

Supplemental Fig. S1. Sequences of the human and mouse *OPRM1* exon 5s and 3' untranslated regions (UTRs) and predicted miRNA sites

A. Sequences of the human *OPRM1* exon 5s and 3'UTR with predicted miRNAs. Exon 5s were color-highlighted (Exon 5e, yellow; exon 5d, green; exon c, gray; exon 5b, pink; exon 5a, blue). miRNAs identified using RegRNA (<http://regrna2.mbc.nctu.edu.tw/>) and miRbase (<http://www.mirbase.org>) programs are indicated with green letters and their names are listed with green letters on the right side of the same lane. miR-378a-3p is labeled with underlined red letters. Poly(A) and cleavage sites are shown by underlined red letters and highlighted with yellow.

|                    |                   |                   |                   |                   |                   |                |                     |
|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------|---------------------|
| CGTCTTCACT         | CAGATATTAA        | ACCAGAAGTG        | ACTTACTTTC        | TAGGTGGAAT        | TGAACCTGGA        | <b>Exon 5e</b> | miR-29b-1-5p        |
| CTGTCACTGT         | GAAAATGCAA        | AGCCTTGGCC        | ACTGAGCTAC        | AATGCAGGGC        | AGTCTCCATT        |                |                     |
| TCCCTTCCCA         | GGAAGAGTCT        | AGAGCATTAA        | TTTTGAGTTT        | GCAAAGGCTT        | GTAACCTATT        |                |                     |
| CATATGATTT         | TTAGAGCTGA        | CTATGACATG        | AACCCTAAAA        | TTCCTGTTCC        | CTTGAAGGTG        | <b>Exon 5d</b> |                     |
| GAGACCAAGA         | GAAGGTACTG        | CCGTGTGGTT        | AAAAGGTCAA        | GCTCCCAAGG        | TGGAGAGACT        |                | miR-34a-5p          |
| <u>TCATCCAGTT</u>  | <u>TTTTTGTGG</u>  | <u>TTTCAGGGAC</u> | <u>CTCCAGCCAA</u> | <u>GTTTGTGCT</u>  | <u>GACCAACTTG</u> | <b>Exon 5c</b> |                     |
| CCGGGTCGTC         | TTGAAAAGGG        | GGCTTACAGG        | TGTTCCAAGC        | CCGTGTTTTA        | TCCTGAAGTA        |                |                     |
| TCCCTCAACA         | CAGAAAAACG        | ACCTCATAAC        | ACAAAATACA        | CCAGCTTAAA        | AATAGCCTTT        |                |                     |
| GAATTATTTT         | TCACATTAAT        | CAAACTTTA         | CAGAGGAGAT        | AAACTGAT          | TTTTTTATTT        |                |                     |
| TATTTTATTT         | TATTTTATTT        | TATTTTATTG        | CCATTCATTC        | AACCGTTTGC        | ACAGAGAGAA        | <b>Exon 5b</b> |                     |
| AGAAGACAGA         | AATCTGACTG        | <u>GTAAGAAATT</u> | <u>GTTACCCTTT</u> | <u>TGCCAGCATG</u> | <u>CCAGGCTTCT</u> |                | miR-548x-5p         |
| GGGTTCCCTT         | TCCCTGAGCG        | GCCCTAGTGA        | TCCGGCTTGC        | GGCACCATCG        | CCTACGGGCC        |                | miR-4453            |
| AAGCTGCATC         | ATAAAGGAAA        | TTTTTTTTTT        | <u>TCATTCTGGC</u> | CAGAGCAAAA        | CACATGTGAT        |                |                     |
| AAAACATAGG         | <u>CATTAGCTAC</u> | <u>TCTGCTTAGC</u> | <u>ACCAAATATC</u> | <u>AGACTAGCTT</u> | <u>AAATTTGCCC</u> |                | miR-32-3p           |
| CCAGATGGGT         | TCCATCATCT        | <u>TTAATCCGAC</u> | <u>CTCTGACTTG</u> | <u>CAGTTTCAAC</u> | <u>ACGTGCTCTC</u> |                | miR-19a-5p          |
| TGGGCAAAAC         | AGTTGCCCTG        | AGTAACAGAA        | AAGATAGGAA        | AGGAAAAGGA        | GAGAGAGAAA        |                |                     |
| AACGTGCCAG         | TGGAAGGGTG        | GGGAAGGTGA        | AATGATCAAG        | GAGGCCAGAG        | AAAGACTCAC        |                |                     |
| CTATTGCAGC         | AACACTGTAG        | <u>AAGTTCAGGC</u> | <u>AGCTGCTTCT</u> | CGGTAGCAAA        | AGGATCTTTT        |                | miR-610             |
| CCAGCAATCC         | <u>TATTAGCTCT</u> | <u>CAAGTTTCCC</u> | <u>CTTTTAGGGA</u> | GGAAAAAGCT        | CCCCATGTCC        |                | miR-296-3p          |
| <u>CGCGATCCTG</u>  | <u>TACATGTCCA</u> | <u>ACCCTGCCAT</u> | <u>CCACAGCCAT</u> | <u>CAGCAAAGAG</u> | <u>TGCAAGACAG</u> |                | miR-26a-2-3p        |
| ATTAATCCAA         | AGAGAATAGC        | AATTAATATC        | CCATAGCATC        | AAAGCTGTTC        | TTAGCCAAGA        |                |                     |
| GGGACTTTAA         | CGAGAGGGGT        | CTCTAACACC        | CTAAATCTTA        | GAAGAGACTC        | TAACCATCCT        |                |                     |
| AAGTAGGGCC         | TCTAACCCCG        | CTTTATAAAC        | TTTTAATTGA        | CTCCCATCTT        | AACAGTTGCA        |                |                     |
| ATCCATGGAG         | GAATGCTTGA        | <u>TAACCTCGGT</u> | <u>GATAAGATAA</u> | AAAACCAAGC        | ATACTAGAAG        |                | miR-5004-3p         |
| TGTTCTCTAA         | AATTAATAAT        | ACAGTAGTTA        | CTAGAGAAAA        | ATTTTAGTCC        | AAAAATCCAA        |                |                     |
| <u>CTATAGAAAAC</u> | <u>ATAGAATGTG</u> | <u>AGAGGTAGCA</u> | <u>CATAAGAAAT</u> | <u>AAGTCATGGG</u> | <u>GATTTTATTT</u> |                | miR-192-5p          |
| CATGGACCAG         | CAATATGATG        | ATAAAAGCCA        | TCTAACCTGT        | TGGAATTATA        | GGTCACATCA        |                |                     |
| AGAGAATTCT         | AGTGTCTAGA        | ACCAAAGAAA        | TGTTAGCCTC        | ACTCTAATAG        | ACAATACACT        |                |                     |
| TCAGGAACGA         | AATAAGCAAA        | <u>TTAGATTGTG</u> | <u>TTCAGAGATG</u> | <u>AATAACCAAG</u> | <u>ATGGCAGAGG</u> |                | miR-23a-3p          |
| GAATTAAAAAT        | AATTGCTCAT        | GATTACCCTG        | GGAAATAGAA        | GGCTTAGAAA        | GGACAACACA        |                | miR-3613-5p         |
| GTTTCTTCAAT        | ATGCTTAAAG        | CAATGTGAAT        | AGGGAATTGG        | ACTCAACCAA        | CATAGCCCGA        |                |                     |
| CTTATTAAG          | CCAATGGGTA        | GAGGTTACAG        | AGAAAGCTAT        | TCCAGTACAA        | CCAAACAAAA        |                |                     |
| AAAAATAAAAT        | GTAAGCCACT        | TTCTTGAGAC        | ATGATTGACT        | TACAAAAAGA        | TGTATGTATT        |                |                     |
| TAATGTATAC         | AACTTGATGA        | GTTTAGAATT        | TTCTAAGCTG        | TGAGTTATAG        | AGATTTTCTT        |                |                     |
| GTTACTGGAA         | GTCTAATATT        | CAAACATCAG        | CATTTTGCCT        | ACATGAAAAG        | GACACTGAGA        |                |                     |
| TAATTCAGAT         | GTAAAGATTT        | GATGATTAGG        | GAATCAGAGG        | GAATGACCCT        | TTGAATAAGG        |                |                     |
| TTTTTCAGTTT        | TCACACGCTC        | TACCAGCTTC        | TTGTAGAACA        | CTACTAAAGT        | GAAATGCTAA        |                |                     |
| TGGTGGTCCG         | TGAATGAGAA        | GCTCTATAGA        | CAAGTGTTAG        | GAAATGTGGC        | CTACCTTATT        |                |                     |
| TTGGTCATGG         | GGACTGATAA        | TATGTATAAG        | CATTTAAAAG        | GCTGTGAAAA        | GCCCTACTCT        |                |                     |
| CTCTCCCTCT         | CTCTCTCTCT        | CTCTCTCTCT        | <u>CTGTGTGTGT</u> | <u>GTGTGTGTGT</u> | <u>GTGTGTGTGT</u> |                | miR-466             |
| <u>GTGTGTGTGT</u>  | <u>GTTGCATACA</u> | <u>TACACATTTT</u> | <u>ATTTTCTAAG</u> | <u>CCAAAGTTCA</u> | <u>GTTCTCCAGT</u> |                | miR-297/miR-146a-5p |
| TCATCTGAGC         | TCAGGCCAG         | TTTTTCAAGG        | GACACCTTAT        | AACATCTCAC        | AGAATAAAGG        |                |                     |
| TTTCACTAAG         | CAATGTTTAA        | AAGCCACTGT        | AGATCATCAG        | TCCCAGTTAG        | GCATGAATCT        |                |                     |
| ATTCAAAATT         | CAATGTTTCA        | CTGGAATAAT        | TGGCAAGGTC        | TCATAATTCT        | AGGCATTAAT        |                |                     |
| CAGAATCCTA         | AAATTGATTG        | TTGAACTCTT        | ATTCTTACTC        | ATTTAAAATA        | TATGCTCTAA        |                |                     |
| ATACTTCAGT         | ATACAAAAAG        | ACATTAAAAAT       | TTCTTATCTC        | TGAAAAATAGA       | GCAGGGTTTT        |                |                     |
| CCCTTTTGTT         | TTATTTGGGT        | TTTCACTTTT        | GTTTTACTTT        | GTTTTCTGGT        | GATATTACAA        |                |                     |
| GAAAAAAATC         | TATGTACCTT        | TGGGGTATAA        | ATCATTGAAT        | TAAACTATAC        | ATTGCTAAGA        |                | miR-186-3p          |

|                    |                          |                     |                    |                    |                     |                |              |
|--------------------|--------------------------|---------------------|--------------------|--------------------|---------------------|----------------|--------------|
| <b>ATAAGCATT</b>   | <b>TAATTGGTAC</b>        | <b>ATTGTTCTGT</b>   | <b>TTTTGAATGA</b>  | <b>AATATCTTTG</b>  | <b>CAGAAAATAG</b>   | <b>Exon 5a</b> | miR-589-3p   |
| <b>ATTTATTTCA</b>  | <b>AAAGTCATCT</b>        | <b>TTACTCAACT</b>   | <b>GTGAGCATA</b>   | <b>CAAGGGCTAA</b>  | <b>TAATTACAAT</b>   |                | miR-126-5p   |
| ATTTTCCC <b>GT</b> | GAAAGAATAT               | AAGATTGGAA          | GCCAGAGAGC         | CTGGGTTCTG         | CTGCTAGCCC          |                | miR-424-5p   |
| TAATGGAGAC         | CATTTGTGTG               | AGTTTTTCAT          | CCCATGGCTT         | AAGGGTTGCT         | TATGGTTGCT          |                |              |
| TAAGGGATCC         | CTTCACAAGC               | AGGAGTTTCC          | GAGCTCTTTT         | GACTGCTCAA         | GAATTAGGAC          |                |              |
| TCATTGGCCG         | GGCACGGTGG               | CTCAAGCCTG          | TAATCCCAGC         | ACTTTGGGAG         | ACCGAAGTGG          |                |              |
| GTGGATCACG         | AGGTCAGGAA               | ATCGAGATCA          | TCCTGGCTAA         | CATGGTGAAA         | CCCCATCT <b>CT</b>  |                |              |
| ACTAAAAATT         | CAAAA <b>ACTTA</b>       | GCAGGCGTGG          | TGGCGGGCAC         | CTGTAGTCCC         | AGCTACTCGG          |                |              |
| GAGGCTGAG          | CAGGAGAATG               | GCGTGAACCC          | GTGAGGCGGA         | GCTTGCAGTG         | AGCAGAGATC          |                |              |
| GCGCCACTGC         | ACTCCAGCCT               | GGGCGACAAA          | GCGGAGACTC         | GTCTCAAAA          | AAAAAAAAAA          |                |              |
| AAAAAAAAGA         | GAGAATTAGG               | ACTCATTTCT          | GGGTTTGACT         | GATTACACCA         | TTCAGACTCC          |                |              |
| <b>AGGGCCAGCT</b>  | <b>TCTGTTAGTG</b>        | <b>GACAATAAAT</b>   | <b>GTAATGACCA</b>  | <b>ACGCTTTCTC</b>  | <b>TTGTGAAAGA</b>   |                | miR-572      |
| AAGATGTATT         | <b>A<b>TATTGGACA</b></b> | <b>AAATAAGTCC</b>   | <b>ATATTCACAG</b>  | <b>CAGAAGAAAG</b>  | <b>CATATGGCAG</b>   |                | miR-378a-3p  |
| ATCAAGTCTG         | GATCTTTTGA               | ACTACCAGAT          | TATTCTACCT         | <b>CTCCTTGAAT</b>  | <b>TCTTCTTTGC</b>   |                | miR-4476     |
| TGAAGTCGGA         | GCCCTTGTAC               | <b>TATAGATTCC</b>   | <b>ATATGTCTGA</b>  | <b>TTCAGGCAAT</b>  | GGAGCTTGGA          |                | miR-3187-5p  |
| AGAGGGGATG         | AGTTTCCTAT               | TATTATTATT          | TAGGTACATG         | GAGATCTTTG         | CCTATGAGTC          |                |              |
| ATCAGCTCCC         | <b>AAGGTTTTCT</b>        | <b>GTATGGCTCT</b>   | <b>GTTTTTATGA</b>  | <b>TTTCTGTAAT</b>  | <b>AAATGAGATT</b>   |                | miR4688      |
| TTGAAGCCTA         | TTTCTGGCTC               | AAACTCTGAT          | TGGCTTCAA          | AGTACCCAAG         | CCTGTTATTG          |                |              |
| CCTTCAATTG         | TAAC <b>TTTGAA</b>       | TGGCATCACA          | AAGAGAAAAG         | AAAAAAATTG         | AGGTGGAGGA          |                |              |
| GAGTGGCCAC         | AAAATAAAAA               | TATTA <b>AAACCA</b> | ACTTTCCTCC         | TCCAATGCAC         | CTGGGCACAC          |                |              |
| CACTTCACT          | CTCAAGGTTA               | TGTTTGCTTC          | CATAGATTGA         | CAAGGTTGAA         | AAGACAATCT          |                |              |
| CTTCAATTTT         | CTTTAGTTCC               | AAAAGTGCAG          | GAAATACACA         | CCAACCTTTG         | CGTGGATAAA          |                |              |
| GATTA <b>AAAGT</b> | GCCTTAAATC               | AGCTTCCATT          | TGAACCTTAA         | AAGCTTTTCA         | AACATTTAAT          |                |              |
| TTTTTTAAAC         | AGGACCAAAA               | ATAGCCCAAG          | GGTATTTGCT         | AGTTGACTTC         | CTGGAAAAAC          |                |              |
| TATAGTTTAT         | TTTTATTTAT               | TTATTTATTT          | ATTTATTTAT         | TTTGAGACCG         | AGTCTCGCTC          |                |              |
| TGTCGCCCAG         | CTGGAGTGCA               | GTGGTGCCAT          | CTCGGCTCAC         | <b>TGCAAGCTCC</b>  | <b>GCCTCCCAG</b>    |                | miR-3180-3p  |
| TTCATGCCAT         | TCTCCTGCCT               | CAGCTTCCCT          | AGTAGCTGGG         | <b>ACTACAGGCA</b>  | <b>CCTGCCACCA</b>   |                | miR-1271-3p  |
| CGCCCAGCTA         | ATTTTTTGT                | TTTTTAGTAG          | <b>AAACGGGGTT</b>  | <b>TCACTGTGTT</b>  | AGCCAGGATG          |                | miR-128      |
| GTCTCGACT          | CCTGACTTGG               | TGATCCGCC           | GCCTCGGCCT         | CCCAATGTGC         | TGGCATTACA          |                |              |
| GGCTGGAGCC         | ACCGCGCCTG               | GCAAAA <b>AACT</b>  | ATAGTTTAA          | AAATTGTTGA         | CAAAAATAGA          |                |              |
| AAACCGACAG         | <b>CAGAGAGTTG</b>        | <b>TGTTACATCT</b>   | ATGTATCTAA         | CATATGTGTC         | TAAGTATGGT          |                | miR-411-3p   |
| ATCTAATGTC         | AAATGTCAA                | TCTACTAACT          | GTACTGTGGT         | TATCATCAGA         | AAAGAAACCC          |                |              |
| AGCTTTAGAA         | AATGGTAGGA               | AGTTCCAAA           | CTGCAAAGGA         | GATATCTTAG         | CAAGCAAGTA          |                |              |
| GCTTGGCTTT         | TCACAATTTT               | ATGGGTGCTA          | GAAATAGCAT         | GACTCAGTGG         | ACCAGAGAAA          |                |              |
| ACCACTTATT         | <b>ACTCACAGCA</b>        | <b>CAGTAAACAG</b>   | <b>CACAAGTATC</b>  | AGCATGCTAA         | TGCCAGTTCC          |                | miR-5588-5p  |
| <b>TTTGCTTTTA</b>  | <b>TGTCTTGTGA</b>        | TGTGACACCA          | TGAACCCAA          | TTGCTGCTAC         | ACATACAATG          |                | miR-424-5p   |
| AGTTGCACAG         | CAGCTGAGGA               | GTTCAGAGAT          | ATGGGTT <b>CAG</b> | TGTCTTTTGT         | AGCAAGCAGT          |                |              |
| AAACAAATCA         | ATCCTCCTTC               | CCCAGGAGCC          | AGAGTCTCAA         | AATGCCGTGG         | TCCTCATGTG          |                |              |
| GTCAGGCAGT         | GAAGGTTGTT               | AATTGACTAT          | GACTAGCTGT         | AGAAAGAAAT         | CAGGGTGAGA          |                |              |
| AGATGATTAG         | ATCTTG <b>CAGT</b>       | TCAGCTCAGT          | CAGTAAGAAT         | GGGCAGGGTT         | GTT <b>CAGT</b> GGA |                |              |
| CTGCCTCTCC         | CAATAATTCA               | CATTCAACCT          | AGAATATTCT         | TGGCTGAACT         | TAAATTTT <b>TA</b>  |                |              |
| TACGATTATG         | CCAC <b>CTATC</b>        | AGCAACTTGA          | ATTAGACATA         | TTGACAAGGA         | CTAGGACCAA          |                |              |
| ATCTGTTTCC         | ACTTATTTCA               | GTCAATACTA          | GATTAGGGCT         | ATTGTCAGCA         | GAATCCCATC          |                |              |
| CACAGGATTA         | GGTCAGTCTG               | CAGTATTGAC          | CTCCACCATG         | CACTCCAGGA         | TCCCCGACCC          |                |              |
| AATTA <b>AAATA</b> | GTCACAGAGA               | AGACTAATAG          | GTCAAATTT <b>C</b> | AGATAAGCAC         | CTAGCTTCTT          |                |              |
| <b>TTCTTATGGT</b>  | ATGCATGGAT               | TGCTCCACCA          | TACCGTGGAT         | <b>ATTAATCCAA</b>  | <b>ACAAAACAGG</b>   |                | miR-670      |
| AACAGTTGGC         | TACCATA <b>CAA</b>       | ATTCTCCTCC          | ATTCAGCCAG         | <b>ACTGTAGTCT</b>  | <b>AAGGCCAATC</b>   |                | miR-26a-1-3p |
| AATGACCCAT         | TTACAATCAG               | GGAGCTAAGA          | CTGACCTGCT         | <b>GACTTCTAT</b>   | <b>GGTTTGTCTT</b>   |                | miR-138-2-3p |
| GTCTCATTGG         | CTAGGGTAGC               | TAAACTTAA <b>G</b>  | AATAGGTTCC         | TGGCCTGTCT         | CTAAAATGTG          |                |              |
| GACTCTGATG         | CTGGGGAACA               | GTACTCACAC          | TGCTGTATGG         | AAATAGAAAA         | CCATGTATCC          |                |              |
| CTCAGGCAGG         | ACAG <b>CCCTCT</b>       | <b>TTACCTAGGG</b>   | <b>GA</b> CTAACAAA | GGAAATAAAA         | TCCAAAGAGT          |                | miR30c-1-3p  |
| GGCGCCATTG         | CCAATTATTG               | CAAGGACTCA          | AAGATGAACC         | AAATAGCAAC         | CTCCACATGC          |                |              |
| TCCAGTGGAT         | GGATATCCTC               | TGGGCCACTC          | TCTCCACAT          | ATGAACATAT         | AACTTGATTT          |                |              |
| GGATCACCAT         | GACCTTGGTT               | TGGTTAAGCT          | CTATGGGCAG         | GGTCGCCAAG         | TACTTGT <b>CAC</b>  |                |              |
| CTGGACAGCC         | CTCCATAGCA               | TGACTCAAGG          | <b>GC</b> ACTCAGTG | <b>TC</b> AGGAGAAG | <b>C</b> ACATGAATC  |                | miR-4660     |
| AGTATGAGCT         | GTCTGAGTGA               | TTGTGCAGGT          | AAAAAGGGTG         | ATTAATTTT <b>G</b> | GGGAGCTGAC          |                |              |
| GATCCACAG          | CACACGGATG               | <b>AGGATGATAA</b>   | <b>ATCCAGCTGA</b>  | TAAATCCAGC         | AGTGTTACGG          |                | miR-2110     |
| GTTGGCAATC         | AGAGCTGCTG               | CTTGCTCTG           | <b>ATGGACCATG</b>  | <b>TG</b> ATTATTTT | GCCAAGTGAG          |                | miR-212-3p   |
| AGGCTGGGAT         | TCAGAGACAA               | AAAGATCATT          | CATTATTCCC         | TCCTCTGAGC         | ACCTCCAGGG          |                |              |
| TCTAAGGTGT         | TCTTTCC <b>CCA</b>       | ATGAAGTGGC          | GAGTGGTGCC         | AGGGAAGCAG         | TGAGTCCAGG          |                |              |
| ATGCCAAGGG         | GTACCTCCAG               | GTGGAGACTG          | TTTCCCTTTC         | CAGAAGCCTG         | GAGTTGAAAA          |                |              |
| GGGCCCCCTA         | GGTGGTCTGC               | TGCAACAGCC          | TGCTACACTG         | ACCCACGTGT         | CACCTGCAGC          |                |              |
| TTAGGTCCCC         | AGTCATATAT               | GGCAGACTTT          | CTAATCAACT         | TGTACATAGG         | ACTCAACAAG          |                |              |

|            |            |             |             |            |             |                   |
|------------|------------|-------------|-------------|------------|-------------|-------------------|
| AGGCATGCAT | AGATAAGGCA | CGTATTGTCT  | CTAAGATCTA  | AATAGTCCAA | TTAAGTGCCA  |                   |
| GGCTTCCTTT | CTCTTAGGAG | AGCCATAGAG  | CAAAGAATAT  | TTTCTTTACC | GTCTAGGATC  |                   |
| AACTTTTGAG | TCTTAGTCCA | CATCATTTTG  | GAGATACTGA  | CTTGGGTGGC | TGGTCCTGTA  |                   |
| TCTTATCAGA | ATTAAGAGCC | TTTCTGGGAC  | TTCATGTGAT  | TTAGCATTGG | CTAATTTTAT  |                   |
| TAAGGCCTTT | CAATAGAATA | TCATCAATAC  | AGTAAGCCCA  | ATTTCTCTGC | AGAAAAAAAA  | miR-3118          |
| AAGAGAGAAA | GAGAAAGAGA | GAGAGGCTTG  | TCCTGTGTTT  | TGACCCACCT | ATTGGCGATA  | miR-32-3p/miR-581 |
| AATAACAGGG | AAATTCACGT | AGTACTGCAA  | CAGCCCAGTA  | AACATGTTTT | GGAGGGTCAG  | miR-2054          |
| CCAGGGAAGG | GGTCTTAATC | TTTGGGTGCA  | AAAGGGATTG  | AGAAAAATAC | ATGGCCAAAA  |                   |
| TCAAAAATGG | CACACCAGGT | GCTATCACAG  | GGAAATTGATT | CATTTACAGT | CACAATGTCT  | miR-9-5p          |
| GTAACAGCCA | GGACTATAAT | ACCAACTAAA  | TTCAGTTGGC  | ATGATCTAAG | ACAAGCCTCC  |                   |
| AGATTTCCCA | TAGTTTTTTT | TTTCACTGAC  | CATACAAGGC  | TGCTACATTG | AGATATTACA  |                   |
| TTTTTCATTA | GTCCCATTGT | ATTTAAGTCC  | TTGGTCAAGG  | TTGTGGTTTC | ATTTTCTCCT  |                   |
| TCTGGAATTC | TAATTAATAA | AAAAAAAAACA | AAAAAATTGA  | AGAGAACCAA | AGCCAAGTTG  | miR-526b-5p       |
| TGATCAGTTG | TGCATGCATC | CCTTCTATCC  | TCTCTACAAA  | TGGCTCTTCC | AATCAAAAAA  |                   |
| ATCTCTCTTG | TACATCATGA | ACATTTACAG  | AACAAGAATG  | TAAATTATCA | ATACCAATTA  |                   |
| CACATTCAGC | CCTGGGAGCC | GCAAAAGTAG  | TAGATAACAG  | GGCTCTAAAC | AGCTCTGCCT  |                   |
| AGTGGATACA | GTTACTTCCT | TTCTATTTTT  | TTTGGTATCA  | AATCTGGGTA | ATTAAATGTG  | miR-1224-3p       |
| TGGTCCTTAC | AAGAGAAGGA | CCTCGGAGAA  | CCTAGTGCAG  | TCCCTCAGGA | GAACCTAGTA  | miR-143-5p        |
| CTTAGTCATT | TGAGCATGGA | TATCAAAAAG  | AGACATAAGG  | CGGCGCAGTG | GCTCAAGCTT  |                   |
| GTAATCCTAG | CACTTTGGGA | GGCTGAGGTG  | GGTAGATCGC  | TTGAGCTCAG | GAGTTCGAGA  | miR-3670          |
| CCAGCCTGGG | CAACATCGTG | AAACCCCGTC  | TCTACCAAAA  | ATACAAAAAT | TAGCCAGGTG  |                   |
| TGGTGGTGCA | TGTCTGTGGT | CCCAGCTACT  | CGGGAGACTG  | AGGTGGGAGA | ATTGCTTGAG  | miR-1224-3p       |
| CCTGGGAGGT | GGAGGTTGCA | GTGAGCAGAG  | ATTATACCAC  | TGCACTCCAG | CCTGGGTGAC  | miR-143-5p        |
| AGAGTGAGGC | TCTGCCTCAA | AAGAAAAAAA  | GAGAGAGAGA  | GAGAATAAGA | GTTGGACCCT  |                   |
| TCCTTCTCTC | CTCTACCTCC | ATTGTTCCCC  | CCATCAGGTG  | TAATGCCTCT | GATTCTCTTT  |                   |
| GGGAATGAAG | AGAGCTTGTC | CTTAAAGGAG  | TCTAAATCAG  | GATATAGAAG | TTTAAAGTTA  |                   |
| GACAGTAGAG | GTTCTGAGGG | GGTGATCTGC  | CCTGGGGCAG  | CAACCTGGCT | TCCCCCTCCA  | miR-324-3P        |
| TTAAAGGAGG | ATTGATCTCC | ACAAAGGAAT  | CTGTTTCTAT  | AAAGGAACAT | AGAGTTTCAT  |                   |
| CTGTGTAAGC | AACTAATCTG | CTCCCTAGGG  | CCCACCGTCG  | CTAGATATCT | GGACTGAGTT  |                   |
| TCTTTGGCGA | TCATCCGATC | ATTCCTTCT   | TTGGGAGCTC  | CTGTTTAGTA | GGCATGCCCA  | miR-24-2-5p       |
| CATTGCCTTA | TGATCAGGTC | CCTTTGGAGG  | GGCTTGGTTT  | TTCTCATCCT | GGGCTTTGTT  | miR-548d-3p       |
| TTGGATTGCA | GAGACCTTAC | CTGGTTTAGG  | GAGTGGTGTC  | TTTATCCTAG | ACATCTAGAG  |                   |
| GCCCTAAATC | AGCACAGCTG | CCAGTACAGG  | ATCTCCCAGC  | AAGAAAAGTA | GTGGAATCCT  | miR-486-5p        |
| CAACCTTGGA | GGGAGAAACT | CAATCTTAAA  | AATGCACTGG  | TCGTGCTCTG | GGTGAGGGTT  | miR-1912          |
| CATCATCAAA | GCTGTCATTC | TGTCCAGGAC  | AGAACAAGTC  | TAGGGCAGCT | TCAGCCCTCA  |                   |
| GGCTTTAAAT | AGCTTCCTCC | ATGGGGTTTC  | ATGAGATTTT  | ATTGACTTAA | GAAAATCTTC  |                   |
| TTCAGTTGGG | CGTGGTGCCT | CATGCCTGTA  | ATCCCACCAT  | TTTGAAGGCC | GAGGCAAGTA  |                   |
| GATCACTTGA | GGTCAAGAGC | TCCAGACCAG  | CCTGGCCAAC  | ATGGGAAACC | CCATCTCTAC  |                   |
| TAAAAGTACA | AAAATTAGCT | GGGCGTGGTG  | GCACATGCTT  | GTAATTCCAG | CTACTCAGGA  |                   |
| GGCTGAGGCA | TAAGAATTGC | TTGAATCTGG  | GAGGTGGAGG  | TTGCAGTCAG | GCAACATCAT  | miR-744-3p        |
| GCCACTGCAC | TCTAGCCTGG | GTGACAGAAC  | GAGACTCTGC  | CTCAAAAAAA | AAAAAAAAAAG |                   |
| AAAAGAAAAG | AAAAGAAAAA | TCTTCTTGGA  | TTTACCATAA  | TGTAGTCACT | AAAACAGAAA  | miR-3118          |
| TCCAGGGTAG | CAAACCTTAT | TGTGGGACAT  | GATTCTATCT  | CAATGACATA | ATTTGCACAG  | miR-188-3p        |
| TGTTTTAAAG | TATAAGGTCC | CACATGAGAC  | AGCCTTGTTT  | CTGCATGCTC | TAAGGCATAA  | miR-532-5p        |
| CCTTTCTTAC | TCCTTCATTA | CACCAATGCA  | GCAGCCAAGT  | GTCGAACAGC | CCCTCTGTCT  |                   |
| GCTGATCCAA | GCACCCCTGG | ACTTCTTTCC  | TTTCTCTCTC  | CCCTTGGATC | TGCATCTTGG  |                   |
| TACTCTCTGT | GGGAATGCAT | TGCCCTTCCG  | GTGTATACAT  | TTGTAACCTA | CAACTTGACA  |                   |
| CCGTTGTGCT | TTCTCCCTA  | ATGGAACCCA  | GAATGTTCTC  | TCCATCCTCC | ACCCACAGA   | miR-23a-5p        |
| TGAGCAAACA | GAAACCATGG | CAGCTTCTTG  | GATTTTATCC  | CTCACCTTTC | AACCTCCATC  |                   |
| TATTGACTCA | ACTCTTGTTT | ATCAACAGGT  | AGGACAGAGG  | TGGACCACTC | GCTGCCACC   |                   |
| TTCTGCACCA | TTTGGGCCAG | AATATTTGCT  | ACCAGACCCA  | GGGAGTTCAC | AAATGTCCCT  |                   |
| GAATCCAGCT | TATGAGTTCT | TGCCTTTTTA  | TTCTTCCAAA  | AAGTTGTTGT | CTGTCTTGGC  |                   |
| ACCCTGCACT | TTGTGCCACT | TTGAGAAGAA  | TTTCAACCTC  | TTAGAAGATG | GCAAGAAGTA  |                   |
| ATAGAATTCC | AAAAGAGATG | ACTAAGCAAG  | CAAGTAGGTT  | GCTTTGCCAC | AACTCTATAG  |                   |
| GTGCCAAAAT | TAGACAAAAG | ACCCAGGCAA  | TTGACTACTC  | ACAGCACAGC | AAACAGCAGA  | miR-661           |
| AGCTTTAGCA | TAATAGTGCC | AGTTCCCCTA  | CTCCCAAATC  | CCACAAGGCA | ATACGATGGG  |                   |
| ACCAGACTGC | AGTACACACA | CAGTGGGTG   | TATCACAGTT  | GAGGAACCCA | GAGCTTAAGT  |                   |
| CTCAGCACCT | GGGGGAGCAA | TAAACAAACC  | TCCCCTACGA  | TCAAGCAGCC | ACATCATGGT  |                   |
| CAGTGCTGTG | CTCGCCTGTG | CTTTCTTAAT  | TGCCTGTGTG  | ACCAGCTACA | GAAATGATCA  | miR-3658          |
| GAGTCAGAGG | ACAGTTAGAC | CTTGTAATTT  | GTCAGGGTCA  | GCAAGGGTGT | GCAGGGACAC  |                   |
| TCCTGGCCAT | GATGGACTGC | CTCTCCCTAA  | AGTGAGAATG  | ACCTAATCTG | TTCTTTATTC  |                   |
| TTAGAAAAAA | TGTACTGAGA | TATTTAAGGG  | TAAAGCATCA  | AATGGCTTAA | AAAGATGGTG  |                   |
| TGTGTGTGTG | TGTGTGTGTG | TGTGTGTATG  | AGAGAGAAAA  | AAAGAGAGAA | AAAGCAGATG  | miR-466           |

GCAAAGCACA TGGATAAAGC ACATTTACTA **AAATAAAA**ATT TTAAAAAAT GATCTTTTAC **poly(A)**  
**CT**TTTTACGC TTCCTATACA AACATCTCCT TTTCTCCTTA **GCAGTATTAT** AATGAATGAT **cleavage site**/miR-374b-5p

B. Sequences of the mouse *Oprm1* exon 5s and 3'UTR with predicted miRNAs. Exon 5s were color-highlighted (Exon 5e, blue; exon 5d, green; exon c, yellow; exon 5b, pink; exon 5a, gray). miRNAs identified using RegRNA (<http://regrna2.mbc.nctu.edu.tw/>) and miRbase (<http://www.mirbase.org>) programs are indicated with green letters and their names are listed with green letters on the right side of the same lane. miR-378a-3p is labeled with underlined red letters. Poly(A) and cleavage sites are shown by underlined red letters and highlighted with yellow.

|                   |                    |                   |                   |                   |                   |                |              |
|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|----------------|--------------|
| TATTTTTAAT        | TTTGTGTGTG         | TGTGTGTGTG        | TGTGTGTGTG        | TGTGTGTGTG        | TGTGTGTGTG        |                | miR-466a-3p  |
| AGTGTGTATG        | AGTGCTATGC         | CCACAGGGAC        | CAGAAGATGG        | TATCAGACCT        | TCTAGAAGCTG       | <b>Exon 5e</b> |              |
| AAGTAGTGAG        | CAGTCCCCAC         | CCCCACCCCC        | CGCAATGTGA        | GTAGCTTATA        | AAATGATTTT        |                | miR-23b-3p   |
| ATGTACTTGT        | TAGCTCTCCA         | TGGAGCACAA        | GATAAAAAGTG       | ACATCACAGT        | TTGAAAATAAT       |                | miR-293-5p   |
| AGCTCTTTGA        | TCCTAGAATG         | AAAGCATGGA        | AAAAATAAGT        | TGGGTCATTT        | GTCTATAGGA        |                |              |
| AGGAAGGGGA        | CAAGGTGGGG         | ACAGAGAGGA        | CTGAGAAGAC        | GTAGACAATT        | AAGGTAGGAA        |                | miR-877-3p   |
| GAAGGCTAAT        | CTAGATAGCA         | CATTTACGTT        | CCAAATCCAC        | TACTTCTTCT        | TGTGTGTCTT        |                |              |
| TCAGGCACAC        | <b>CAAAAA</b> CCTC | AAGAATGCCT        | GAAATGCAGA        | TGTCTATCCC        | TTACCATCCT        | <b>Exon 5d</b> | miR-20a-3p   |
| GGTTATATGC        | CTACATTTCC         | AACATCAGCA        | ATTCTTCATA        | ATGATCAAAA        | AAAATGTTTC        |                | miR-138-5p   |
| ATAACTAAAG        | GAAAAACCAT         | CTGCTTCTTT        | TGATTTAATG        | AAACTTAAAT        | ATCTCTGGGT        |                |              |
| GTGGGGGACA        | TTAGGATGTT         | AAAGTTTCTT        | CAAAGGAAAG        | AGATAACTTC        | TCATAGTGCT        |                | miR-302b-5p  |
| GAAATGGGTA        | CCCTCAAGAT         | AGGGGACAGG        | CAAACAGAGT        | TTATGGAAGA        | TGATATTAAG        |                |              |
| AAAGAAAAAC        | ATATCAATCA         | AGAAAAATAG        | TGTTACGTAT        | TTTGACAACA        | AAGCCTAATT        |                |              |
| GATAACTTAC        | AGAATTAATA         | TATGTAGAAT        | GGGATAAGAC        | TTCTGTGCAT        | TGATGATAAA        |                |              |
| TCTGCTGCTT        | AGCCCCTGTT         | ACAATGTACA        | GCTAAGTACG        | TCTTTCTTGT        | CTTTCTTTCT        |                |              |
| GTGCTTTCTT        | CACTTTGATT         | TAGGCTAAAA        | TGTCAGTTAT        | TCAAAGGCC         | CTAAATATTG        |                |              |
| CCAAATCCAG        | TCTCATTGAG         | ATCCTGTAGA        | ATTAATATTA        | GTTTGAGTTG        | CTCTTTCAGA        |                |              |
| GAAAATGACA        | TGCAGCCCGA         | ATCATTATTC        | ACAAAGAAAA        | AGGGCCAATC        | AAGGTGAAGT        |                |              |
| GTTGCTAACA        | CTGGAAAGGT         | CTGAACAAGG        | CCTACTTTCC        | TAACAATAAC        | AACGCCTCAA        |                |              |
| GAGACTTCTCA       | GGATGAAATA         | CAACTCGAAA        | AATATAAATT        | ATAAAGCCCT        | GGACGTAAAT        |                | miR-374-3p   |
| CACAAGGAGT        | AAGAGGAGTC         | TCTGACATAT        | TGGGTAAGAT        | AGAGCCCAA         | GATTAATGGG        |                |              |
| AAAGATTCTA        | GCAAACGAAC         | AACCACAAAC        | TATCAAGCTG        | TGTAAACTTG        | TCCCAGAACC        |                |              |
| TGGGTCACAG        | TGAGAGGAGC         | AGGTGGCTCT        | GAGAAGCAAG        | ACTGCATCTG        | GCAAAATTGC        |                |              |
| AAAGAAAGAA        | ATTAGCTACT         | AGATGGCACA        | ATTGGATGAA        | CTCGAGAACC        | AGTGGTTTAT        |                | miR-182-3p   |
| GTAGATTTGA        | AAACCTCTAT         | CAATCTCTGT        | AACCATACAC        | TGTGTTTAGT        | TCTGATCTAA        |                |              |
| ATTTAATGAT        | GCTATGACTT         | AGCTTTTATA        | AATTTTATCT        | CATTGTATTC        | TTAGGAGCCT        |                | miR-590-3p   |
| CAGTCAGCAG        | AGACATGATG         | TGAATGAACG        | GACTGATTAG        | ACAAGGTTTC        | CTGAACACTG        |                | miR-124-5p   |
| AAATACAAAA        | CAAATAGAGA         | GCTTACTAGA        | GAAAATTCGT        | AGCCCGAAAA        | TTCAATTATA        |                |              |
| GAAACAAATG        | AGTGTTAGAG         | TAGATATGGT        | AAGGCCTCAG        | AGAGGTTTTA        | TTTCATGACT        |                | miR-3103-3p  |
| AACAACATGA        | CCCAAGGCAC         | CTAATCCATG        | GTGATTAGAT        | TACAAAGACA        | ATTCTAGTGC        |                |              |
| CTGGGACTAG        | AGAAATGTTT         | GTCTCCACA         | GACAAGCCTC        | ACACTTCAGT        | AATGGAATGA        | <b>Exon 5c</b> |              |
| GTAGATTTAA        | TCGGTGAGCA         | AGATGGTGGG        | AGGAGTCAAA        | ATATTTTCAT        | GCCTTCCTGT        |                |              |
| GGAACTCCAA        | AGGAAGACCA         | ACACAGTCAA        | CTAACCTGGA        | CTCTTGGTGG        | CTCTCAGAGC        |                |              |
| CTGAACAACC        | AACCAAAGAG         | CATTCATGAG        | CTAGACCTAG        | GCCTCTTTTA        | CACGTGTAGC        |                |              |
| AGATGTGCGT        | CTCCATCTTC         | ATGTGGGTCC        | CCCAACAAGT        | AAAGTAGCAG        | CTGTCTCTAA        |                |              |
| AGCTGTTGCC        | TGTCTGGCTT         | TGGTGGGAAG        | AGATGTGATT        | CGCTTAACC         | TGAAGTGACT        |                |              |
| TGATATGCAG        | GGTAGGTTGG         | ATACCCAGGG        | GGGCCCCACC        | CTTTCAGAAG        | ATGAGGGCAG        |                | miR-331-3p   |
| AGGGGAGGGT        | CTGTGTGAGG         | AGGTACAGT         | GATTAGGATA        | TATTGTAAT         | AAATAAATTA        |                | miR-342-3p   |
| ATTAATGGGA        | AAAAATCTTC         | AGGTAGTTAC        | CTGGAAAGAGA       | TGTGACTTCA        | AAAGTCCTGA        |                | miR-365-1-5p |
| TAGTTAGCAA        | ACACTTAGAG         | GAAAGTAGGC        | AGTAAACTAG        | CCCCCTCCAG        | CATCACCCCA        |                |              |
| CTAGTAAAGC        | CATGAGGAAA         | GTTACAGGGG        | AAGATATTTT        | AATACAATCA        | AAGAAAGAAT        |                |              |
| TGTTTTTTTT        | AAAATTACTG         | CATTGTTATT        | AACAGACAAA        | AAGTTGCAGC        | TAATTCGTAG        |                |              |
| GTTCAATTTG        | TGTTTGGGGA         | AAAAAATGTT        | TGTAAGCTTT        | GAGACTGTTA        | TCCTCTTGTT        |                |              |
| CCTAGAAGCT        | TTTAATGTGG         | AGAGCTATGC        | CTACATTCAA        | GAGACACTTG        | GCTATCATGT        | <b>Exon 5b</b> |              |
| <b>TAAGCCTTGA</b> | <b>TAATTAGGGC</b>  | <b>ACCAAAGGGG</b> | <b>ACAAGTGTCA</b> | <b>AATCAAGATG</b> | <b>CTGTTTTTGT</b> |                | miR-3572     |
| TTTTGTTTTT        | TGTTTTTTGT         | TTTTTCTGGT        | TCCATCAAGT        | TCTTGTAGAA        | CACTATTATG        |                |              |
| GTTAGCAATG        | CTCAATAGAC         | AATGTCAGGG        | GGTGTGACAT        | ATTTTAGATG        | TAGAAGCACT        |                |              |

|                    |                          |                     |                     |                    |                    |                |
|--------------------|--------------------------|---------------------|---------------------|--------------------|--------------------|----------------|
| ACACTGTCCT         | AACTCCATAG               | TTGGAAGAGC          | ACCTC <b>GTACT</b>  | ATCAGGCTTG         | ACAAGTCCCC         | miR-365-1-5p   |
| <b>TGCAGGCCAT</b>  | <b>CAGGCCCAA</b>         | <b>GCTGTGAATT</b>   | GATCCGCGGT          | TTAAACCTGT         | ATGAAAATAA         | miR-3101-3p    |
| GTAGCAATGT         | CTCAGAATTC               | AAGAAATTCA          | GAATTCTAAA          | ACTGATTGTT         | AATCTCTCAC         |                |
| TCCCATGCAT         | TCAAATGTGT               | CCTGAAT <b>ACA</b>  | <b>TCCACAGACA</b>   | <b>CACAAAATAC</b>  | TAAAACCTCTC        | miR-669b-5p    |
| TCTGGAAGCA         | GAGCTTGTGC               | TTCGTTTGGG          | TTTTCATTTTC         | TTTGTTTGTT         | TGTTTTGTTTG        |                |
| TTTTTGCTTTG        | TTTGAAGCCT               | AC <b>CGCTTTCT</b>  | <b>GGCTATAATT</b>   | <b>ATGAGGAAGG</b>  | CAGTCTGTGC         | miR-670-3p     |
| AGCCTTAGGG         | TATGTTTTTC               | TCTAATTTAA          | TTGCATGTTG          | CTAAGTGTTA         | GGCTTGTAATA        |                |
| <b>TGACACGTTT</b>  | <b>TTTTGTTTTG</b>        | <b>AATACAATAT</b>   | <b>GTTTGCAGAA</b>   | <b>AATAGATTTA</b>  | <b>TTTTGAAAAG</b>  | <b>Exon 5a</b> |
| GCATATACAC         | AGAACTGGGA               | GAAGCACACC          | AAAGATATTT          | TGTTACCATA         | TGGCAAATGT         |                |
| AACCATAGAG         | AGCAG <b>AGTAC</b>       | <b>CTAATGCTGG</b>   | <b>TGCCAACCCC</b>   | AGTGGCAACC         | GCTTGTGGGA         | miR-96-5p      |
| GAACATTCCA         | TGCCAATGGT               | <b>TGTATGCTGG</b>   | <b>CATCTCTTCA</b>   | TGACCAGAAG         | ATCATTGACC         | miR-300-5p     |
| TACAAGTTTG         | CCCTAGAATT               | AGAACTTGGT          | <b>TGACTGCATC</b>   | <b>ATTCCGTCTC</b>  | TGGGGCAAGA         | miR-92b-5p     |
| TTCTCTCAAT         | GA <b>AAAAAAAA</b>       | <b>AAAAAAAAACCA</b> | TAATCACTTA          | AGCTTTCTTC         | CATGGCAGAA         | miR-1196-3p    |
| AATCACCTGA         | CATTA <b>AAAGC</b>       | AGGAGTAACC          | GGGCGTGGTG          | <b>GCGCACACTT</b>  | <b>TTAATCCAG</b>   | miR-1186b      |
| CACTCGGGAG         | GCAGAGACTG               | <b>GCGGATTTCT</b>   | <b>GAGTTCGAGG</b>   | <b>CCAGC</b> CTGGT | CTACAGAGTG         | miR-378a-3p    |
| AGTTCTGGTA         | TATCATGTGT               | GGGTCCTTTG          | AAGTATTAGG          | TTTTCCCTCCA        | CTCCTTCTTG         |                |
| ACCAAATTTA         | GAAC <b>AAAAA</b>        | AAAAAATAGA          | AAGATGTTAC          | TACATGTTTA         | TAATAAAGGC         |                |
| TGGGAA <b>AACT</b> | GCTTAGTTGG               | TTATGTGCTT          | ACCTTGTAAG          | CATCCATCAT         | GCAAAAAGGC         |                |
| TGGAAATGGA         | GGTGCCCACT               | CTGGAAAGGT          | GGAAAGGCAT          | GTGTCTCTGG         | AAATTGCCAG         |                |
| CGAGCCATTC         | TGACCTAATT               | <b>GGTTGACTTG</b>   | <b>AGTTTCACAG</b>   | AGCCTGCCTC         | AAAAAGCAGT         | miR-146a-3p    |
| AGACAGCACC         | CAAGGAATGA               | CACCCAATGT          | TGTCCTCTGA          | GTTCTACATG         | CATGTGTACA         |                |
| TGTTCTCATA         | CAT <b>ACATACA</b>       | <b>CATACAAACA</b>   | <b>TACACAGAGA</b>   | GAGAGAGAGA         | GAGAGAGAGA         | miR-297a-5p    |
| GAGACGGGTG         | GACAGACAGA               | CAGATAGACA          | <b>TGCTTAAACA</b>   | <b>TGTTTCTTGC</b>  | <b>CAGGGCTGCA</b>  | miR-221-5p     |
| TTAAACACAA         | AGGGGACTGA               | <b>GTGAGTGCAC</b>   | <b>ATCAAAGGCA</b>   | TCTCGTGACT         | TCAGATGAAA         | miR-511-5p     |
| ATTGCATTGT         | ACATAAACTC               | CTCTCAAAGA          | ATAGAATGTT          | CTTCACATAA         | TCTGTCTGAT         |                |
| CACTGTGCTT         | TAGAAATACT               | ACATGCAGCT          | CCTTATCCCC          | ATATCATATC         | TAGGCTATAC         |                |
| TGTAAAATCA         | GGAAATAAGGA              | GAAATCCCAC          | CACGTCTGAT          | CCAGGCAGTG         | AGGCTTGGA          |                |
| GAAAGGATCA         | GTTCCAGACA               | CTTAGGAACA          | CTGAGATCTT          | TGCTCTGAG          | TCATAGGCTC         |                |
| CAAAATAGTTT        | TTGT <b>GTGACT</b>       | <b>CTGTTTTGAT</b>   | <b>GATTTCTCTA</b>   | ATGAATGGGG         | TTTTAAAGTC         | miR-3071-3p    |
| TATTACAAGC         | AAGGACTGAT               | CAGTTTCCAA          | AGTACCTGAA          | TCAGTTACTG         | CCTTCAGTTG         |                |
| CAACTTTAGA         | TGGAAGGAAA               | AGTGGAAAGG          | CAGCGGGGGC          | TTCAAGAAGT         | GTAATATTAA         |                |
| ATTAGCATTT         | TTATCCAGTA               | CAAATGAGTA          | CATCACTTCT          | CAAAGGTGTC         | AAAGTTAAAA         |                |
| AACATAATCT         | TTTAAATTTT               | CTCCAGCTCT          | AACACAACAA          | TCTTTCTATG         | AAAAATAACT         |                |
| AAAATTCCTT         | AAATAAACTT               | CACCTTGGAG          | CTTAAAAGCT          | TTTGAGACAT         | TTTTTTAACA         |                |
| GAGAAAAACA         | TAGCCTAGAG               | GGTATTTGCT          | AGTTGACTTC          | CTGGAAAGGT         | TATAAAATGA         |                |
| AAAAAAATA          | ACATTAGAGA               | ATCATATCTA          | TGCAATATTA          | TATATGTATG         | TACAGTATCT         |                |
| ATTGTCAACC         | ACCAACTCCA               | TGGACATGTG          | TGACTGCAGT          | GTCCTTCTGC         | TCAGAAAGAA         |                |
| GCTTGGGTGT         | ATAGTTCTGG               | TGGTGACGTC          | TCATCAAGAG          | CTCATCACCG         | ATCTGAGGAG         |                |
| GACAAGAAGT         | CAAGAAACCA               | GCAGAACCAC          | CAACACAGTC          | GTGAAATCCC         | CTTACTCTGT         |                |
| GCCTCACAGC         | ACAACACAGG               | GAGGCCAGAC          | CACAGGCAA           | CATGGTGAGC         | TGCACCACTG         |                |
| CCTGAGAACC         | CAGAGCAACG               | GGCCCCATAT          | ATTTTATAGC          | AAACAATAAA         | TAGCTTGATC         |                |
| TTCCTTCCCT         | AAGAACAAGC               | ACCCCAAAGT          | AGTCCCCTTG          | TAGTCCCTCCT        | GTGACTGGAC         |                |
| AATGACAGTT         | CAAAACTGAC               | TAGCAGTAGA          | AACTATTCAG          | AATCAATAAG         | ATCTGCAACC         |                |
| TCACTCAGTA         | AGCAAAGCTA               | GGCAGAGATG          | CTCACTGTAT          | ATCTCCCCCA         | GCTTCACCTG         |                |
| TCAATCTGCC         | <b>TTCTTAGCCA</b>        | <b>TGCATGTTTA</b>   | <b>CATGGTTGTG</b>   | CCATCCCATC         | AACA <b>ACTGAG</b> | miR-30e-5p     |
| ATTAGGTGTT         | TGTA <b>AAATGCT</b>      | CAGACCAGAT          | CTGCCCCCAC          | TTTTTTTCAA         | TCAATGATTG         |                |
| ATTAGAATTA         | CTATCAACAG               | AAGGTCATTG          | ACAAGATGAG          | ATTGATGTAC         | AGTATCAAGC         |                |
| TTAACTGTGC         | ACTACATCAC               | ATGAGACGGA          | TGCAACTAAG          | TCCCAGAGAA         | GACCAAAAGT         |                |
| CTAATTACAG         | AAAACCACCT               | GGACTCTTTG          | CTCATCATT           | GCATAAATTA         | AGCCAGCATG         |                |
| CTGTGGGTAC         | TAATCCAAA                | ACAGAAGCAT          | TTGGAAGCCA          | TATCTGCCTT         | CCACCATGTT         |                |
| CATCCAGACT         | ATGGATTAAG               | ACCAAACAGA          | <b>GATTCATCTA</b>   | <b>TCATCAGAGA</b>  | <b>GTACAGACTT</b>  | miR-1896       |
| ACCTGCCGAT         | TTTTGTGGCT               | CTTTCCATCT          | CATTGGCTAT          | AGCTCATAGA         | GTGAAAGATA         |                |
| GCTTTCTGAG         | CTTTCTCTAG               | GTTTGA <b>ACTC</b>  | TGAT <b>TGGAAGG</b> | <b>GACAGTGTTC</b>  | <b>ACAGTCAGTA</b>  | miR-679-5p     |
| CTATATAGAA         | GTAGGAAACC               | ATATAAACAC          | TGATATCCTC          | AGTATCCCTG         | CGGTCTCAAT         |                |
| <b>AAAGAAAACA</b>  | <b>TCTACAAAGT</b>        | <b>GTGCCATTGC</b>   | CACTGATGGT          | GGGTAATTTA         | AAATGAACCT         | miR-3470a      |
| <b>AGGTATGGGG</b>  | <b>AGATGGTTCA</b>        | <b>ATGCATAAAG</b>   | TGCTTGCTAG          | ACCAGGCATG         | ACTACCCGAG         | miR-434-3p     |
| TACCCATGTT         | <b>AAA<b>ACTAGGC</b></b> | <b>CCGACAGGGT</b>   | <b>ACATTTGAAA</b>   | TCCTATCACT         | AGAGGGGAGG         | miR-10b-5p     |
| AACACACACA         | GGAAGACTTC               | TCAAGTTCAC          | TGCCACCAAG          | CTTAACCAAG         | CCAGTGAAC          |                |
| TAGGACTCAA         | TAAGAGACCA               | TGTCT <b>CAAAA</b>  | <b>ATAGAGCAGC</b>   | <b>AAGCCATAGA</b>  | AGAAATTAAC         | miR-135a-5p    |
| ATGTTGATCT         | GATTTCTACA               | <b>TGCATGAGCA</b>   | <b>TACACACAAA</b>   | <b>AATTAATAAG</b>  | CCCAAGAGCA         | miR-669a-5p    |
| GCAATCCTGC         | CCTTGACAT                | AAACCATATG          | GGCATTTTTG          | TCTTTTATAT         | AAATATACAA         |                |
| CAAAATGGGC         | ATATCACCCC               | TGTTGGGATT          | <b>CACTGAAACT</b>   | <b>TGATTTAGAT</b>  | TGCTATTGCA         | miR-551b-5p    |
| TTGGTTTGGC         | TAAGCCAGAT               | GGCCACAGTC          | ACCCAGTGGC          | TATTGTCTAG         | ACACTAGACA         |                |

|                    |                    |                   |                   |                   |                     |                              |
|--------------------|--------------------|-------------------|-------------------|-------------------|---------------------|------------------------------|
| TTATATAACC         | CCAGGGCAAT         | TAGGTGTCAC        | AAGAAGCCTA        | AGAGTAGTCA        | TGAGCTTAAG          | miR-1929-3p                  |
| TAACAAGGAG         | GCCTCTCTGT         | GAGTTCACGT        | GCACAGTGAT        | TCATTGTCTA        | GAGATGCCTC          |                              |
| TCGTAGCATC         | AGGTACAGCG         | GGATAATGTG        | GGCCAAGCCT        | GCCAACAGCA        | GACTTCTTCT          |                              |
| GTTCA <b>CACCG</b> | <b>CAGGTGGACA</b>  | <b>GAGGTGGTGA</b> | ACGCAGCAAC        | AGCACCATTA        | ACAGGTGC            | miR-1968-3p                  |
| ACTTATTTCT         | GGTGAGTCAT         | GAGTTTGCTC        | AGCCAGACAG        | AAGCTGTAAG        | ATAACAGGGA          |                              |
| TGGTATTATT         | TCTTCCCTAT         | ACCTTCAGGG        | TCCAAACAGT        | TCCTTCCACG        | AATAAAGTGG          |                              |
| TTAGTGTGAG         | GGGACAGAGC         | ATATGGGTTC        | AGAATCCCAA        | GGGGTATTTT        | TGGTTAGAGG          |                              |
| CTGACTCCCT         | TCCCAGAGAC         | CTGTAATTCA        | AAGGAGGCTT        | CTGGCTGATC        | TTTTGGGATA          |                              |
| GCCTCCAATG         | CTACCTGATC         | CTTTTTTTTT        | CCTAGCCAAA        | TTTGATGAAA        | CTCCCATTTA          |                              |
| AGTCAACATG         | CCGATGCAA          | AGATCACACC        | TGAATACTGC        | CTCTAAAAGC        | CAGGTTTCCT          |                              |
| CTTTTCTGAT         | AGTGCAAGCC         | AAGCGTAGAC        | <b>AATGTCGTCA</b> | <b>CTGTTTTCTC</b> | <b>TAGGGTTGGG</b>   | miR-652-5p                   |
| CCATACCTTT         | TTTGCAAATG         | GTTCTGACAT        | GAATGGTTGG        | ACATTGTGTC        | TTATCAGAGC          |                              |
| TAACGAGCTT         | CTCAAGACTT         | TTATTGAAAC        | CCATAAACAT        | AAAACCATCA        | ATGTAATGAC          |                              |
| ACCAGATCAG         | CTTCAGAAGA         | ACTGCATTGG        | CTTGTGTTTT        | GATCTCCCAT        | ATGGTGGCAA          |                              |
| ATATCAGGAG         | AATTCAAATA         | GTA               | CTACTCAGAG        | GCTAAAGAAA        | TGGCTGAATG          | GCTAAGACCA                   |
| CGTACTGCAC         | TTACAAAGGA         | CCTATGCTTA        | GTTCTGAGAA        | CCCAGAAGGA        | CTGACTCAGA          |                              |
| ATTGTCTGTA         | ACCCAGCTGC         | AGGAGCATT         | AATGCCTTTT        | ACCTTTGTAA        | ACACCTCCAC          |                              |
| TAATGTGCAC         | ATCAAACACA         | <b>CACACACACA</b> | <b>CACACACACA</b> | <b>CACACACACA</b> | <b>CACACACACA</b>   | miR-574-5p                   |
| <b>CACACATACA</b>  | <b>CACATAGACA</b>  | <b>CATACACACA</b> | <b>AGTGATTATA</b> | <b>ATAATAATTA</b> | <b>ATAATAATGA</b>   | miR-4661-5p                  |
| TGACAAATAA         | TGCCTCAGCT         | GCACAATAAC        | ATTATGTGGT        | GCTTGTGAGA        | GAAAATAATT          |                              |
| TTGACAACCA         | ATAGAATTAA         | GAAAAATAGA        | AGATGGAATT        | GTAGAAATTT        | GAGTAAGAAC          |                              |
| AGACCTGCTC         | CTTAGGTGCA         | TATATTTGAA        | CTCTTGGTAC        | CTGGTTGGTG        | GAATTTTGGG          |                              |
| GGGAAGGATT         | ATAAGGTAGT         | GTTATCTTGA        | TGGAGGAGGT        | GTCTCCCTGG        | AGTCTCTCTC          |                              |
| TCTCTCCCTC         | <b>TTTCTCTGTC</b>  | <b>TCTCTCCCTC</b> | <b>CCTCCCTCCC</b> | <b>TCCCTCCCTC</b> | <b>TCTCATCCCC</b>   | miR-149-3p                   |
| <b>CTCCCTCTCT</b>  | <b>CTCTCCCTCC</b>  | <b>CTCACTCTCT</b> | <b>CTCCCTCCCT</b> | <b>TCCTTCCCTC</b> | <b>CCTCCCTCCC</b>   | miR-149-3p/miR-1493p         |
| TCTCTCTCTC         | <b>CCTCTCTCTT</b>  | <b>TCTCCCTCCC</b> | <b>TCCCTCCCTC</b> | TCTCTATGCC        | TCTCTCTCCC          | miR-149-3p                   |
| TCCTTCCCTC         | <b>TCTCTCTCTC</b>  | <b>CCTTTCTCTC</b> | <b>CCCCCTCCCT</b> | <b>CCTTCCCCCC</b> | <b>CTCCCTCTGC</b>   | miR-185-5p/miR-149-3p        |
| TTCTCTGTTG         | <b>AGGATCAGAT</b>  | <b>CTAAGCTCTC</b> | ACCTACTGCT        | CCACTGCCCA        | TGTGCCTGTT          | miR-27b-5p                   |
| ACCACGCTCC         | CTACCATGCT         | GTTGATAGAC        | TCATCCTCTG        | AAACTATAAA        | CAAGCCCATG          |                              |
| ATAAACACTT         | <b>TCTTTTCATAA</b> | <b>GTTCCCTTGG</b> | TTGTGATGTC        | TCTTCAGGGC        | AACAGAACAG          | miR-1894-3p                  |
| TAACTAAGAC         | AGAAGTCCCA         | CATGGCCTAG        | CAAGTGCTGT        | CATAGTTAGT        | TGATCCATTT          |                              |
| <b>ACATTACAG</b>   | <b>TGCCCAGAAC</b>  | <b>TGCAGGCTGT</b> | AGTCTGGAGC        | <b>AGCCAATGCT</b> | ATCACATCAA          | miR-17-3p                    |
| CTGAATTGAG         | TTGGCAATCA         | TCCACTGTAA        | GCCTCCAATT        | CCATTAGCTT        | TCTGTCGCTG          |                              |
| GCCTCATTGA         | GTGATTATAT         | TAAGATGTTG        | CATTTTTTCAT       | TAGTCTTGCT        | GTGTTTGGAT          |                              |
| CCATTGAGCA         | AGACTGTGGC         | TTCCTCTTCT        | CTTCCTAGAA        | CTCTAGATTA        | GTTCCTTTTA          |                              |
| ACACAGAAGA         | GAGCCCAAAG         | ATGCGCTATG        | ACCTCCTTGC        | TATGACCTCC        | TTGCCCGTCT          |                              |
| CCTACAGTCA         | TCTCTTTGCA         | AAATGCCTTG        | <b>AATATCTTAT</b> | <b>GCATTTACAA</b> | <b>AACAAGCATG</b>   | miR-669b-5p                  |
| TCAATTATCA         | GTAGAAAAGG         | GGACAGTGGT        | GCTTAGCAAG        | GGATCCAATT        | AGCCTCTCTT          |                              |
| ACTCCAGATC         | <b>CTAGTGTACT</b>  | <b>ATTGACAGTC</b> | <b>CATATGACTA</b> | TATGCACAGC        | CCTAGCCCCA          | miR-489-5p                   |
| CCAGAGAACC         | TAGTGCTTAG         | TGACCCCAA         | CCCCTCTCAC        | CTATCTCCAC        | TGTA <b>CT</b> CATG |                              |
| GAATGAGTCC         | <b>CCTGATCTTC</b>  | <b>CAAGTTCAGC</b> | AAGAAAGGCT        | ATAAAAGAGC        | AATTACTCTA          | miR-345-3p                   |
| AGACAGACAA         | GCATCATTTT         | CTAGCTCTTT        | TGGTGATCTC        | CACAAAAGAA        | CTTGTCCCAC          |                              |
| AAAAGCAAGG         | CTTTCACCCA         | TGAGAGCCAT        | <b>CTTTTCTTCA</b> | <b>GAGCATGAGC</b> | <b>CTCCTCGCAT</b>   | miR-3079-3p                  |
| GATGTCTGGA         | CTGAGCTAGA         | GATTATCT          | <b>AA ATAAA</b>   | CTTTGGTCAT        | CC <b>CAGG</b> CCTC | <b>poly(A)/cleavage site</b> |
| GTGTGGTTCA         | CTGCCTTTCC         | TTGGGTGTTT        | TTGAAAGGAG        | TTGGTCTTTC        | TCATACTGAC          |                              |
| CTCTGTATTG         | GATTCCAGGG         | GTGTCACATG        | ACTTAAAGAG        | TAGTGCCTTT        | CTCCTGGGCA          |                              |