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BIOTECH CORP.

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## **Favorgen Biosettia<sup>™</sup> Human Lenti-miRNA Collection**

**1 ml lentiviral stock  
for specific miRNA expression**

**Catalog number: FA-mir-LV###**

**August 2008**

**Amount: 1 ml / vial**

**Storage Temperature: -70°C**

**User Manual**

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## Product Description

Human microRNA (hsa-miRNA) precursors and approximately 100bp upstream and downstream flanking genomic sequences were PCR amplified and cloned into a self-inactivated (SIN) lentiviral vector to generate a lenti-miRNA collection (Fig. 1). The cloning site of pre-miRNA genomic fragments is within the intron of human EF1 $\alpha$  promoter region. The miRNA lentiviral stock was prepared by cotransfecting HEK 293T cells with the lenti-miRNA vector and plasmids expressing Gag-Pol gene products and the vesicular stomatitis virus envelope G (VSV-G). The lentiviral supernatants were collected at 48 hours post transfection and stored at -70°C. The titer of the virus is generally above  $5 \times 10^6$  infection units per ml (IU/ml).

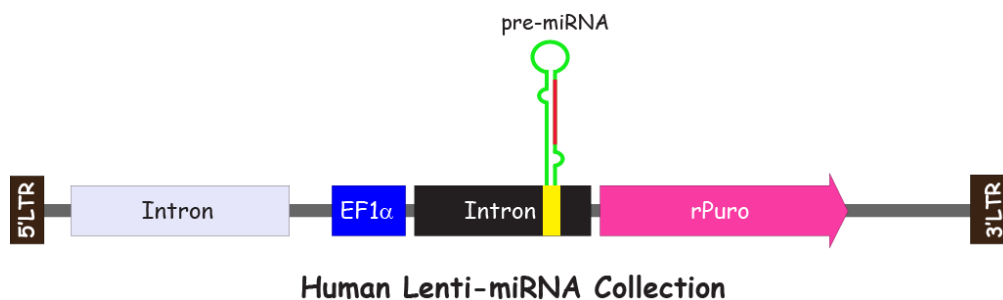


Figure 1. Human miRNA lentiviral expression system.

## Advantages of the Product

1. The lenti-miRNA is a ready-to-use lentiviral stock
2. Lentiviral transduction is one of the most effective delivery system to express miRNA, shRNA, cDNA and etc. Unlike the retroviral system, the lentiviral integration is cell cycle independent. The genetic materials encoded by the lentivirus can be efficiently delivered into both dividing and non-dividing cells.
3. The lenti-miRNA viral genome is integrated into the host chromosome, thus the miRNA is stably expressed in transduced cell lines.
4. The human EF1 $\alpha$  promoter it is unlikely to be silenced in cells. It has been reported that the activities of some viral promoters such as CMV and SV40 are potentially silenced by DNA methylation after a period of time. The human EF1 $\alpha$  promoter, used to express miRNA precursors and the puromycin selection marker, is a house-keeping gene promoter. Therefore, it is unlikely to be silenced by methylation *in vitro* and *in vivo*.
5. The rPuro gene product, expressed from the EF1 $\alpha$  promoter, is the red fluorescent puromycin-N-acetyltransferase. The model cells transduced by lenti-miRNA can not only be selected in the presence of puromycin in the medium, but also display red fluorescence at excitation/emission wavelengths of 587/610 nm (Fig. 2).
6. Each individual miRNA in Favorgen Biosettia™ human lentiviral collection was cloned from its native context, including the stem-loop precursor sequence and approximately 100bp upstream and downstream flanking sequences. This ensured that the miRNA was properly expressed and processed, and would function similarly to its endogenous form (Fig. 3).

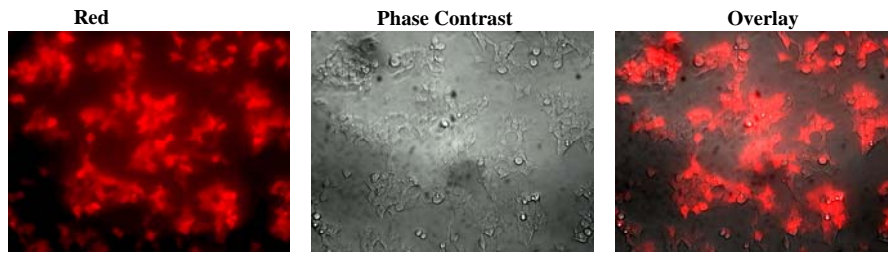


Figure 2. Microscopy images of 293T cells transduced with hsa-mir-24-1

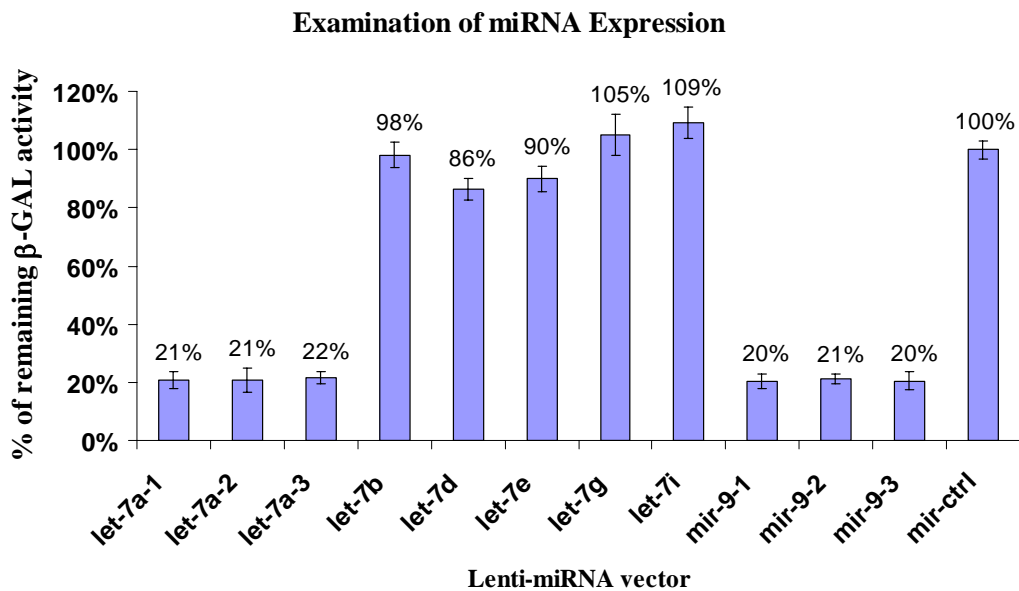


Figure 3. Examination of miRNA expression. To examine the expression and efficacy of mature miRNAs, a 42-bp DNA oligonucleotide (aactatacaacctactacacagctagataaccaaga) containing sequences complementary to both mature hsa-let-7a (tgaggtagtaggtgtatagtt) and hsa-mir-9 (tccttggtatctagctgtatga) were inserted into the 3' end of the  $\beta$ -galactosidase gene to serve as RNAi target. The  $\beta$ -galactosidase activity is suppressed when either mature let-7a or mir-9 miRNAs is present and targeted to the  $\beta$ -galactosidase fusion mRNA. The  $\beta$ -galactosidase activity is not suppressed by the other let-7 miRNAs that do not perfectly match the inserted target sequence (e.g. let-7b, d, e, g and i). The mir-ctrl, a lentiviral vector without miRNA insertion, is used as negative control.

## Protocol

**Lentiviral Transduction for Functional Analysis.** This protocol may be used with 96-well, 48-well, 24-well, 12-well and 6-well plates.

Day 0: Seed cells at appropriate density.

Suggestion: Plate cells so that cell density will be ~10-25% confluent at the time of transduction.

Day 1: Transduction. Remove the medium from the tissue culture plate by aspiration and replace it with fresh complete medium containing 5-8 µg/ml polybrene. Gently mix lentivirus with 1ml pipette tip, and add appropriate amount of virus to each well.

Note: Transduction efficiency varies in different cell lines, and polybrene may be toxic to some cell lines.

Suggestion: Add 1-10 µl lentivirus per 1,000 cells.

Optional: Spin transduction ( $1,000 \times g$  for 30 min at room temperature) helps increase of transduction efficiency.

Day 2: Replace the transduction medium with fresh complete medium to remove lentivirus and polybrene.

Day 3-4: Select transduced cells (>50% confluence is recommended) with medium containing puromycin.

Note: The optimal puromycin concentration varies from cell line to cell line (ranging from 0.5 to 5 µg/ml).

Suggestion: A pilot experiment should be performed to determine the minimum concentration of puromycin required to kill the untransduced cells before this experiment.

Day 6+: Assay transduced cells.

Suggestion: Expand the culture of cell lines stably expressing miRNA and store the cell line stocks in liquid nitrogen before analyzing the cells.

Note: We have noticed that the level of rPuro gene expression may vary among different cell lines. Therefore, please keep in mind that the red fluorescence may provide a general idea whether the model cells are transduced, but may not quantitatively reflect the percentage of cells transduced by Lenti-miRNA. It is highly recommended to determine the transduction efficiency by puromycin selection, since in some cells, the expression level of red fluorescent puromycin-N-acetyl-transferase is enough to render the cells resistant to puromycin, but not enough for the cells to display detectable red fluorescence.

**Optional: Determining Lentiviral Titer in the Cell Line of Your Choice.** Follow the protocol below if you wish to determine multiplicity of infection (MOI) to control the copy number of Lenti-miRNA genome integrated into the chromosomes of the cells of interest.

Day 0: Seed the cell of your choice in a 6-well plate so that the cell density that will be ~25-50% confluent at the time of transduction.

Day 1: Thaw lentiviral stock, gently mix virus with 1ml pipette tip and then prepare 2 ml 10-fold serial dilutions ranging from  $10^{-3}$  to  $10^{-7}$  in complete medium containing 5-8 µg/ml polybrene.

Remove the medium from previous day and add 1 ml fresh dilutions into each well.

Suggestion: Leave one well for mock control

Day 2: Replace the medium containing virus and polybrene with 2 ml of complete medium.

Day 3-4: Replace medium with fresh medium containing puromycin to select for stably transduced cells.

Note: At least 48 hours of transduction allows lenti-miRNA to integrate into the host genome.

The optimal puromycin concentration varies from cell line to cell line (range 0.5-5 µg/ml).

Suggestion: A pilot experiment should be performed to determine the minimum concentration of puromycin required to kill the untransduced cells before this experiment.

Day 5-6: Replace medium with 2 ml fresh medium containing puromycin every 2 days.

Day 7-8: Allow puromycin-resistant colonies to form in dilution wells. No live cells should be growing in the mock well.

Note: The number of days required for the formation of visible colonies may vary among different cell lines.

Wash wells twice with 2 ml PBS

Stain cells with 1 ml 0.5% crystal violet solution in 20% ethanol and incubate for 30 minutes at room temperature.

Wash wells with distilled water by submerging the plate in a tray full of water, and repeat wash one more time.

Dry the plate and count the number of blue-stained colonies.

The titer should be the average colony number times the dilution factor.

**Safety Guidelines for Working with Lenti-miRNA.** The recombinant lentiviruses have been designated as Level 2 organisms by NIH and CDC. A Biosafety Level 2 (BSL-2) facility is required in order to work with lentiviruses. The information of Biosafety in Microbiological and Biomedical Laboratories (BMBL) can be downloaded from the following link:

[http://www.cdc.gov/od/ohs/biosfty/bmb15/BMBL\\_5th\\_Edition.pdf](http://www.cdc.gov/od/ohs/biosfty/bmb15/BMBL_5th_Edition.pdf)

**Please be aware that you are working with media containing infectious virus which could infect human cells.**

### **Favorgen Biosettia™ Lenti-miRNA Collection**

Favorgen Biosettia™ Lenti-miRNA collection includes 93% of miRNAs (497 miRNAs) listed in release 10.0 of Sanger's miRBase sequence database.

### General References

Burns, J. C., Friedmann, T., Driever, W., Burrascano, M., and Yee, J.-K. (1993) Vesicular Stomatitis Virus G Glycoprotein Pseudotyped Retroviral Vectors: Concentration to a Very High Titer and Efficient Gene Transfer into Mammalian and Nonmammalian Cells. *Proc. Natl. Acad. Sci. USA* 90, 8033-8037

Coffin, J. M., Hughes, S. H. & Varmus, H. E., eds. (1997) *Retroviruses*, Cold Spring Harbor Laboratory Press (Cold Spring Harbor, NY).

Dull, T., Zufferey, R., Kelly, M., Mandel, R. J., Nguyen, M., Trono, D., and Naldini, L. (1998) A Third-Generation Lentivirus Vector with a Conditional Packaging System. *J. Virol.* 72, 8463-8471

Huang Q, Gumireddy K, Schrier M, le Sage C, Nagel R, Nair S, Egan DA, Li A, Huang G, Klein-Szanto AJ, Gimotty PA, Katsaros D, Coukos G, Zhang L, Puré E, and Agami, R. (2008) The microRNAs miR-373 and miR-520c promote tumour invasion and metastasis. *Nat Cell Biol.* 10, 202-10.

Johnson, S. M., H. Grosshans, J. Shingara, M. Byrom, R. Jarvis, A. Cheng, E. Labourier, K. L. Reinert, D. Brown and F. J. Slack (2005). RAS is regulated by the let-7 microRNA family. *Cell* 120, 635-47.

Ma, L., Teruya-Feldstein, J., Weinberg, R. A. (2007) Tumour invasion and metastasis initiated by microRNA-10b in breast cancer. *Nature* 449, 682–688.

Naldini, L. (1998) Lentiviruses as Gene Transfer Agents for Delivery to Non-dividing Cells. *Curr. Opin. Biotechnol.* 9, 457-463

Naldini, L., Blomer, U., Gage, F. H., Trono, D., and Verma, I. M. (1996) Efficient Transfer, Integration, and Sustained Long-Term Expression of the Transgene in Adult Rat Brains Injected with a Lentiviral Vector. *Proc. Natl. Acad. Sci. USA* 93, 11382-11388

Shin, K. J., E. A. Wall, J. R. Zavzavadjian, L. A. Santat, J. Liu, J. I. Hwang, R. Rebres, T. Roach, W. Seaman, M. I. Simon and I. D. Fraser (2006). A single lentiviral vector platform for microRNA-based conditional RNA interference and coordinated transgene expression. *Proc Natl Acad Sci U S A* 103, 13759-64.

Stegmeier, F., G. Hu, R. J. Rickles, G. J. Hannon and S. J. Elledge (2005). A lentiviral microRNA-based system for single-copy polymerase II-regulated RNA interference in mammalian cells. *Proc Natl Acad Sci U S A* 102, 13212-7.

Voorhoeve PM, le Sage C, Schrier M, Gillis AJ, Stoop H, Nagel R, Liu YP, van Duijse J, Drost J, Griekspoor A, Zlotorynski E, Yabuta N, De Vita G, Nojima H, Looijenga LH, and R Agami, R. (2006). A genetic screen implicates miRNA-372 and miRNA-373 as oncogenes in testicular germ cell tumors. *Cell* 124, 1169–1181

Zufferey, R., Dull, T., Mandel, R. J., Bukovsky, A., Quiroz, D., Naldini, L., and Trono, D. (1998) Self-inactivating Lentivirus Vector for Safe and Efficient *in vivo* Gene Delivery. *J. Virol.* 72, 9873-9880.

List of Lenti-miRNA (1 ml / vial)

miRNA	Catalog #
<a href="#">hsa-let-7a-1</a>	FA-mir-LV001
<a href="#">hsa-let-7a-2</a>	FA-mir-LV002
<a href="#">hsa-let-7a-3</a>	FA-mir-LV003
<a href="#">hsa-let-7b</a>	FA-mir-LV004
<a href="#">hsa-let-7c</a>	FA-mir-LV005
<a href="#">hsa-let-7d</a>	FA-mir-LV006
<a href="#">hsa-let-7e</a>	FA-mir-LV007
<a href="#">hsa-let-7f-1</a>	FA-mir-LV008
<a href="#">hsa-let-7f-2</a>	FA-mir-LV009
<a href="#">hsa-let-7g</a>	FA-mir-LV010
<a href="#">hsa-let-7i</a>	FA-mir-LV011
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miRNA	Catalog #
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<a href="#">hsa-mir-301b</a>	FA-mir-LV485
<a href="#">hsa-mir-302a</a>	FA-mir-LV187
<a href="#">hsa-mir-302b</a>	FA-mir-LV188
<a href="#">hsa-mir-302c</a>	FA-mir-LV189
<a href="#">hsa-mir-302d</a>	FA-mir-LV190
<a href="#">hsa-mir-320a</a>	FA-mir-LV191
<a href="#">hsa-mir-323</a>	FA-mir-LV192

miRNA	Catalog #
<a href="#">hsa-mir-324</a>	FA-mir-LV193
<a href="#">hsa-mir-325</a>	FA-mir-LV194
<a href="#">hsa-mir-326</a>	FA-mir-LV195
<a href="#">hsa-mir-328</a>	FA-mir-LV196
<a href="#">hsa-mir-329-1</a>	FA-mir-LV197
<a href="#">hsa-mir-329-2</a>	FA-mir-LV198
<a href="#">hsa-mir-330</a>	FA-mir-LV199
<a href="#">hsa-mir-331</a>	FA-mir-LV200
<a href="#">hsa-mir-335</a>	FA-mir-LV201
<a href="#">hsa-mir-337</a>	FA-mir-LV202
<a href="#">hsa-mir-338</a>	FA-mir-LV203
<a href="#">hsa-mir-339</a>	FA-mir-LV204
<a href="#">hsa-mir-340</a>	FA-mir-LV205
<a href="#">hsa-mir-342</a>	FA-mir-LV206
<a href="#">hsa-mir-345</a>	FA-mir-LV207
<a href="#">hsa-mir-346</a>	FA-mir-LV208
<a href="#">hsa-mir-361</a>	FA-mir-LV209
<a href="#">hsa-mir-362</a>	FA-mir-LV210
<a href="#">hsa-mir-363</a>	FA-mir-LV211
<a href="#">hsa-mir-365-1</a>	FA-mir-LV212
<a href="#">hsa-mir-365-2</a>	FA-mir-LV213
<a href="#">hsa-mir-367</a>	FA-mir-LV214
<a href="#">hsa-mir-369</a>	FA-mir-LV216
<a href="#">hsa-mir-370</a>	FA-mir-LV217
<a href="#">hsa-mir-371</a>	FA-mir-LV218
<a href="#">hsa-mir-372</a>	FA-mir-LV219
<a href="#">hsa-mir-373</a>	FA-mir-LV220
<a href="#">hsa-mir-374a</a>	FA-mir-LV221
<a href="#">hsa-mir-374b</a>	FA-mir-LV486
<a href="#">hsa-mir-375</a>	FA-mir-LV222
<a href="#">hsa-mir-376a-1</a>	FA-mir-LV223
<a href="#">hsa-mir-376a-2</a>	FA-mir-LV224
<a href="#">hsa-mir-376b</a>	FA-mir-LV225
<a href="#">hsa-mir-376c</a>	FA-mir-LV215
<a href="#">hsa-mir-377</a>	FA-mir-LV226
<a href="#">hsa-mir-378</a>	FA-mir-LV227
<a href="#">hsa-mir-379</a>	FA-mir-LV228
<a href="#">hsa-mir-380</a>	FA-mir-LV229
<a href="#">hsa-mir-381</a>	FA-mir-LV230
<a href="#">hsa-mir-382</a>	FA-mir-LV231

miRNA	Catalog #
<a href="#">hsa-mir-383</a>	FA-mir-LV232
<a href="#">hsa-mir-384</a>	FA-mir-LV233
<a href="#">hsa-mir-409</a>	FA-mir-LV234
<a href="#">hsa-mir-410</a>	FA-mir-LV235
<a href="#">hsa-mir-411</a>	FA-mir-LV236
<a href="#">hsa-mir-412</a>	FA-mir-LV237
<a href="#">hsa-mir-421</a>	FA-mir-LV238
<a href="#">hsa-mir-422a</a>	FA-mir-LV239
<a href="#">hsa-mir-423</a>	FA-mir-LV240
<a href="#">hsa-mir-424</a>	FA-mir-LV241
<a href="#">hsa-mir-425</a>	FA-mir-LV242
<a href="#">hsa-mir-429</a>	FA-mir-LV243
<a href="#">hsa-mir-431</a>	FA-mir-LV244
<a href="#">hsa-mir-432</a>	FA-mir-LV245
<a href="#">hsa-mir-433</a>	FA-mir-LV246
<a href="#">hsa-mir-448</a>	FA-mir-LV247
<a href="#">hsa-mir-449a</a>	FA-mir-LV248
<a href="#">hsa-mir-449b</a>	FA-mir-LV249
<a href="#">hsa-mir-450a-1</a>	FA-mir-LV250
<a href="#">hsa-mir-450a-2</a>	FA-mir-LV251
<a href="#">hsa-mir-450b</a>	FA-mir-LV487
<a href="#">hsa-mir-451</a>	FA-mir-LV252
<a href="#">hsa-mir-452</a>	FA-mir-LV253
<a href="#">hsa-mir-453</a>	FA-mir-LV254
<a href="#">hsa-mir-454</a>	FA-mir-LV255
<a href="#">hsa-mir-455</a>	FA-mir-LV256
<a href="#">hsa-mir-483</a>	FA-mir-LV257
<a href="#">hsa-mir-484</a>	FA-mir-LV258
<a href="#">hsa-mir-485</a>	FA-mir-LV259
<a href="#">hsa-mir-486</a>	FA-mir-LV260
<a href="#">hsa-mir-487a</a>	FA-mir-LV261
<a href="#">hsa-mir-487b</a>	FA-mir-LV262
<a href="#">hsa-mir-488</a>	FA-mir-LV263
<a href="#">hsa-mir-489</a>	FA-mir-LV264
<a href="#">hsa-mir-490</a>	FA-mir-LV265
<a href="#">hsa-mir-491</a>	FA-mir-LV266
<a href="#">hsa-mir-492</a>	FA-mir-LV267
<a href="#">hsa-mir-493</a>	FA-mir-LV268
<a href="#">hsa-mir-494</a>	FA-mir-LV269
<a href="#">hsa-mir-495</a>	FA-mir-LV270

miRNA	Catalog #
<a href="#">hsa-mir-496</a>	FA-mir-LV271
<a href="#">hsa-mir-497</a>	FA-mir-LV272
<a href="#">hsa-mir-498</a>	FA-mir-LV273
<a href="#">hsa-mir-499</a>	FA-mir-LV274
<a href="#">hsa-mir-500</a>	FA-mir-LV275
<a href="#">hsa-mir-501</a>	FA-mir-LV276
<a href="#">hsa-mir-502</a>	FA-mir-LV277
<a href="#">hsa-mir-503</a>	FA-mir-LV278
<a href="#">hsa-mir-504</a>	FA-mir-LV279
<a href="#">hsa-mir-505</a>	FA-mir-LV280
<a href="#">hsa-mir-506</a>	FA-mir-LV281
<a href="#">hsa-mir-507</a>	FA-mir-LV282
<a href="#">hsa-mir-508</a>	FA-mir-LV283
<a href="#">hsa-mir-509-1</a>	FA-mir-LV284
<a href="#">hsa-mir-509-2</a>	FA-mir-LV488
<a href="#">hsa-mir-509-3</a>	FA-mir-LV489
<a href="#">hsa-mir-510</a>	FA-mir-LV285
<a href="#">hsa-mir-511-2</a>	FA-mir-LV287
<a href="#">hsa-mir-512-1</a>	FA-mir-LV288
<a href="#">hsa-mir-512-2</a>	FA-mir-LV289
<a href="#">hsa-mir-513a-1</a>	FA-mir-LV290
<a href="#">hsa-mir-514-2</a>	FA-mir-LV293
<a href="#">hsa-mir-514-3</a>	FA-mir-LV294
<a href="#">hsa-mir-515-1</a>	FA-mir-LV295
<a href="#">hsa-mir-516a-1</a>	FA-mir-LV297
<a href="#">hsa-mir-516b-2</a>	FA-mir-LV299
<a href="#">hsa-mir-517a</a>	FA-mir-LV301
<a href="#">hsa-mir-517c</a>	FA-mir-LV303
<a href="#">hsa-mir-518b</a>	FA-mir-LV306
<a href="#">hsa-mir-518c</a>	FA-mir-LV307
<a href="#">hsa-mir-519a-2</a>	FA-mir-LV312
<a href="#">hsa-mir-519c</a>	FA-mir-LV314
<a href="#">hsa-mir-520b</a>	FA-mir-LV318
<a href="#">hsa-mir-520c</a>	FA-mir-LV319
<a href="#">hsa-mir-520e</a>	FA-mir-LV321
<a href="#">hsa-mir-520f</a>	FA-mir-LV322
<a href="#">hsa-mir-520h</a>	FA-mir-LV324
<a href="#">hsa-mir-523</a>	FA-mir-LV328
<a href="#">hsa-mir-524</a>	FA-mir-LV329
<a href="#">hsa-mir-525</a>	FA-mir-LV330

miRNA	Catalog #
<a href="#">hsa-mir-526a-2</a>	FA-mir-LV332
<a href="#">hsa-mir-527</a>	FA-mir-LV334
<a href="#">hsa-mir-532</a>	FA-mir-LV335
<a href="#">hsa-mir-539</a>	FA-mir-LV336
<a href="#">hsa-mir-541</a>	FA-mir-LV490
<a href="#">hsa-mir-542</a>	FA-mir-LV337
<a href="#">hsa-mir-543</a>	FA-mir-LV491
<a href="#">hsa-mir-544</a>	FA-mir-LV338
<a href="#">hsa-mir-545</a>	FA-mir-LV339
<a href="#">hsa-mir-548a-1</a>	FA-mir-LV340
<a href="#">hsa-mir-548a-2</a>	FA-mir-LV341
<a href="#">hsa-mir-548a-3</a>	FA-mir-LV342
<a href="#">hsa-mir-548b</a>	FA-mir-LV343
<a href="#">hsa-mir-548c</a>	FA-mir-LV344
<a href="#">hsa-mir-548d-1</a>	FA-mir-LV345
<a href="#">hsa-mir-548d-2</a>	FA-mir-LV346
<a href="#">hsa-mir-549</a>	FA-mir-LV347
<a href="#">hsa-mir-550-1</a>	FA-mir-LV348
<a href="#">hsa-mir-550-2</a>	FA-mir-LV349
<a href="#">hsa-mir-551a</a>	FA-mir-LV350
<a href="#">hsa-mir-551b</a>	FA-mir-LV351
<a href="#">hsa-mir-552</a>	FA-mir-LV352
<a href="#">hsa-mir-553</a>	FA-mir-LV353
<a href="#">hsa-mir-554</a>	FA-mir-LV354
<a href="#">hsa-mir-555</a>	FA-mir-LV355
<a href="#">hsa-mir-556</a>	FA-mir-LV356
<a href="#">hsa-mir-557</a>	FA-mir-LV357
<a href="#">hsa-mir-558</a>	FA-mir-LV358
<a href="#">hsa-mir-559</a>	FA-mir-LV359
<a href="#">hsa-mir-560</a>	FA-mir-LV360*
<a href="#">hsa-mir-561</a>	FA-mir-LV361
<a href="#">hsa-mir-562</a>	FA-mir-LV362
<a href="#">hsa-mir-563</a>	FA-mir-LV363
<a href="#">hsa-mir-564</a>	FA-mir-LV364
<a href="#">hsa-mir-565</a>	FA-mir-LV365*
<a href="#">hsa-mir-566</a>	FA-mir-LV366
<a href="#">hsa-mir-567</a>	FA-mir-LV367
<a href="#">hsa-mir-568</a>	FA-mir-LV368
<a href="#">hsa-mir-569</a>	FA-mir-LV369
<a href="#">hsa-mir-570</a>	FA-mir-LV370

\* may not be miRNA

miRNA	Catalog #
<a href="#">hsa-mir-571</a>	FA-mir-LV371
<a href="#">hsa-mir-572</a>	FA-mir-LV372
<a href="#">hsa-mir-573</a>	FA-mir-LV373
<a href="#">hsa-mir-574</a>	FA-mir-LV374
<a href="#">hsa-mir-575</a>	FA-mir-LV375
<a href="#">hsa-mir-576</a>	FA-mir-LV376
<a href="#">hsa-mir-577</a>	FA-mir-LV377
<a href="#">hsa-mir-578</a>	FA-mir-LV378
<a href="#">hsa-mir-579</a>	FA-mir-LV379
<a href="#">hsa-mir-580</a>	FA-mir-LV380
<a href="#">hsa-mir-581</a>	FA-mir-LV381
<a href="#">hsa-mir-582</a>	FA-mir-LV382
<a href="#">hsa-mir-583</a>	FA-mir-LV383
<a href="#">hsa-mir-584</a>	FA-mir-LV384
<a href="#">hsa-mir-585</a>	FA-mir-LV385
<a href="#">hsa-mir-586</a>	FA-mir-LV386
<a href="#">hsa-mir-587</a>	FA-mir-LV387
<a href="#">hsa-mir-588</a>	FA-mir-LV388
<a href="#">hsa-mir-589</a>	FA-mir-LV389
<a href="#">hsa-mir-590</a>	FA-mir-LV390
<a href="#">hsa-mir-591</a>	FA-mir-LV391
<a href="#">hsa-mir-592</a>	FA-mir-LV392
<a href="#">hsa-mir-593</a>	FA-mir-LV393
<a href="#">hsa-mir-594</a>	FA-mir-LV475*
<a href="#">hsa-mir-595</a>	FA-mir-LV394
<a href="#">hsa-mir-596</a>	FA-mir-LV395
<a href="#">hsa-mir-597</a>	FA-mir-LV396
<a href="#">hsa-mir-598</a>	FA-mir-LV397
<a href="#">hsa-mir-599</a>	FA-mir-LV398
<a href="#">hsa-mir-600</a>	FA-mir-LV399
<a href="#">hsa-mir-601</a>	FA-mir-LV400
<a href="#">hsa-mir-602</a>	FA-mir-LV401
<a href="#">hsa-mir-603</a>	FA-mir-LV402
<a href="#">hsa-mir-604</a>	FA-mir-LV403
<a href="#">hsa-mir-605</a>	FA-mir-LV404
<a href="#">hsa-mir-606</a>	FA-mir-LV405
<a href="#">hsa-mir-607</a>	FA-mir-LV406
<a href="#">hsa-mir-608</a>	FA-mir-LV407
<a href="#">hsa-mir-609</a>	FA-mir-LV408
<a href="#">hsa-mir-610</a>	FA-mir-LV409

miRNA	Catalog #
<a href="#">hsa-mir-611</a>	FA-mir-LV410
<a href="#">hsa-mir-612</a>	FA-mir-LV411
<a href="#">hsa-mir-613</a>	FA-mir-LV412
<a href="#">hsa-mir-614</a>	FA-mir-LV413
<a href="#">hsa-mir-615</a>	FA-mir-LV414
<a href="#">hsa-mir-616</a>	FA-mir-LV415
<a href="#">hsa-mir-617</a>	FA-mir-LV416
<a href="#">hsa-mir-618</a>	FA-mir-LV417
<a href="#">hsa-mir-619</a>	FA-mir-LV418
<a href="#">hsa-mir-620</a>	FA-mir-LV419
<a href="#">hsa-mir-621</a>	FA-mir-LV420
<a href="#">hsa-mir-622</a>	FA-mir-LV421
<a href="#">hsa-mir-623</a>	FA-mir-LV422
<a href="#">hsa-mir-624</a>	FA-mir-LV423
<a href="#">hsa-mir-625</a>	FA-mir-LV424
<a href="#">hsa-mir-626</a>	FA-mir-LV425
<a href="#">hsa-mir-627</a>	FA-mir-LV426
<a href="#">hsa-mir-628</a>	FA-mir-LV427
<a href="#">hsa-mir-629</a>	FA-mir-LV428
<a href="#">hsa-mir-630</a>	FA-mir-LV429
<a href="#">hsa-mir-631</a>	FA-mir-LV430
<a href="#">hsa-mir-632</a>	FA-mir-LV431
<a href="#">hsa-mir-633</a>	FA-mir-LV432
<a href="#">hsa-mir-634</a>	FA-mir-LV433
<a href="#">hsa-mir-635</a>	FA-mir-LV434
<a href="#">hsa-mir-636</a>	FA-mir-LV435
<a href="#">hsa-mir-637</a>	FA-mir-LV436
<a href="#">hsa-mir-638</a>	FA-mir-LV437
<a href="#">hsa-mir-639</a>	FA-mir-LV438
<a href="#">hsa-mir-640</a>	FA-mir-LV439
<a href="#">hsa-mir-641</a>	FA-mir-LV440
<a href="#">hsa-mir-642</a>	FA-mir-LV441
<a href="#">hsa-mir-643</a>	FA-mir-LV442
<a href="#">hsa-mir-644</a>	FA-mir-LV443
<a href="#">hsa-mir-645</a>	FA-mir-LV444
<a href="#">hsa-mir-646</a>	FA-mir-LV445
<a href="#">hsa-mir-647</a>	FA-mir-LV446
<a href="#">hsa-mir-648</a>	FA-mir-LV447
<a href="#">hsa-mir-649</a>	FA-mir-LV448
<a href="#">hsa-mir-650</a>	FA-mir-LV449

miRNA	Catalog #
<a href="#">hsa-mir-651</a>	FA-mir-LV450
<a href="#">hsa-mir-652</a>	FA-mir-LV451
<a href="#">hsa-mir-653</a>	FA-mir-LV452
<a href="#">hsa-mir-654</a>	FA-mir-LV453
<a href="#">hsa-mir-655</a>	FA-mir-LV454
<a href="#">hsa-mir-656</a>	FA-mir-LV455
<a href="#">hsa-mir-657</a>	FA-mir-LV456
<a href="#">hsa-mir-658</a>	FA-mir-LV457
<a href="#">hsa-mir-659</a>	FA-mir-LV458
<a href="#">hsa-mir-660</a>	FA-mir-LV459
<a href="#">hsa-mir-661</a>	FA-mir-LV460
<a href="#">hsa-mir-662</a>	FA-mir-LV461
<a href="#">hsa-mir-663</a>	FA-mir-LV462
<a href="#">hsa-mir-665</a>	FA-mir-LV492
<a href="#">hsa-mir-668</a>	FA-mir-LV463
<a href="#">hsa-mir-671</a>	FA-mir-LV464
<a href="#">hsa-mir-675</a>	FA-mir-LV465
<a href="#">hsa-mir-708</a>	FA-mir-LV495
<a href="#">hsa-mir-744</a>	FA-mir-LV496
<a href="#">hsa-mir-758</a>	FA-mir-LV466
<a href="#">hsa-mir-765</a>	FA-mir-LV467
<a href="#">hsa-mir-766</a>	FA-mir-LV468
<a href="#">hsa-mir-767</a>	FA-mir-LV469
<a href="#">hsa-mir-768</a>	FA-mir-LV470
<a href="#">hsa-mir-769</a>	FA-mir-LV471
<a href="#">hsa-mir-770</a>	FA-mir-LV472
<a href="#">hsa-mir-801</a>	FA-mir-LV473*
<a href="#">hsa-mir-802</a>	FA-mir-LV474
<a href="#">hsa-mir-873</a>	FA-mir-LV500
<a href="#">hsa-mir-874</a>	FA-mir-LV501
<a href="#">hsa-mir-875</a>	FA-mir-LV502
<a href="#">hsa-mir-876</a>	FA-mir-LV503
<a href="#">hsa-mir-877</a>	FA-mir-LV504
<a href="#">hsa-mir-885</a>	FA-mir-LV505
<a href="#">hsa-mir-886</a>	FA-mir-LV506
<a href="#">hsa-mir-887</a>	FA-mir-LV507
<a href="#">hsa-mir-888</a>	FA-mir-LV508
<a href="#">hsa-mir-889</a>	FA-mir-LV509
<a href="#">hsa-mir-891a</a>	FA-mir-LV511
<a href="#">hsa-mir-891b</a>	FA-mir-LV512

\* may not be miRNA

miRNA	Catalog #
<a href="#">hsa-mir-892a</a>	FA-mir-LV513
<a href="#">hsa-mir-892b</a>	FA-mir-LV514
<a href="#">hsa-mir-920</a>	FA-mir-LV515
<a href="#">hsa-mir-921</a>	FA-mir-LV516
<a href="#">hsa-mir-922</a>	FA-mir-LV517
<a href="#">hsa-mir-923</a>	FA-mir-LV518
<a href="#">hsa-mir-924</a>	FA-mir-LV519
<a href="#">hsa-mir-933</a>	FA-mir-LV520
<a href="#">hsa-mir-934</a>	FA-mir-LV521
<a href="#">hsa-mir-935</a>	FA-mir-LV522
<a href="#">hsa-mir-936</a>	FA-mir-LV523
<a href="#">hsa-mir-937</a>	FA-mir-LV524
<a href="#">hsa-mir-938</a>	FA-mir-LV525
<a href="#">hsa-mir-939</a>	FA-mir-LV526
<a href="#">hsa-mir-940</a>	FA-mir-LV527
<a href="#">hsa-mir-941</a>	FA-mir-LV528
<a href="#">hsa-mir-942</a>	FA-mir-LV532
<a href="#">hsa-mir-943</a>	FA-mir-LV533
<a href="#">hsa-mir-944</a>	FA-mir-LV534
<a href="#">hsa-mir-663b</a>	FA-mir-LV579
<a href="#">hsa-mir-513a-2</a>	FA-mir-LV291

miRNA	Catalog #	Note
<a href="#">hsa-mir-ctrl</a>	FA-mir-LV000	no miRNA insert as negative control
<a href="#">hsa-mir-c01</a>	FA-mir-LVc01	mir-15a_16-1
<a href="#">hsa-mir-c02</a>	FA-mir-LVc02	mir-17_18a_19a_20a_19b-1_92a-1
<a href="#">hsa-mir-c03</a>	FA-mir-LVc03	mir-106a_18b_20b_19b-2_92a-2

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