Supplemental Information

Silencing of Long Non-coding RNA RP1-93H18.6 Acts as a Tumor Suppressor in Cervical Cancer through the Blockade of the PI3K/Akt Axis

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**Supplementary Table 1** Differentially expressed long non-coding RNAs in chip GSE63514.

| Gene symbol  | Log Fold-change | AveExpr   | t       | P.Value     | adj.P.Val    | B        |
|--------------|-----------------|-----------|---------|-------------|--------------|----------|
| RAB11B-AS1   | -1.714224746    | 4.173155316 | -9.158260974 | 2.42E-12   | 1.81E-09    | 17.93024531 |
| RBPMS-AS1    | -1.174458004    | 4.749504049 | -8.248100352 | 6.07E-11   | 1.29E-08    | 14.80925143 |
| LOC100506098 | -1.796707724    | 3.330926781 | -6.015419024 | 1.96E-07   | 4.99E-07    | 6.973080078 |
| DYNLL1-AS1   | -1.202932167    | 4.279738763 | -8.093502077 | 1.06E-10   | 1.87E-08    | 14.27192228 |
| FLG-AS1      | -1.714790788    | 4.040198486 | -7.001248423 | 5.48E-09   | 9.26E-07    | 10.43852965 |
| LINC01315    | -2.045288529    | 6.187158241 | -5.904530603 | 2.92E-07   | 6.91E-06    | 7.586671355 |
| LOC102724362 | -1.236527786    | 5.310434987 | -6.764331158 | 1.30E-08   | 6.07E-07    | 9.603166795 |
| LOC100505715 | -2.019673566    | 5.108174783 | -5.104798539 | 4.99E-06   | 7.14E-06    | 7.84568805  |
| RP1-93H18.6  | 2.180169733     | 5.892611008 | 4.69897949  | 2.03E-05   | 6.57E-06    | 6.49982064  |
| LINC00467    | 1.362117141     | 5.185401933 | 5.654125644 | 7.15E-07   | 1.45E-05    | 5.71875605  |
| THUMPD3-AS1  | 1.212254862     | 5.087185559 | 6.094140917 | 1.47E-07   | 3.94E-06    | 7.248043808 |
| RP11-134G8.8 | -1.521169272    | 7.959852824 | -5.753917321 | 5.01E-07   | 1.08E-05    | 5.063787494 |
| ZNF667-AS1   | -2.818933587    | 5.636180136 | -5.501612999 | 1.23E-06   | 2.30E-05    | 5.193936234 |
| RP11-164P12.4 | -1.834633892    | 8.103364561 | -5.484884627 | 1.31E-06   | 2.42E-05    | 5.136579057 |
| RP11-29H23.4 | 1.224079593     | 3.514674623 | 5.464036035 | 1.41E-06   | 2.54E-05    | 5.065116506 |
| RP11-124L9.5 | 2.027078026     | 5.369081108 | 5.410328007 | 1.70E-06   | 2.95E-05    | 4.881415815 |
| LINC00925    | 1.32229384      | 3.634375945 | 5.352276262 | 2.09E-06   | 3.51E-05    | 4.683352271 |
| RP11-846E15.4 | 2.041121237     | 5.133987424 | 5.32149362  | 2.33E-06   | 3.85E-05    | 4.578303806 |
| RP11-1IL12.3 | 2.381041783     | 4.104124293 | 5.239710194 | 3.11E-06   | 4.85E-05    | 4.300927045 |
| LOC101927752 | -1.715705189    | 7.007725091 | -5.141754219 | 4.38E-06   | 6.40E-05    | 3.970010453 |
| LINC0135     | 2.873985777     | 4.113590211 | 5.071113462 | 5.61E-06   | 7.83E-05    | 3.732533348 |
| RP11-199F11.2 | 1.411358188     | 6.962000407 | 5.026330701 | 6.56E-06   | 8.85E-05    | 3.582516123 |
| LOC100507221 | -2.226851363    | 4.112676156 | -5.005180316 | 7.06E-06   | 9.37E-05    | 3.511812839 |
| LOC102724275 | 1.858699151     | 6.33703089  | 4.968717455 | 8.01E-06   | 0.000103478 | 3.390150276 |
| EPB41L4A-AS2 | -1.21984987     | 3.807871656 | -4.944359512 | 8.71E-06   | 0.00011146  | 3.309041343 |
| RP11-255C15.4 | 1.271661625     | 3.861987592 | 4.914625581 | 9.66E-06   | 0.000121245 | 3.210213279 |
| RP11-196G18.24 | 1.565704947    | 9.050068752 | 4.885697485 | 1.07E-05   | 0.00013207  | 3.114259218 |
| RP11-349E4.1 | -1.177219695    | 5.231249556 | -4.853002769 | 1.19E-05   | 0.000144443 | 3.006048446 |
| Gene   | Value1   | Value2   | Value3   | Value4   | Value5   | Value6   |
|--------|----------|----------|----------|----------|----------|----------|
| LOC101927151 | -1.26553063 | 5.177246906 | -4.782980201 | 1.52E-05 | 0.000177209 | 2.775163773 |
| RP11-196G18.23 | 1.078909616 | 3.241258437 | 4.781732839 | 1.53E-05 | 0.000177681 | 2.771061874 |
| LOC101927507 | -1.273712767 | 2.989760485 | -4.763834988 | 1.62E-05 | 0.000186216 | 2.712248775 |
| RP11-216L13.19 | 1.036877003 | 3.333341558 | 4.736830471 | 1.78E-05 | 0.00020094 | 2.62366539 |
| LINC01214 | -2.115872762 | 3.446206903 | -4.652212102 | 2.37E-05 | 0.000253578 | 2.347327702 |
| LOC102724017 | 1.857343852 | 5.759245035 | 4.648577371 | 2.40E-05 | 0.000256351 | 2.335500815 |
| RP5-1039K5.17 | -1.101812494 | 5.073820916 | -4.637372848 | 2.50E-05 | 0.000264083 | 2.299065689 |
| LOC101927420 | 1.733634333 | 5.686381706 | 4.635927511 | 2.51E-05 | 0.000264865 | 2.294368219 |
| RP11-532F12.5 | -1.332641626 | 10.08803362 | -4.626152594 | 2.59E-05 | 0.000272507 | 2.262614032 |
| THOC6 | 1.231169953 | 3.597523747 | 4.626112922 | 2.59E-05 | 0.000272507 | 2.26248521 |
| LOC101928000 | 1.118749443 | 5.238913209 | 4.61416657 | 2.70E-05 | 0.000281588 | 2.223711313 |
| LOC102724356 | 1.831250552 | 7.966860993 | 4.399046607 | 5.57E-05 | 0.00051526 | 1.532633951 |
| RP11-1094M14.11 | 1.501737767 | 5.442119309 | 4.369080757 | 6.15E-05 | 0.000561039 | 1.437488677 |
| LOC101927451 | 1.228167028 | 3.312721325 | 4.32996959 | 7.01E-05 | 0.000626928 | 1.31374552 |
| UNC5B-AS1 | -2.028106599 | 4.808369834 | -4.301851243 | 7.69E-05 | 0.000675231 | 1.225083378 |
| RP4-595K12.1 | -1.523921848 | 10.06066225 | -4.162094848 | 0.000121681 | 0.001000383 | 0.7884186 |
| RP13-238F13.5 | 1.513151829 | 3.563860844 | 4.161527301 | 0.000121907 | 0.001001856 | 0.786652954 |
| LOC101929709 | 1.043849573 | 3.656276216 | 4.143370142 | 0.00012934 | 0.001052556 | 0.730434879 |
| LINC01116 | 1.927100387 | 3.515530128 | 4.12095868 | 0.000139122 | 0.001117464 | 0.66210157 |
| LOC100130476 | -3.304535524 | 5.728645699 | -4.108081868 | 0.000145063 | 0.001156178 | 0.621505692 |
| RP1-151F17.2 | 1.524966004 | 5.568374738 | 4.077526746 | 0.000160161 | 0.001258905 | 0.527557428 |
| NNT-AS1 | 1.242840021 | 5.052504114 | 3.934531047 | 0.000253504 | 0.00185398 | 0.09261798 |
| LOC101928054 | 1.633632035 | 5.045817875 | 3.927373208 | 0.000259351 | 0.00189354 | 0.071057548 |
| TMEM44-AS1 | 1.296311677 | 5.306044469 | 3.660958609 | 0.000597878 | 0.00379212 | -0.716136939 |
| RP11-271C24.3 | 1.615239533 | 9.315103991 | 3.646461606 | 0.000625187 | 0.003924945 | -0.758080018 |
| LOC101929668 | 1.227721838 | 3.294091347 | 3.560590550 | 0.000802129 | 0.004819673 | -0.991792087 |
| RP11-391M1.4 | -1.074569494 | 4.095166898 | -3.542802313 | 0.000858284 | 0.005101011 | -1.055150474 |
| LINC00621 | -1.611721805 | 10.79293928 | -3.530113373 | 0.000891958 | 0.005259967 | -1.091166214 |
| LINC00284 | -1.609582585 | 3.776255216 | -3.514738835 | 0.000934485 | 0.005469868 | -1.13470083 |
| LINC00115 | 1.130205267 | 4.10472736 | 3.439214103 | 0.001172748 | 0.006576674 | -1.346881316 |
| Gene       | Coefficient | Standard Error | z Score | P Value  | q Value |
|------------|-------------|----------------|---------|----------|---------|
| RP11-480A16.1 | 1.602978541 | 2.442670882    | 3.415565997 | 0.001258556 | 0.006956107 | -1.412737173 |
| LOC100288152  | -2.004290074 | 7.076809239    | -3.39963505 | 0.001319691 | 0.007223938 | -1.456943274 |
| ZEB1-AS1     | 1.255898633 | 3.951364411    | 3.324201844 | 0.001649464 | 0.00897139 | -1.664496758 |
| RP11-274H2.5 | 1.107669999 | 3.79287302     | 3.318087427 | 0.00179369 | 0.008816176 | -1.681191296 |
| LINC01094    | -1.813525935 | 4.497656943    | -3.302022525 | 0.001760404 | 0.009163834 | -1.724960685 |
| LOC100132352 | 1.087721429 | 5.944025533    | 3.299429146 | 0.001773828 | 0.009227057 | -1.732013696 |
| RP5-1074L1.4 | 1.394677304 | 7.133486559    | 3.281593052 | 0.001868807 | 0.009619449 | -1.780424735 |
| RP11-395B7.7 | -1.092143731 | 7.429402308    | -3.42328686 | 0.002095109 | 0.010583063 | -1.886399014 |
| LOC101929787 | 1.049673647 | 5.20360137     | 3.165886588 | 0.00211833 | 0.01268429 | -2.090316969 |
| HNRNPU-AS1   | 1.03716183  | 10.24448685    | 3.099569348 | 0.003155084 | 0.014747104 | -2.264598631 |
| LOC100133315 | 1.11858174  | 3.879023096    | 3.03435826  | 0.00379133 | 0.017093743 | -2.433542996 |
| ASH1L-AS1    | 1.016394685 | 7.981629142    | 2.880791003 | 0.005793287 | 0.02427978 | -2.821459623 |
| EMC3-AS1     | 1.400800416 | 4.888497073    | 2.833492527 | 0.00658499 | 0.026941694 | -2.938054606 |
| EP300-AS1    | -1.334171473 | 8.492255118   | -2.813517559 | 0.006948511 | 0.028072763 | -2.988676165 |
| LHX4-AS1     | 1.047278737 | 6.181233039    | 2.770537903 | 0.00794442 | 0.030851515 | -3.091071276 |
| RP11-373D23.2 | -1.539857432 | 6.238805716    | -2.723245586 | 0.008834356 | 0.034076945 | -3.204359285 |
| RP3-5081.21  | 1.377058447 | 5.657359895    | 2.650716224 | 0.01067906 | 0.03977572 | -3.375280317 |
| RP11-44F21.5 | -1.413257163 | 7.887822055   | -2.580705892 | 0.012787973 | 0.04501469 | -3.536959482 |
| LOC101927720 | -1.096025194 | 4.125467973    | -2.563541117 | 0.0133599 | 0.047575832 | -3.576095296 |
| LINC00622    | 1.11610944  | 4.820886764    | 2.486642177 | 0.016218494 | 0.055667955 | -3.748949246 |
| PAX8-AS1     | -1.211466333 | 7.094346628    | -2.205315285 | 0.031977285 | 0.095063894 | -4.345541017 |
| LOC100505776 | -1.468788592 | 4.020883271    | -2.186909251 | 0.03372203 | 0.098162872 | -4.382545722 |
**Supplementary Table 2** Co-expressed genes of RP1-93H18.6 and RP1-93H18.6-regulating signaling pathways

| Pathway                        | Gene                                                                 |
|--------------------------------|----------------------------------------------------------------------|
| Herpes simplex infection       | STAT1; STAT2; TAP1; TAP2; TLR2; CD74                                  |
| Antigen processing and presentation | PSME1; TAP1; TAP2; CD74                                         |
| Influenza A                    | CCL5; IFIH1; STAT1; STAT2; CASP1; TNFSF10                              |
| Tuberculosis                   | STAT1; TLR1; TLR2; RIPK2; CD14; CD74                                  |
| PI3K/Akt signaling pathway     | CCL5; STAT1; STAT2; AIM2                                               |
| Allograft rejection            | CD86                                                                  |
| Leishmaniasis                  | NCF2; NCF4; STAT1; TLR2                                               |

Notes: PI3K, phosphatidylinositol-3-kinase; Akt, serine/threonine kinase; STAT, signal transducer and activator of transcription; TAP, transporter associated with antigen processing; TLR, Toll-like receptor; PSME1, proteasome activator complex subunit 1; CCL5, Chemokine (C-C motif) ligand 5; IFIH1, interferon induced with helicase C domain 1; CASP1, caspase1; TNFSF10, Tumor necrosis factor ligand superfamily member 10; RIPK2, receptor-interacting serine/threonine-protein kinase 2; AIM2, absent in melanoma 2; NCF, neutrophil cytosol factor; CD, cluster of differentiation.
**Supplementary Table 3** Clinical features of patients with CC

| Clinical features          | n (n = 78) |
|----------------------------|------------|
| Mean age (years old)       | 47.25 ± 7.9|
| Type                       |            |
| squamous cell carcinoma    | 63         |
| adenocarcinoma             | 15         |
| FIGO staging               |            |
| I - II                     | 45         |
| III - IV                   | 33         |
| Histological differentiation|            |
| well                       | 13         |
| moderate                   | 41         |
| poor                       | 24         |
| LNM                        |            |
| Yes                        | 37         |
| No                         | 41         |

Notes: CC, cervical cancer; FIGO, International Federation of Gynaecology and Obstetrics; LNM, lymph node metastasis.
### Supplementary Table 4 Information of antibodies used in IHC and WB.

| No   | Name                                      | Description          | Notes                 | Company                       |
|------|-------------------------------------------|----------------------|-----------------------|-------------------------------|
|      | ab191606 Anti-PI 3 Kinase p85 alpha antibody | Rabbit monoclonal    | IHC: 1/250            | Abcam, Cambridge, MA, USA    |
|      |                                            |                      | WB: 1/1000            |                               |
|      | ab8805 Anti-pan-AKT antibody               | Rabbit monoclonal    | IHC: 1/100            | Abcam, Cambridge, MA, USA    |
|      |                                            |                      | WB: 1/500             |                               |
|      | ab2732 Anti-mTOR antibody                  | Rabbit polyclonal    | IHC: 1/200            | Abcam, Cambridge, MA, USA    |
|      |                                            |                      | WB: 1/2000            |                               |
|      | ab131442 Anti-p53 antibody                 | Rabbit polyclonal    | IHC: 1/200            | Abcam, Cambridge, MA, USA    |
|      |                                            |                      | WB: 1/1000,           |                               |
|      | ab97051 Goat Anti-Rabbit IgG H&L (HRP)     | Goat Anti-Rabbit IgG | IHC: 1/5000           | Abcam, Cambridge, MA, USA    |
|      |                                            |                      | WB: 1/20000           |                               |
|      | ab182651 Anti-PI 3 Kinase p85 alpha (phospho Y607) antibody | Rabbit polyclonal    | WB: 1/800             | Abcam, Cambridge, MA, USA    |
|      | ab38449 Anti-pan-AKT (phospho T308) antibody | Rabbit polyclonal    | WB: 1/1000            | Abcam, Cambridge, MA, USA    |
|      | ab109268 Anti-mTOR (phospho S2448) antibody | Rabbit monoclonal    | WB: 1/2000            | Abcam, Cambridge, MA, USA    |
|      | ab182858 Anti-Bcl-2 antibody               | Rabbit monoclonal    | WB: 1/2000            | Abcam, Cambridge, MA, USA    |
|      | ab32503 Anti-Bax antibody                  | Rabbit monoclonal    | WB: 1/2000            | Abcam, Cambridge, MA, USA    |
|      | ab134175 Anti-Cyclin D1 antibody           | Rabbit monoclonal    | WB: 1/10000           | Abcam, Cambridge, MA, USA    |
|      | ab32572 Anti-beta Catenin antibody         | Rabbit monoclonal    | WB: 1/5000            | Abcam, Cambridge, MA, USA    |
|      | ab15148 Anti-E Cadherin antibody           | Rabbit polyclonal    | WB: 1/500             | Abcam, Cambridge, MA, USA    |
|      | ab137321 Anti-Vimentin antibody            | Rabbit polyclonal    | WB: 1/1000            | Abcam, Cambridge, MA, USA    |
|      | ab8227 Anti-beta Actin antibody            | Rabbit polyclonal    | WB: 1/2000            | Abcam, Cambridge, MA, USA    |

Notes: IHC, immunohistochemistry; WB, western blot analysis; PI, phosphatidylinositol; Akt, serine/threonine kinase; mTOR, mammalian target of rapamycin; Bcl-2, B-cell lymphoma-2; Bax, Bcl-2 Associated X protein; HRP, horseradish peroxidase.
| Gene     | Forward (5’– 3’)          | Reverse (5’– 3’)          |
|----------|---------------------------|---------------------------|
| RP1-93H18.6 | GGCTTTCCACTCTGCGAGAA     | ACTAGGGTGCCGCAATAGAG     |
| PI3K     | CATCACTTCCTCTGCTCTAT     | CAGTTGTTGGCAATCTTCTTC    |
| Akt      | GTCATCGAACGCACCTCCAT     | AGTTTCAGGTACTCAAACCTGT   |
| p53      | TTCACCACTCCAAAAACCTGC    | GAGGCGAGGCAACTCCATTAG    |
| mTOR     | ATGTGGAACCCGGACCTG       | TCTTGACTCATCTCTCGGAGTT   |
| Bcl-2    | GGTGGGGTGATGTGTTG        | CGTTTCAGGTACTCAGTCATCC   |
| Bax      | CCCGAGAGGTCTTTTCGCAG     | CCAGCCCATGATGGTCTGTGAT   |
| Vimentin | GACAATGCCTCCGGACGGTCTTT  | TCCTCGCCGCTCGAGGTCTTT    |
| E-cadherin | CCCACCACGTACAAGGGTC      | CTGGGATTGGG GGCATC       |
| cyclinD1 | ACGAAGGTCTGCGCTGTT       | CCGCTGCCCCTGAACCTACCT    |
| β-catenin | ATTTGATGGAGTTGGACATGCG   | GAGGAAGAGGATGTTGATACCT   |
| GAPDH    | GGAGCGGAGATCCCTCAAAAAT   | GGCTGTGTCTACTTCTCATG     |

Notes: RT-qPCR, reverse transcription quantitative polymerase chain reaction; PI3K, phosphatidylinositol-3-kinase; Akt, serine/threonine kinase; mTOR, mammalian target of rapamycin; Bcl-2, B-cell lymphoma-2; Bax, Bcl-2 Associated X protein; GAPDH, glyceraldehyde-3-phosphate dehydrogenas.