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| **Key Resources Table** |
| **Reagent type (species) or resource** | **Designation** | **Source or reference** | **Identifiers** | **Additional information** |
| Primary cells (*Homo sapiens*) | RPTE | ATCC | PCS-400-010 | Primary renal proximal tubule epithelial cells; sex and age batch-specific |
| cell line (*Homo sapiens*) | HEK-293 | ATCC | CRL-1573; RRID:CVCL\_0045 |  |
| cell line (*Cercopithecus aethiops*) | COS-7 | ATCC | CRL-1651; RRID:CVCL\_0224 |  |
| cell line (*Spodoptera frugiperda*) | Sf9 | Expression Systems | 94-001F; RRID:CVCL\_0549 |  |
| strain, strain background (*Escherichia coli*) | XL10-Gold | Agilent | Cat # 200315 |  |
| strain, strain background (*Escherichia coli*) | BL21 Star (DE3) | Invitrogen | Cat # C601003 |  |
| strain, strain background (*Escherichia coli*) | 10-beta | NEB | Cat # C3019I |  |
| recombinant DNA reagent) | pBKV (35-1) | ATCC | 45026 | pBR322 backbone containing BKV ST1 genome (Genbank: J02039) |
| recombinant DNA reagent) | pM1TC | Walter Atwood |  Genbank: J02227 | JCV genotype Ia isolate Mad1 cloned into pBR322 backbone |
| antibody | P8D11 (Human monoclonal) | This paper |  | Anti-BKV neutralizing antibody |
| antibody | Anti-BKV VP1 (Mouse monoclonal) | This paper |  | IF(1:500) |
| antibody | anti-SV40 T-antigen (Mouse monoclonal) | EMD Millipore |  PAb416; RRID:AB\_10682473 | IF(1:200) |
| antibody | anti-SV40 VP1 (Rabbit polyclonal) | Abcam | Cat # ab53977; RRID:AB\_946338 | IF(1:500), IB (1:1000) |
| antibody | anti-SV40 VP2/3 (Rabbit polyclonal) | Abcam | Cat# ab53983; RRID:AB\_946339 | IF(1:1000), IB (1:1000) |
| antibody | anti-GRP78 BiP (Rabbit polyclonal) | Abcam | Cat#: ab21685; RRID:AB\_2119834 | IB (1:1000) |
| antibody | anti-Hsp90 antibody [D7a] (Mouse monoclonal) | Abcam |  Cat#: ab59459; RRID:AB\_942030 | IB (1:1000) |
| antibody | Anti-biotin (Rabbit polyclonal) | Abcam | Cat#: ab53494; RRID:AB\_867860 | IF(1:750) |
| antibody | Goat anti-Mouse IgG (H+L) Cross-Adsorbed Secondary Antibody, Alexa Fluor 594 | Invitrogen | A-11005; RRID:AB\_2534073 | IF(1:1000) |
| antibody | Goat anti-Rabbit IgG (H+L) Highly Cross-Adsorbed Secondary Antibody, Alexa Fluor 488 | Invitrogen | A-11034; RRID:AB\_2576217 | IF(1:1000) |
| antibody | Goat anti-Mouse IgG (H+L) Cross-Adsorbed Secondary Antibody, Alexa Fluor 647 | Invitrogen | A-21235; RRID:AB\_2535804 | IF(1:1000) |
| antibody | Goat anti-Rabbit IgG (H+L) Highly Cross-Adsorbed Secondary Antibody, Alexa Fluor 594 | Invitrogen | A-11037; RRID:AB\_2534095 |  IF(1:1000) |
| antibody | IRDye 800CW Goat anti-Rabbit IgG Secondary Antibody | Li-COR | P/N: 925-32211; RRID:AB\_2651127 |  IB (1:12,000) |
| antibody | IRDye 680RD Goat anti-Mouse IgG Secondary Antibody | Li-COR | P/N: 925-68070; RRID:AB\_2651128 |  IB (1:12,000) |
| peptide, recombinant protein | D1min | This paper | Peptide | Ac-APQWMLPLLLGLY-NH2 |
| peptide, recombinant protein | D122 | This paper | Peptide | APGGANQRTAPQWMLPLLLGLY |
| peptide, recombinant protein | biotin-D122 | This paper | Peptide | biotin-GGGGAPGGANQRTAPQWMLPLLLGLY |
| peptide, recombinant protein | TAT-D1min | This paper | Peptide | GRKKRRQRRR-PEG2-APQWMLPLLLGLY-NH2 |
| peptide, recombinant protein | D1min-TAT | This paper | Peptide | Ac-APQWMLPLLLGLY-PEG2-GRKKRRQRRR |
| sequenced-based reagent | VP1\_P232S\_F | This paper | PCR primers | caggaggggaaaatgtttccccagtacttcat |
| sequenced-based reagent | VP1\_P232S\_R | This paper | PCR primers | cacatgaagtactggggaaacattttcccctcctg |
| sequenced-based reagent | VP1\_P232L\_F | This paper | PCR primers | caggaggggaaaatgttctcccagtacttcat  |
| sequenced-based reagent | VP1\_P232L\_R | This paper | PCR primers | cacatgaagtactgggagaacattttcccctcctg |
| sequenced-based reagent | VP1\_P232I\_F | This paper | PCR primers | caggaggggaaaatgttatcccagtacttcat  |
| sequenced-based reagent | VP1\_P232I\_R | This paper | PCR primers | cacatgaagtactgggataacattttcccctcctg |
| sequenced-based reagent | VP1\_V234S\_F | This paper | PCR primers | gaaaatgttcccccatcacttcatgtgaccaac  |
| sequenced-based reagent | VP1\_V234S\_R | This paper | PCR primers | gtgttggtcacatgaagtgatgggggaacatt |
| sequenced-based reagent | VP1\_V234L\_F | This paper | PCR primers | gaaaatgttcccccattacttcatgtgaccaac  |
| sequenced-based reagent | VP1\_V234L\_R | This paper | PCR primers | gtgttggtcacatgaagtaatgggggaacatt |
| sequenced-based reagent | VP1\_V234I\_F | This paper | PCR primers | gaaaatgttcccccaatacttcatgtgaccaac  |
| sequenced-based reagent | VP1\_V234I\_R | This paper | PCR primers | gtgttggtcacatgaagtattgggggaacatt |
| sequenced-based reagent | ΔVP2\_F | This paper | PCR primers | gtatttccaggttcataggtgctgctctagcacttttgggggac |
| sequenced-based reagent | ΔVP2\_R | This paper | PCR primers | gagcagcacctatgaacctggaaatacaaaaaaaaagggattac |
| sequenced-based reagent | ΔVP3\_F | This paper | PCR primers | gcaatcaggcatagctttggaattgtttaacccagatgagtac |
| sequenced-based reagent | ΔVP3\_R | This paper | PCR primers | ccaaagctatgcctgattgctgatagaggcctacagtggaaac |
| sequenced-based reagent | VP2\_P291A\_F | This paper | PCR primers | caaagaactgctgctcaatggatgttgcctttacttctaggcc |
| sequenced-based reagent | VP2\_P291A\_R | This paper | PCR primers | catccattgagcagcagttctttgattagcacctcctgg |
| sequenced-based reagent | VP2\_W293A\_F | This paper | PCR primers | ctgctcctcaagcgatgttgcctttacttctaggcctgtac |
| sequenced-based reagent | VP2\_W293A\_R | This paper | PCR primers | ggcaacatcgcttgaggagcagttctttgattagcacctcc |
| sequenced-based reagent | VP2\_L297A\_F | This paper | PCR primers | gatgttgcctgcacttctaggcctgtacgggactgtaacac |
| sequenced-based reagent | VP2\_L297A\_R | This paper | PCR primers | caggcctagaagtgcaggcaacatccattgaggagcagttc |
| sequenced-based reagent | VP2\_Y302A\_F | This paper | PCR primers | ctaggcctggccgggactgtaacacctgctcttgaagcatg |
| sequenced-based reagent | VP2\_Y302A\_R | This paper | PCR primers | gttacagtcccggccaggcctagaagtaaaggcaacatccattg |
| sequenced-based reagent | GAPDH PrimeTime primer set | IDT | Hs.PT.39a.22214836 |  |
| sequenced-based reagent | CXCL10 PrimeTime primer set | IDT | Hs.PT.58.3790956.g |  |
| sequenced-based reagent | IFNA2 PrimeTime primer set | IDT | Hs.PT.58.24294810.g |  |
| sequenced-based reagent | IFNB1 PrimeTime primer set | IDT | Hs.PT.58.39481063.g |  |
| sequenced-based reagent | MX1 PrimeTime primer set | IDT | Hs.PT.58.40261042 |  |
| sequenced-based reagent | OAS1 PrimeTime primer set | IDT | Hs.PT.58.2338899 |  |
| sequenced-based reagent | STAT1 PrimeTime primer set | IDT | Hs.PT.58.15049687 |  |
| commercial assay or kit | Recombinant Human IFN-β | Peprotech | Cat # 300-02BC |  |
| commercial assay or kit | RNeasy Mini Kit | Qiagen | Cat # 74104 |  |
| commercial assay or kit | QIAquick PCR Purification Kit | Qiagen | Cat # 28106 |  |
| commercial assay or kit | SuperScript IV VILO Master Mix | Invitrogen | Cat # 11756050 |  |
| commercial assay or kit | Fast SYBR Green Master Mix | Applied Biosystems | Cat # 4385610 |  |
| commercial assay or kit | CellTiter-Glo Luminescent Cell Viability Assay | Promega | Cat # G7570 |  |
| commercial assay or kit | Dynabeads M-280 Streptavidin | Invitrogen | Cat # 11205D |  |
| commercial assay or kit | InstantBlue Protein Stain | Expedeon | Cat # ISB1L |  |
| commercial assay or kit | Lipofectamine 2000 Transfection Reagent | Invitrogen | Cat # 11668027 |  |
| commercial assay or kit | Lipofectamine 3000 Transfection Reagent | Invitrogen | Cat # L3000008 |  |
| commercial assay or kit | Bac-to-Bac Vector Kit | Gibco | Cat # 10360014 |  |
| commercial assay or kit | AlphaScreen Protein A Acceptor beads | PerkenElmer | Cat # 6760137M |  |
| commercial assay or kit | Sensor Chip SA | GE Healthcare | Cat # BR-1005-31 |  |
| software, algorithm | CellProfiler | *Kamentsky et al.* 2011 | v2.1.2; RRID:SCR\_007358 |  |
| software, algorithm | R | R Core Team | v3.5.1; RRID:SCR\_001905 |   |
| software, algorithm | XLFit | IDBS | v5.5.0.5 |  |
| software, algorithm | Fiji | Schindelin *et al*. 2012 | Built on ImageJ v1.52b; RRID:SCR\_002285 |  |
| software, algorithm | Biacore Evaluation Software | GE Healthcare | v2.0; RRID:SCR\_015936 |  |
| other | DAPI stain | Calbiochem | Cat # 508741 | 1.67 µg/mL |