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| **Key Resources Table** | | | | |
| **Reagent type (species) or resource** | **Designation** | **Source or reference** | **Identifiers** | **Additional information** |
| Cell line (*Homo sapiens*) | HEK293 Flp-In T-REx | Thermo Fisher Scientific | Cat# R78007  RRID:CVCL\_U427 |  |
| Cell line (*Homo sapiens*) | HEK293 Flp-In T-REx FUBI-eS30-StHA | This paper |  | See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HEK293 Flp-In T-REx FUBI(AA)-eS30-StHA | This paper |  | AA: G73,74A  See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HEK293 Flp-In T-REx FUBI(GV)-eS30-StHA | This paper |  | GV: G74V  See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HEK293 Flp-In T-REx HASt-C21orf70 | (Zemp et al., 2014) DOI: 10.1242/jcs.138719 |  |  |
| Cell line (*Homo sapiens*) | HEK293 Flp-In T-REx HASt-FUBI-eS30 | This paper |  | See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HEK293 Flp-In T-REx HASt-GFP | (Wyler et al., 2011) DOI: 10.1261/rna.2325911 |  |  |
| Cell line (*Homo sapiens*) | HeLa Flp-In T-REx | (Hafner et al., 2014) DOI: 10.1038/ ncomms5397 |  | Obtained from T. Mayer (University of Konstanz) |
| Cell line (*Homo sapiens*) | HeLa Flp-In T-REx FUBI-eS30-StHA | This paper |  | See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HeLa Flp-In T-REx FUBI(AA)-eS30-StHA | This paper |  | AA: G73,74A  See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HeLa Flp-In T-REx FUBI(GV)-eS30-StHA | This paper |  | GV: G74V  See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HeLa FRT/TetR | Other |  | Obtained from M. Beck (EMBL, Heidelberg) |
| Cell line (*Homo sapiens*) | HeLa FRT/TetR EGFP-USP36 | This paper |  | See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HeLa FRT/TetR EGFP-USP36(CA) | This paper |  | CA: C131A  See Materials and methods, *Cell culture, cell lines, and treatments* |
| Cell line (*Homo sapiens*) | HeLa Kyoto | Other | RRID:CVCL\_1922 | Obtained from D. Gerlich (IMBA, Vienna) |
| Antibody | anti-AAMP (rabbit polyclonal) | This paper |  | WB (1:800)  See Materials and methods, *Antibodies* |
| Antibody | anti--actin (mouse monoclonal) | Santa Cruz Biotechnology | Cat# sc-47778  RRID:AB\_626632 | WB (1:1000) |
| Antibody | anti-C21ORF70 (rabbit polyclonal) | (Montellese et al., 2017) DOI: 10.1093/nar/gkx253 |  | WB (1:500) |
| Antibody | anti-EIF1AD | Proteintech | Cat# 20528-1-AP  RRID: AB\_10693533 | WB (1:1000) |
| Antibody | anti-ENP1 (rabbit polyclonal) | (Zemp et al., 2009) DOI: 10.1083/jcb.200904048 |  | IF (1:15,000)  WB (1:1000) |
| Antibody | anti-eS1 (RPS3A) (rabbit polyclonal) | (Wyler et al., 2011) DOI: 10.1261/rna.2325911 |  | WB (1:1000) |
| Antibody | anti-eS26 (RPS26) (rabbit polyclonal) | Abcam | Cat# ab104050 RRID: AB\_10710999 | WB (1:500) |
| Antibody | anti-FAU (FUBI-eS30) (rabbit polyclonal) | Abcam | Cat# ab135765 | WB (1:500) |
| Antibody | anti-FUBI (rabbit polyclonal) | This paper |  | WB (1:2000)  See Materials and methods, *Antibodies* |
| Antibody | anti-HA (mouse monoclonal) | Enzo Life Sciences | ENZ-ABS120-0200 | IF (1:2000)  WB (1:1000) |
| Antibody | anti-His (mouse monoclonal) | Sigma-Aldrich | Cat# H1029  RRID:AB\_260015 | WB (1:2000) |
| Antibody | anti-LSG1 (rabbit polyclonal) | (Wyler et al., 2014) DOI: 10.1016/j.febslet.2014.08.013 |  | WB (1:3000) |
| Antibody | anti-LTV1 (rabbit polyclonal) | (Zemp et al., 2009) DOI: 10.1083/jcb.200904048 |  | IF (1:4000)  IB (1:2000) |
| Antibody | anti-NMD3 (rabbit polyclonal) | (Zemp et al., 2009) DOI: 10.1083/jcb.200904048 |  | IF (1:1000)  IB (1:10,000) |
| Antibody | anti-NOB1 (rabbit polyclonal) | (Zemp et al., 2009) DOI: 10.1083/jcb.200904048 |  | IF (1:5000)  WB (1:2000) |
| Antibody | anti-NOC4L (rabbit polyclonal) | (Wyler et al., 2011) DOI: 10.1261/rna.2325911 |  | WB (1:5000) |
| Antibody | anti-PNO1 (DIM2) (rabbit polyclonal) | (Zemp et al., 2009) DOI: 10.1083/jcb.200904048 |  | IF (1:2000)  WB (1:2000) |
| Antibody | anti-RIOK1 (rabbit polyclonal) | (Widmann et al., 2012) DOI: 10.1091/mbc.E11-07-0639 |  | IF (1:8000)  WB (1:1000) |
| Antibody | anti-RIOK2 (rabbit polyclonal) | (Zemp et al., 2009) DOI: 10.1083/jcb.200904048 |  | IF (1:5000)  WB (1:5000) |
| Antibody | anti-RRP12 (rabbit polyclonal) | (Wyler et al., 2011) DOI: 10.1261/rna.2325911 |  | IF (1:2000)  WB (1:1000) |
| Antibody | anti-Strep (mouse monoclonal) | IBA GmbH | Cat# 2-1507-001  RRID:AB\_513133 | WB (1:1000) |
| Antibody | anti-TRIP4 (rabbit polyclonal) | This paper |  | WB (1:50,000)  See Materials and methods, *Antibodies* |
| Antibody | anti-TSR1 (rabbit polyclonal) | (Zemp et al., 2014) DOI: 10.1242/jcs.138719 |  | WB (1:10,000) |
| Antibody | anti-uL23 (RPL23A) (rabbit polyclonal) | (Wyler et al., 2011) DOI: 10.1261/rna.2325911 |  | WB (1:200) |
| Antibody | anti-uS3 (RPS3) (rabbit polyclonal) | (Zemp et al., 2009) DOI: 10.1083/jcb.200904048 |  | WB (1:1000) |
| Antibody | anti-USP10 (rabbit polyclonal) | Sigma-Aldrich | Cat# HPA006731  RRID:AB\_1080495 | WB (1:1000) |
| Antibody | anti-USP16 (rabbit polyclonal) | Bethyl Laboratories | Cat# A301-615A  RRID:AB\_1211387 | WB (1:500) |
| Antibody | anti-USP36 (rabbit polyclonal) | Sigma-Aldrich | Cat# HPA012082  RRID:AB\_1858682 | IF (1:1000)  WB (1:250) |
| Antibody | goat anti-mouse Alexa Fluor 594 | Thermo Fisher Scientific | A-11005, RRID:AB\_2534073 | IF (1:250) |
| Antibody | goat anti-rabbit Alexa Fluor 488 | Thermo Fisher Scientific | A-11008, RRID:AB\_143165 | IF (1:250) |
| Antibody | goat anti-mouse Alexa Fluor Plus 680 | Thermo Fisher Scientific | Cat# A32729  RRID:AB\_2633278 | WB (1:10,000) |
| Antibody | goat anti-rabbit Alexa Fluor Plus 800 | Thermo Fisher Scientific | Cat# A32735, RRID:AB\_2633284 | WB (1:10,000) |
| Recombinant DNA reagent | pC2Pi/control | (Boneberg et al., 2019) DOI: 10.1261/rna.069609.118 |  | See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pC2Pi/USP36i-g1 | This paper |  | USP36 guide 1  See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pC2Pi/USP36i-g2 | This paper |  | USP36 guide 2  See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pCDNA5/FRT/TO/FUBI-eS30-StHA | This paper |  | See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pCDNA5/FRT/TO/FUBI(AA)-eS30-StHA | This paper |  | AA: G73,74A  See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pCDNA5/FRT/TO/FUBI(GV)-eS30-StHA | This paper |  | GV: G74V  See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pCDNA5/FRT/TO/EGFP-USP36 | This paper |  | See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pCDNA5/FRT/TO/EGFP-USP36(CA) | This paper |  | CA: C131A  See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pCDNA5/FRT/TO/HASt-FUBI-eS30 | This paper |  | See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pDEST/LTR/Flag-HA-USP36 | Addgene  (Sowa et al., 2009) DOI: 10.1016/j.cell.2009.04.042 | Cat# 22579  RRID:Addgene\_22579 | See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pET-28b(+)/His6-FUBI-EGFP | This paper |  | See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pET-28b(+)/His6-Ub-EGFP | This paper |  | See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pFBD/EGFP/His10-USP36-TEV-St | This paper |  | pFBD: pFastBac Dual  See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pFBD/EGFP/His10-USP36(CA)-TEV-St | This paper |  | pFBD: pFastBac Dual, CA: C131A  See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pQE30/His6-FUBI-eS30 | This paper |  | See Materials and methods, *Molecular cloning* |
| Recombinant DNA reagent | pQE30/His6-FUBI(AA)-eS30 | This paper |  | AA: G73,74A  See Materials and methods, *Molecular cloning* |
| Sequence-based reagent | QuikChange primers for FUBI(AA)-eS30 | Sigma-Aldrich |  | 5'-GCAGGCCGCATGCTTGcAGcTAAAGTTCATGGTTCC-3', 5'-GGAACCATGAACTTTAgCTgCAAGCATGCGGCCTGC-3'  See Materials and methods, *Molecular cloning* |
| Sequence-based reagent | QuikChange primers for FUBI(GV)-eS30 | Sigma-Aldrich |  | 5'-GGCCGCATGCTTGGAGtTAAAGTTCATGGTTCC-3', 5'-GGAACCATGAACTTTAaCTCCAAGCATGCGGCC-3'  See Materials and methods, *Molecular cloning* |
| Sequence-based reagent | QuikChange primers for USP36(CA) | Sigma-Aldrich |  | 5'-CCACAACCTaGGCAACACCgcCTTTCTCAATGCCACC-3', 5'-GGTGGCATTGAGAAAGgcGGTGTTGCCtAGGTTGTGG-3'  See Materials and methods, *Molecular cloning* |
| Sequence-based reagent | QuikChange primers for USP36(NdeI) | Sigma-Aldrich |  | 5’- CCGTGTGCAAGAGCGTCagcGAtACaTAtGACCCCTACTTGGAC-3’, 5'-GTCCAAGTAGGGGTCaTAtGTaTCgctGACGCTCTTGCACACGG-3'  See Materials and methods, *Molecular cloning* |
| Sequence-based reagent | 5'ITS1 | Microsynth  (Rouquette et al., 2005) DOI: 10.1038/sj.emboj.7600752 |  | 5'-CCTCGCCCTCCGGGCTCCGTTAATGATC-3'  See Materials and methods, *Northern blot analysis* |
| Sequence-based reagent | ITS2 | Microsynth  (Rouquette et al., 2005) DOI: 10.1038/sj.emboj.7600752 |  | 5'-GCGCGACGGCGGACGACACCGCGGCGTC-3'  See Materials and methods, *Northern blot analysis* |
| Sequence-based reagent | Cy3-5'ITS1 | Microsynth  (Rouquette et al., 2005) DOI: 10.1038/sj.emboj.7600752 |  | 5'-CCTCGCCCTCCGGGCTCCGTTAATGATC-3'  See Materials and methods, *Fluorescence in situ hybridization* |
| Sequence-based reagent | si-AAMP | Microsynth |  | 5’-CAGGAUGGCAGCUUGAUCCUA-3  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-control | Qiagen | Cat# 1027281 | Allstars Negative Control siRNA  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-eS4X (RPS4X) | Qiagen |  | 5’-CUGGAGGUGCUAACCUAGGAA-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-FAU (FUBI-eS30) | Qiagen |  | 5’-CCGGCGCUUUGUCAACGUUGU-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-uS19 (RPS15) | Microsynth  (Rouquette et al., 2005) DOI: 10.1038/sj.emboj.7600752 |  | 5’-UCACCUACAAGCCCGUAAA-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-USP10-1 | Qiagen |  | 5'-UCGCUUUGGAUGGAAGUUCUA-3'  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-USP10-2 | Qiagen |  | 5’-UACGUCAACACCCAUGAUAGA-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-USP10-3 | Qiagen |  | 5’-AACACAGCUUCUGUUGACUCU-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-USP10-4 | Qiagen |  | 5’-AAGAACUAGUUCUUACUUCAA-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-USP36-1 | Qiagen, Microsynth |  | 5’-CAAGAGCGUCUCGGACACCUA-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-USP36-2 | Qiagen |  | 5’-UCCGUAUAUGUCCCAGAAUAA-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-USP36-3 | Qiagen |  | 5’-CCGCAUCGAGAUGCCAUGCAU-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-USP36-4 | Qiagen |  | 5’-UUCCUUGUGAGUAGCUCUCAA-3’  See Materials and methods, *RNA interference* |
| Sequence-based reagent | si-XPO1 (CRM1) | Microsynth  (Zemp et al., 2009) DOI: 10.1083/jcb.200904048 |  | 5’-UGUGGUGAAUUGCUUAUAC-3’  See Materials and methods, *RNA interference* |
| Chemical compound, drug | cycloheximide, CHX | Sigma-Aldrich | Cat# C7698 |  |
| Chemical compound, drug | Leptomycin B | LC Laboratories | Cat# L-6100 |  |
| Chemical compound, drug | tetracycline | Invitrogen | Cat# 550205 |  |

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