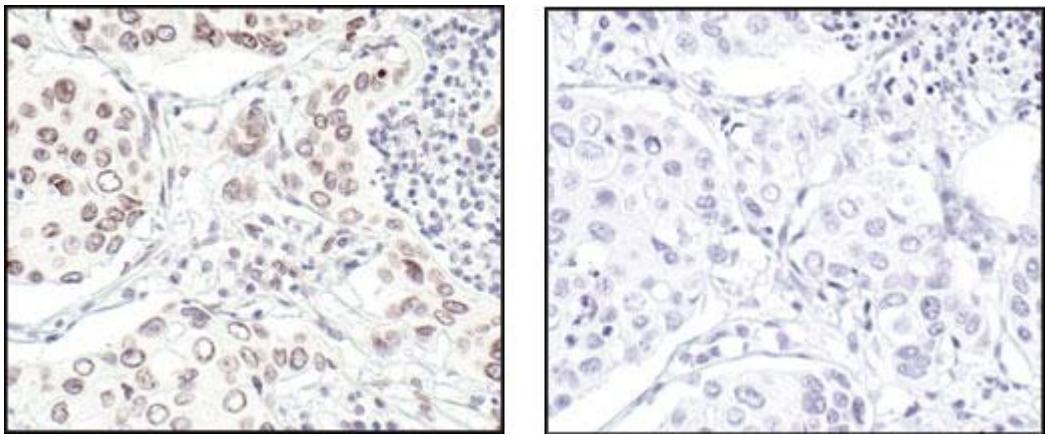
Western blot analysis of extracts from HeLa, Raw 264.7 and PC12 cells, using Lamin A/C Antibody.

IHC-P (paraffin)



Immunohistochemical staining of paraffin-embedded human breast tumor, showing staining of the nuclear envelope, using Lamin A/C Antibody.

IHC-P (paraffin)



Immunohistochemical analysis of paraffin-embedded human lung carcinoma, using Lamin A/C Antibody in the presence of control peptide (left) or antigen-specific peptide (right).