**Supplementary information**

**Protocol of transient transfection using fugene**

**Dialysis of FBS** (preparation of serum containing no biotin) was carried out using 2 beakers of 5 liters. Six tablets of PBS (1 tablet is designed for 500 ml of water) were dissolved in 3 liters of distilled water in one of the beakers, while stirring with a magnetic stirrer. A piece of the dialysis membrane (a 16 mm diameter Servapor tube) of about 100 ml volumes was soaked in a beaker with 400 ml of distilled water for 10-15 minutes. One end of the dialysis bag was fixed with plastic clamp and about 100 ml of FBS serum was pipetted there. Then, the other end of the bag was fixed with another clamp and put into a beaker with 3 liters of PBS buffer solution and left to stir at +14 °C overnight. The next day, the PBS buffer solution was changed and a dialysis bag containing serum was left overnight. The same thing was repeated on the third day and left for the night. On the fourth day, the dialysis bag was removed from the beaker and its contents filtered through a special Millipore Express TM 0.22 μm sterile filter. Subsequently, dialyzed, biotin-free serum was heated for 15 minutes at 55 °C and stored at +4 ° C.

**Cell culture, transient transfection with FUGENE, and biotin labeling *in vivo***

Dulbecco’s Modified Eagle’s Medium (DMEM) (Gibco/Invitrogen) supplemented with 10% Fetal Bovine Serum (FBS) (BD Biosciences) and 1×Antibiotic reagent (100 U/mL penicillin + 100 μg/mL streptomycin) was used for growing of HEK293T cells.

One day before transfection, cells were seeded in 6-well plates (approximately 3×105 of cells per well) in 2 ml complete DMEM supplement with 10% FBS at a density so that they reached approximately 80% confluence at time of transfection.

1.5 ml Eppendorf tubes marked as **0**, **1**, **2**, **3**, **4** contained plasmids in the next combinations and quantities as indicated below:

**0** - Control (No plasmid)

**1** - pcDNA3-BAP-GFP (0.5 g)+ pOz-BirA-Sox2 (0.3 g)

**2** - pcDNA3-BAP-GFP (0.5 g) + pOz-BirA-Oct4 (0.3 g)

**3** - pcDNA3-BAP-Sox2 (1.0 g)+ pOz-BirA-Oct4 (0.3 g)

**4** - pcDNA3-BAP-Oct4 (1.0 g)+ pOz-BirA-Sox2 (0.3 g)

Plasmids were diluted in sterile deionized water up to 100 μl for each tube.

FuGENE vial was mixed well by inverting (FuGENE HD Transfection Reagent, Promega, cat. no. E2311) and 5 l FuGENE HD Transfection Reagent was added directly into the solution containing plasmids without allowing contact with the walls of the plastic tubes. Then solutions were mixed carefully by pipetting (10-15 times) and incubated for 40 minutes at room temperature. 100 ml of transfection complex was added per well to the cells in a drop-wise manner the cells were incubated in a CO2 incubator for 48 hours.

For the biotin labeling *in vivo*, and for the specified time of labeling (in this experiment 30 min before harvesting cells), stock solution of biotin (1 mg/mL) was added to a final concentration of 5 μg/mL, while the pH was stabilized by addition of 50 mM HEPES (pH 7.35) to the medium.

**Cell lysis, biochemistry, and Western Blot Analysis**

In order to harvest HEK293T cells, DMEM medium was removed by aspiration, then 500 μl of PBS was add to each well. Cells were resuspended, transfered to the 1.5 ml Eppendorf tubes, and spinned 5 min at 700 rcf. Supernatant was discarded. All subsequent steps should be performed on ice, spun in a refrigerated centrifuge and in the presence of PMSF and protease inhibitors in CSK buffer.

Cell nuclei were isolated by pipetting and disruption of cells in CSK buffer with 0.5% Triton X-100. Then tubes were centrifuged for 5 min at 4000 rpm (4 °C). Supernatants were discarded. Pellet can be stored at -20°C for a few months.

60 l of CSK with 20 l of 4×NuPAGE LDS Sample buffer with DTT buffer was added and to the pellet, sonicated to break DNA, boiled for 5 min at 96 °C, and loaded on 4-12% gradient Novex TrisGlycine precast gels. Western blot analysis was carried out according to standard protocol.

**Protocol of transient transfection using calcium phosphate**

**(Collecting nuclear and cytoplasmic fractions)**

One day before transfection, cells were seeded in 6-well plates (approximately 3×105 of cells per well) in 2 ml complete DMEM supplement with 10% FBS at a density so that they reached approximately 80% confluence at time of transfection.

1.5 ml Eppendorf tubes marked as **0**, **1**, **2** contained plasmids in the next combinations and quantities as indicated below:

**0** - Control (No plasmid)

**1** - pcDNA3-BAP-Sox2 (0.7 g)+ pOz-BirA-Oct4 (0.5 g)

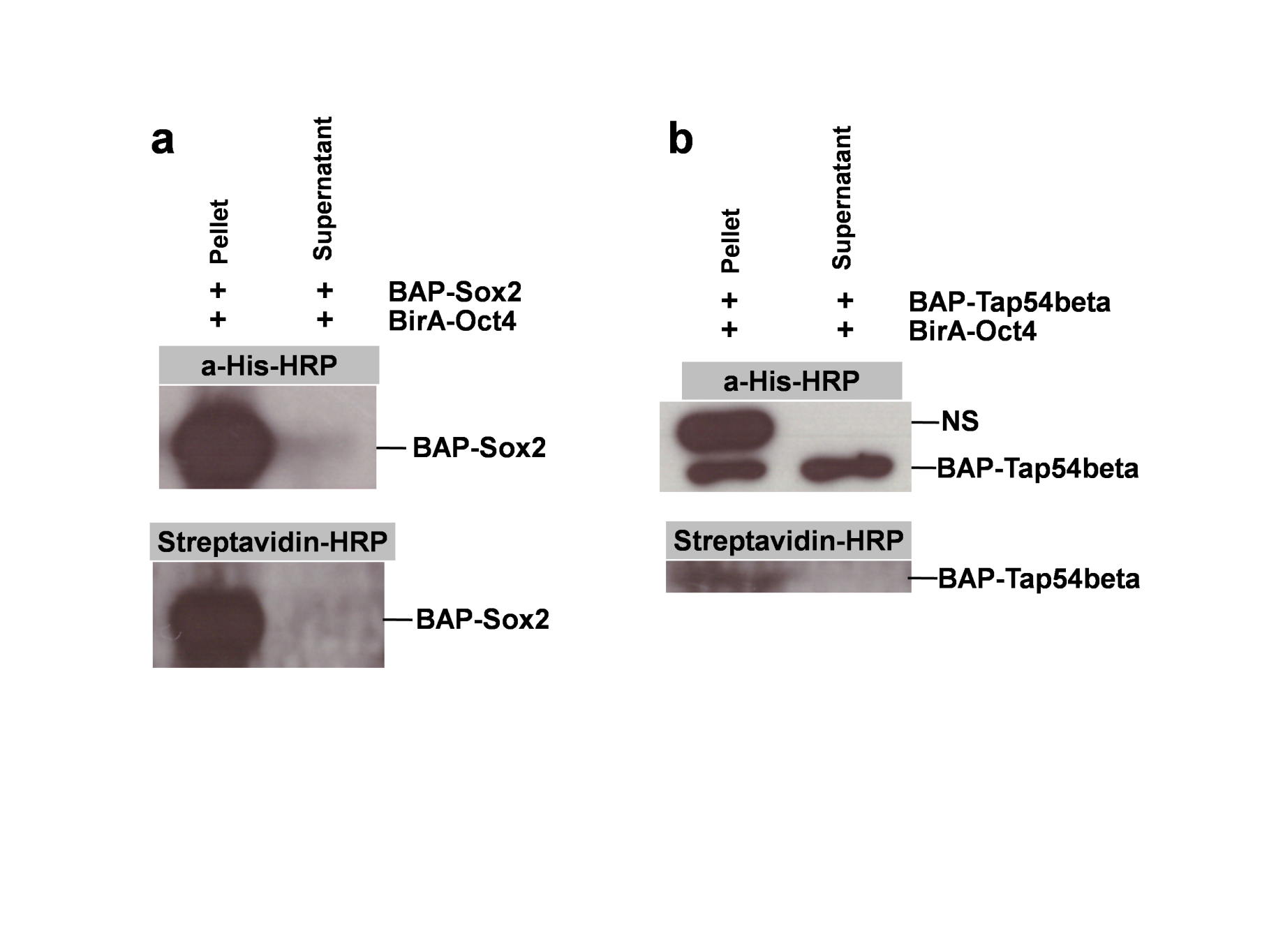
**2** - pcDNA3-BAP-Tap54beta (1.0 g) + pOz-BirA-Oct4 (0.5 g)

31 l of CaCl2 was added to the each tube containing plasmids and solution was diluted by deionized water up to 250 l. Solutions with DNA were added dropwise to the tubes with 250 l of HBS 2x buffer. Tubes were left for 15 minutes at room temperature. Then transfection complex was added per well to the cells in a drop-wise manner. The cells were placed in a CO2 incubator for 48 hours.

For the biotin labeling *in vivo*, and for the specified time of labeling (in this experiment 30 min before harvesting cells), stock solution of biotin (1 mg/mL) was added to a final concentration of 5 μg/mL, while the pH was stabilized by addition of 50 mM HEPES (pH 7.35) to the medium.

**Cell lysis, biochemistry, and Western Blot Analysis**

This part of the protocol is identical as described earlier except that after pipetting by 0.5% Triton X-100 both fractions supernatants which were transferred to separate tubes (cytoplasmic fraction) and pellets which contained nuclei were kept for the next step.



**Figure 1S.** Comparison of biotinylation levels in different fractions (nuclear vs. cytoplasmic). Positions of the BAP-fusions and nonspecific signal (NS) are indicated. a) BAP-Sox2 was strongly expressed in nuclear fraction. No noticeable amount of this protein was detected in cytoplasm. b) Presence of BAP-Tap54beta (which was used instead of GFP as another control) was observed in both two fractions. Despite comparable amount in pellet and supernatant detected by aHis-HRP, weak biotinylation signal of BAP-Tap54beta protein was observed in nuclear fraction. Biotin pulse – 30 min.