Data article

Data supporting that miR-92a suppresses angiogenic activity of adipose-derived mesenchymal stromal cells by down-regulating hepatocyte growth factor

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ABSTRACT

This article contains the full list of miRNAs expressed in cultured mesenchymal stromal cells, which were isolated from human adipose tissue. We provide here data regarding the effect of miR-92a over-expression on MSCs viability and cellular content of HGF and angiopoietin-1. These are followed by the data regarding the effect of conditioned medium of MSC transfected with pre-miR-92a, anti-miR-92a or scramble oligos on HUVEC viability as well as their tube formation efficiency. We also demonstrate here data regarding the effect of extracellular vesicle depletion from MSCs conditioned medium on its ability to stimulate the tube formation by HUVEC. Data interpretation and discussion can be found in Kalinina et al. (2015) [1]. © 2015 Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

Specifications Table

| Subject area | Biology |
|--------------|---------|
| More specific subject area | Mesenchymal stromal cells and tissue regeneration |

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2352-3409/© 2015 Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).
Type of data: Table, graphs and microphotographs

How data was acquired:

Illumina Human v2 microRNA panel was used to obtain a list of evidently expressed microRNAs. Capillary-like structures were assayed in 24 h under the light microscope (Leica). Concentrations of HGF and angiopoietin-1 in lysates of MSCs transfected with pre-miR-92a (Ambion), anti-miR-92a or pre-miR negative control 1 were measured by ELISA kits (R&D Systems).

Data format: Analyzed

Experimental factors:

MSC nucleofected with pre-miR-92a, anti-miR-92a or scramble oligos; MSC conditioned medium applied to HUVEC, recombinant human HGF added microRNA content in adipose-derived mesenchymal stromal cells was analysed. Adipose-derived MSCs were nucleofected with pre-miR-92a, anti-miR-92a or scramble oligos. HGF and angiopoietin-1 were measured in cell lysates by ELISA. Conditioned medium of transfected cells was applied to HUVEC and tube formation was assessed. Extracellular vesicles were depleted by ultracentrifugation.

Data source location:

Lomonosov Moscow State University, Moscow, Russia

Data accessibility:

Data with this article

Value of the data:

- List of microRNAs expressed in adipose-derived MSCs will help to develop new experiments to study functional activities of these cells.
- Overexpression or down-regulation of miR-92a by nucleofection does not affect MSC viability.
- Our data point to HGF as a new target of miR-92a.

1 Data

Using human microRNA v2 panel (Illumina) we have identified 586 miR species, which were evidently expressed in MSCs (see Table 1).

We selected miR-92a as a one of the most abundant angio-miRs expressed in MSCs and confirmed its expression by real-time PCR [1]. Then, we overexpressed or down-regulated its content using nucleofection. We examined viability of transfected cells, which was about 90% and did not differ between cells transfected with pre-miR-92a, anti-miR-92a or scramble oligos (Fig. 1).

We also analyzed the content of HGF and angiopoietin-1 in these cells and found that intracellular content of HGF was 2.6 times lower in MSCs transfected with pre-miR-92a comparing to scramble transfected cells; however, angiopoietin content within MSCs did not change significantly (see Fig. 2).

We collected conditioned medium of MSCs transfected with pre-miR-92a, anti-miR-92a or scramble oligos, applied it to HUVEC and analyzed their viability. Conditioned medium of transfected MSCs did not affect the viability of HUVEC (see Fig. 3), which was about 90%.

Addition of recombinant HGF but not angiopoietin-1 to the conditioned medium of MSCs transfected with pre-miR-92a restored its ability to stimulate the tube formation by HUVEC (see Fig. 4).

We also examined if the suppressive effect of conditioned medium of MSCs, which overexpress miR-92a, could be mediated by a direct transfer of this microRNA to endothelial cells by extracellular vesicles. We removed these vesicles from conditioned medium by ultracentrifugation and analyzed the effect of cleared medium on tube formation. Removal of extracellular vesicles completely abrogated the ability of conditioned medium to induce tube formation (see Fig. 5). Data interpretation and discussion can be found in [1].
| TargetID | Mean  | SD   |
|----------|-------|------|
| hsa-miR-1280 | 23567.3 | 480.0 |
| hsa-miR-21 | 23136.3 | 781.4 |
| hsa-let-7a | 22779.0 | 692.8 |
| hsa-miR-214 | 22123.8 | 804.3 |
| solexa-3927-221 | 21213.3 | 1085.0 |
| hsa-miR-221 | 20160.3 | 954.3 |
| hsa-miR-23a | 19960.5 | 719.2 |
| hsa-miR-199a-9.1 | 19815.5 | 1912.1 |
| hsa-miR-720 | 19392.3 | 513.3 |
| hsa-let-7g | 19323.3 | 974.2 |
| hsa-miR-125b | 18808.8 | 643.9 |
| hsa-miR-24 | 18341.5 | 1204.0 |
| HS_22.1 | 18114.5 | 609.4 |
| hsa-miR-320d,hsa-miR-320b,hsa-miR-320a | 18100.8 | 428.0 |
| hsa-miR-1274b | 17902.8 | 2536.3 |
| hsa-miR-26a | 17701.5 | 1134.3 |
| hsa-let-7e | 17673.3 | 2166.1 |
| hsa-miR-768-3p:11.0 | 17642.0 | 2731.8 |
| hsa-miR-100 | 17579.3 | 1745.4 |
| hsa-let-7i | 17241.8 | 804.4 |
| hsa-miR-923 | 16997.3 | 3498.3 |
| hsa-let-7b | 16807.8 | 585.4 |
| hsa-miR-222 | 16276.8 | 1295.1 |
| hsa-miR-125a-5p | 16050.5 | 1068.0 |
| hsa-miR-199a-3p,hsa-miR-199b-3p | 15980.3 | 1402.7 |
| hsa-miR-92a | 15764.3 | 650.1 |
| hsa-let-7c | 15695.5 | 2136.7 |
| hsa-miR-151-5p | 15560.0 | 1490.1 |
| hsa-miR-23b | 15545.5 | 2236.8 |
| hsa-miR-1308 | 15318.5 | 2330.0 |
| hsa-miR-196a | 15272.8 | 645.1 |
| hsa-miR-16 | 15181.3 | 1449.2 |
| hsa-miR-25 | 15137.8 | 1294.5 |
| hsa-miR-193a-5p | 15061.8 | 978.5 |
| hsa-miR-27a | 15018.3 | 2589.6 |
| solexa-555-1991 | 14762.5 | 897.6 |
| hsa-miR-143 | 14714.8 | 1900.5 |
| hsa-miR-15b | 14409.3 | 884.1 |
| HS_100 | 14373.3 | 1144.9 |
| hsa-let-7d | 14286.3 | 1618.1 |
| hsa-miR-1274a | 13864.0 | 1486.9 |
| hsa-miR-145 | 13787.3 | 1564.7 |
| hsa-miR-31 | 13704.5 | 1530.4 |
| hsa-miR-574-3p | 13679.8 | 1696.2 |
| hsa-miR-152 | 13586.8 | 2963.6 |
| hsa-miR-26b | 13480.8 | 1235.7 |
| hsa-miR-1260 | 13472.3 | 1928.7 |
| hsa-miR-1246 | 13409.8 | 2074.7 |
| hsa-miR-1826 | 13393.8 | 3269.9 |
| HS_192.1 | 13391.0 | 2645.2 |
| solexa-2952-306 | 13256.3 | 953.8 |
| hsa-miR-424 | 13215.3 | 4095.2 |
| hsa-miR-191 | 13163.8 | 1851.0 |
| hsa-miR-197 | 12943.0 | 1094.8 |
| hsa-miR-98 | 12607.5 | 1564.1 |
| hsa-miR-199a-5p | 12574.5 | 3478.1 |
| HS_204.1 | 12545.0 | 1184.5 |
| hsa-miR-29a | 12474.3 | 2501.4 |
| TargetID | Mean | SD   |
|----------|------|------|
| HS_263.1 | 12208.3 | 2000.0 |
| hsa-miR-224 | 11944.3 | 1349.4 |
| hsa-miR-10b | 11895.3 | 1703.7 |
| hsa-miR-27b | 11848.5 | 3310.9 |
| hsa-miR-1201 | 11518.3 | 2715.9 |
| hsa-miR-20a | 11454.3 | 2086.0 |
| hsa-miR-30d | 11199.5 | 2248.6 |
| hsa-miR-503 | 11092.3 | 1588.7 |
| solexa-3464-254 | 11059.3 | 391.3 |
| hsa-miR-132 | 10687.5 | 1492.4 |
| hsa-miR-768-5p:11.0 | 10639.3 | 1341.5 |
| hsa-miR-10a | 10583.8 | 1824.0 |
| hsa-miR-155 | 10402.0 | 2429.4 |
| HS_243.1 | 10376.3 | 2551.2 |
| hsa-miR-193b | 10359.5 | 2138.7 |
| hsa-miR-664 | 10341.0 | 1762.0 |
| hsa-miR-432 | 10037.0 | 2265.1 |
| hsa-miR-195 | 9968.0 | 2337.5 |
| hsa-let-7d | 9928.8 | 783.0 |
| hsa-miR-29b-1 | 9900.3 | 1879.9 |
| hsa-miR-34a | 9880.8 | 2109.6 |
| hsa-miR-99b | 9711.8 | 2675.7 |
| hsa-miR-30c | 9600.3 | 2441.4 |
| hsa-miR-134 | 9303.3 | 934.1 |
| hsa-miR-93 | 9285.0 | 592.1 |
| hsa-miR-382 | 9096.3 | 1240.3 |
| hsa-miR-92b | 8970.5 | 814.7 |
| hsa-miR-151-3p | 8963.0 | 1436.3 |
| hsa-miR-484 | 8832.0 | 1093.8 |
| hsa-miR-28-5p | 8679.8 | 2117.9 |
| hsa-miR-455-3p | 8657.8 | 1939.9 |
| hsa-miR-423-3p | 8573.5 | 1260.9 |
| hsa-miR-424 | 8397.5 | 1168.2 |
| solexa-51-13984 | 8340.0 | 850.3 |
| hsa-miR-409-3p | 8295.8 | 866.6 |
| HS_284.1 | 8291.0 | 1037.4 |
| hsa-miR-374a | 8283.5 | 2769.2 |
| hsa-miR-30e | 8194.8 | 2534.1 |
| hsa-miR-1228 | 7994.8 | 492.6 |
| hsa-miR-29b | 7992.3 | 774.7 |
| hsa-miR-148a | 7992.0 | 3801.0 |
| hsa-miR-185 | 7845.3 | 1517.6 |
| hsa-miR-15a | 7627.3 | 3472.2 |
| hsa-let-7b | 7564.8 | 881.2 |
| hsa-miR-365 | 7544.3 | 1540.2 |
| hsa-miR-493 | 7387.3 | 1028.6 |
| hsa-miR-324-5p | 7379.0 | 1880.9 |
| hsa-miR-361-5p | 7259.5 | 2303.2 |
| hsa-miR-544 | 7162.3 | 3061.8 |
| hsa-miR-324-3p | 7123.3 | 1935.3 |
| hsa-miR-30b | 7072.0 | 1144.3 |
| hsa-miR-379 | 6963.3 | 771.4 |
| hsa-miR-342-3p | 6835.3 | 1553.5 |
| hsa-miR-99a | 6792.0 | 3415.3 |
| hsa-miR-22 | 6725.0 | 3846.5 |
| hsa-miR-328 | 6488.0 | 1575.3 |
| hsa-miR-151:9.1 | 6460.3 | 2527.1 |
| hsa-miR-146a | 6456.3 | 2689.7 |
| solexa-539-2056 | 6418.3 | 3114.5 |
| HS_96 | 6396.5 | 551.2 |
| TargetID          | Mean  | SD   |
|------------------|-------|------|
| hsa-miR-196b     | 6232.5| 647.2|
| hsa-miR-181b     | 6187.5| 2869.8|
| solexa-9029-92   | 6172.0| 299.1|
| hsa-miR-423-5p   | 6119.0| 1363.2|
| hsa-miR-615-3p   | 6081.8| 332.8|
| hsa-miR-708      | 6033.8| 2431.3|
| hsa-miR-411      | 5970.5| 1412.8|
| hsa-miR-130h     | 5941.5| 1460.8|
| hsa-miR-146b-5p  | 5919.0| 3049.7|
| hsa-miR-329      | 5866.5| 1477.3|
| solexa-8048-104  | 5741.5| 2872.2|
| hsa-miR-22       | 5670.8| 2076.8|
| hsa-miR-130a     | 5667.3| 853.1 |
| hsa-miR-181a     | 5661.5| 4037.6|
| hsa-miR-199b-5p  | 5543.8| 1838.6|
| hsa-miR-337-3p   | 5513.0| 1579.9|
| hsa-miR-28-3p    | 5509.5| 1213.1|
| hsa-miR-140-3p   | 5425.3| 814.1 |
| hsa-miR-1275     | 5317.8| 1528.2|
| hsa-miR-218      | 5297.0| 488.0 |
| hsa-miR-30a      | 5277.8| 2734.4|
| hsa-miR-106b     | 5075.3| 1656.1|
| hsa-miR-425      | 4907.8| 3109.0|
| hsa-miR-886-5p   | 4860.3| 632.8 |
| hsa-miR-17       | 4835.8| 558.0 |
| solexa-8211-102  | 4810.8| 3885.4|
| solexa-499-2217  | 4718.8| 514.6 |
| hsa-miR-103      | 4697.0| 1083.3|
| hsa-miR-574-5p   | 4654.8| 1382.9|
| hsa-miR-594:9.1  | 4525.3| 1320.1|
| hsa-miR-939      | 4440.3| 524.5 |
| hsa-miR-889      | 4371.3| 835.2 |
| hsa-miR-877      | 4359.5| 2022.5|
| hsa-miR-145      | 4353.5| 2399.0|
| hsa-miR-576-5p   | 4334.8| 688.7 |
| hsa-miR-744      | 4311.3| 520.4 |
| solexa-578-1915  | 4307.3| 785.1 |
| HS_188           | 4275.3| 399.0 |
| hsa-miR-331-3p   | 4249.8| 507.8 |
| hsa-miR-370      | 4245.3| 941.4 |
| hsa-miR-7        | 4233.0| 887.0 |
| hsa-miR-129-5p   | 4125.3| 289.4 |
| hsa-miR-127-3p   | 4077.5| 1046.9|
| hsa-miR-625      | 4070.8| 855.9 |
| HS_108.1         | 4007.3| 1646.7|
| HS_29            | 3980.5| 1256.6|
| hsa-miR-518a-3p  | 3974.5| 439.7 |
| hsa-miR-542-3p   | 3970.3| 2890.8|
| hsa-miR-1249     | 3959.0| 1488.5|
| hsa-miR-106a     | 3835.0| 825.1 |
| hsa-miR-193b     | 3768.3| 1340.9|
| hsa-miR-24-2     | 3718.0| 1956.8|
| hsa-miR-532-3p   | 3716.8| 1867.2|
| hsa-miR-128      | 3681.0| 888.9 |
| hsa-miR-628-5p   | 3673.0| 1407.6|
| hsa-miR-29c      | 3658.8| 2366.8|
| hsa-miR-663      | 3592.3| 588.6 |
| hsa-miR-625      | 3586.5| 745.3 |
| hsa-miR-204      | 3579.8| 443.0 |
| hsa-miR-30c-1    | 3551.8| 1099.1|
| TargetID     | Mean  | SD    |
|--------------|-------|-------|
| hsa-miR-376c | 3492.5| 589.6 |
| hsa-miR-221  | 3461.0| 2028.3|
| hsa-miR-539  | 3454.3| 466.6 |
| hsa-miR-30a  | 3437.3| 1699.3|
| hsa-miR-548b-5p | 3402.5| 343.6 |
| hsa-miR-886-3p | 3352.5| 649.1 |
| hsa-miR-7-1   | 3338.0| 3726.7|
| hsa-miR-1300  | 3277.5| 2082.2|
| hsa-miR-450a  | 3205.5| 2247.8|
| hsa-miR-628-3p | 3185.8| 1065.8|
| hsa-miR-15b   | 3160.3| 764.0 |
| hsa-miR-130b  | 3152.0| 1059.8|
| hsa-miR-372   | 3144.3| 302.8 |
| hsa-miR-433   | 3129.8| 378.9 |
| hsa-miR-335   | 3084.5| 1863.3|
| hsa-miR-126   | 3052.3| 703.7 |
| hsa-miR-675   | 3024.3| 591.5 |
| hsa-miR-487b  | 3016.0| 534.6 |
| hsa-miR-16-2  | 3011.0| 1345.6|
| hsa-miR-126   | 2964.3| 2488.8|
| hsa-miR-299-5p| 2726.3| 738.4 |
| hsa-miR-30e   | 2707.3| 1939.7|
| hsa-miR-10a   | 2704.0| 604.5 |
| hsa-miR-31    | 2686.3| 2011.9|
| hsa-miR-517a  | 2681.8| 439.7 |
| solexa-4793-177| 2568.5| 298.2 |
| hsa-miR-421   | 2521.0| 728.3 |
| hsa-miR-342-5p| 2514.5| 439.7 |
| hsa-miR-654-5p| 2511.8| 472.9 |
| hsa-miR-940   | 2479.5| 212.6 |
| HS_239        | 2468.8| 749.4 |
| hsa-miR-143   | 2447.8| 213.5 |
| hsa-miR-138   | 2432.8| 1123.8|
| hsa-miR-485-3p| 2414.8| 1197.9|
| hsa-miR-450b-5p| 2403.8| 1373.2|
| hsa-miR-137   | 2398.5| 2711.8|
| HS_244        | 2385.8| 156.3 |
| hsa-miR-378   | 2350.5| 611.8 |
| HS_275        | 2310.3| 174.3 |
| hsa-miR-500   | 2307.8| 1487.3|
| hsa-miR-499-5p| 2305.3| 367.1 |
| hsa-miR-148b  | 2279.5| 2879.8|
| hsa-miR-664   | 2117.5| 660.3 |
| hsa-miR-301a  | 2088.8| 190.6 |
| hsa-miR-214   | 2069.5| 1221.0|
| hsa-miR-181a-2| 2052.5| 1471.7|
| hsa-miR-335   | 1995.0| 1939.3|
| HS_38.1       | 1993.3| 175.6 |
| hsa-miR-29a   | 1978.5| 1742.2|
| hsa-miR-362-3p| 1967.5| 421.5 |
| hsa-miR-23a   | 1926.3| 661.7 |
| HS_152        | 1902.3| 74.4  |
| HS_303_a      | 1883.8| 254.7 |
| hsa-miR-548d-5p| 1872.8| 408.0 |
| hsa-miR-339-5p| 1872.3| 419.9 |
| hsa-miR-502-3p,hsa-miR-500 | 1848.5| 321.7 |
| hsa-miR-560:9.1| 1840.8| 249.8 |
| hsa-miR-189:9.1| 1812.8| 638.2 |
| hsa-miR-125b-1| 1798.3| 557.2 |
| hsa-miR-585   | 1794.8| 360.7 |
| TargetID       | Mean  | SD   |
|---------------|-------|------|
| hsa-miR-210   | 1787.5| 616.7|
| hsa-miR-494   | 1746.5| 766.3|
| hsa-miR-769-5p| 1733.3| 264.7|
| hsa-miR-532-5p| 1717.5| 463.2|
| HS_94         | 1704.8| 219.0|
| hsa-miR-493   | 1696.3| 786.1|
| hsa-miR-517c  | 1695.5| 633.4|
| hsa-miR-565-9.1| 1675.3| 493.9|
| hsa-miR-454   | 1663.3| 527.2|
| hsa-miR-323-3p| 1660.8| 616.3|
| solexa-9555-85| 1649.5| 120.6|
| hsa-miR-92b   | 1644.3| 727.9|
| hsa-miR-1287  | 1643.0| 272.5|
| hsa-miR-212   | 1632.3| 810.2|
| HS_199        | 1621.5| 211.5|
| hsa-miR-1307  | 1608.3| 381.4|
| hsa-miR-154   | 1606.0| 957.6|
| hsa-miR-1301  | 1584.5| 285.1|
| hsa-miR-1284  | 1539.0| 114.2|
| hsa-miR-485-5p| 1535.8| 381.7|
| hsa-miR-194   | 1534.8| 88.7 |
| hsa-miR-624   | 1526.8| 622.9|
| hsa-miR-519b-3p| 1509.8| 95.1 |
| HS_113        | 1492.0| 41.2 |
| HS_711        | 1466.5| 89.0 |
| hsa-miR-216b  | 1444.8| 389.1|
| hsa-miR-1285  | 1442.0| 443.3|
| HS_150        | 1428.5| 143.1|
| hsa-miR-27b   | 1396.0| 892.5|
| HS_268        | 1390.5| 100.5|
| hsa-miR-133a  | 1384.5| 203.6|
| HS_156        | 1361.5| 984.0|
| HS_139        | 1354.8| 105.8|
| HS_19         | 1354.0| 97.7 |
| hsa-miR-551a  | 1344.8| 195.1|
| hsa-miR-505   | 1342.5| 835.9|
| HS_184        | 1299.3| 63.8 |
| hsa-miR-1271  | 1277.0| 806.7|
| hsa-miR-491-5p| 1243.0| 206.9|
| HS_114        | 1242.8| 196.3|
| hsa-miR-381   | 1231.0| 278.1|
| hsa-miR-627   | 1210.3| 356.3|
| hsa-miR-181a  | 1200.3| 46.4 |
| hsa-miR-660   | 1192.0| 1533.2|
| hsa-miR-1224-3p| 1182.8| 115.5|
| hsa-miR-449b  | 1178.3| 39.1 |
| hsa-miR-140-5p| 1161.0| 840.4|
| hsa-miR-1228  | 1158.3| 214.7|
| hsa-miR-501-3p| 1156.0| 167.3|
| hsa-miR-548a-3p| 1153.3| 66.9 |
| hsa-miR-1299  | 1153.0| 185.4|
| hsa-miR-296-3p| 1151.8| 410.7|
| HS_32         | 1139.5| 123.6|
| hsa-miR-1254  | 1130.5| 125.3|
| **hsa-miR-200c** | **1126.8** | **208.4** |
| HS_81         | 1122.8| 90.8 |
| hsa-miR-671:9.1| 1109.5| 455.8|
| hsa-miR-34c-3p| 1103.8| 866.9|
| hsa-miR-1234  | 1097.5| 302.5|
| hsa-miR-34b   | 1097.3| 369.2|
Table 1 (continued)

| TargetID   | Mean  | SD   |
|------------|-------|------|
| hsa-miR-125a-3p | 1073.3 | 88.8 |
| hsa-miR-1296  | 1071.8 | 354.0|
| hsa-let-7e    | 1068.8 | 429.2|
| hsa-miR-571   | 1065.8 | 110.0|
| hsa-miR-149   | 1061.5 | 533.1|
| HS_166.1     | 1056.8 | 305.9|
| hsa-miR-19b   | 1041.0 | 80.3 |
| hsa-miR-298   | 1038.0 | 120.1|
| hsa-miR-1233  | 1037.5 | 183.0|
| hsa-let-7f-1  | 1036.5 | 333.0|
| hsa-miR-362-5p| 1034.8 | 270.1|
| hsa-miR-99b   | 1034.5 | 449.7|
| hsa-miR-105   | 1021.0 | 259.3|
| hsa-miR-23b   | 999.8  | 338.4|
| hsa-miR-409-5p| 997.5  | 728.5|
| hsa-miR-629   | 988.5  | 336.3|
| hsa-miR-369-5p| 986.8  | 304.0|
| hsa-miR-602   | 983.8  | 75.8 |
| hsa-miR-875-5p| 982.3  | 130.0|
| hsa-miR-495   | 974.8  | 217.1|
| hsa-miR-584   | 969.3  | 310.9|
| hsa-miR-18a   | 957.5  | 786.4|
| hsa-miR-501-5p| 957.3  | 246.6|
| hsa-miR-187   | 955.5  | 126.8|
| hsa-miR-1257  | 948.5  | 41.4 |
| hsa-miR-25    | 947.5  | 143.1|
| hsa-miR-452:9.1| 946.0 | 343.0|
| hsa-miR-1267  | 940.0  | 146.5|
| hsa-miR-505   | 926.8  | 575.6|
| hsa-miR-642   | 919.0  | 295.5|
| HS_10        | 918.5  | 780.9|
| hsa-miR-18a   | 916.8  | 353.2|
| hsa-miR-615-5p| 912.5  | 284.8|
| hsa-miR-517   | 908.5  | 116.3|
| hsa-miR-26b   | 904.0  | 564.8|
| hsa-miR-890   | 896.5  | 71.4 |
| hsa-miR-452   | 892.3  | 397.7|
| hsa-miR-431   | 889.5  | 179.5|
| hsa-miR-186   | 874.8  | 415.7|
| HS_303_b      | 863.8  | 241.4|
| hsa-miR-671-3p| 862.3  | 430.5|
| hsa-miR-192   | 861.8  | 991.3|
| hsa-miR-609   | 859.8  | 29.5 |
| hsa-miR-194   | 859.3  | 1047.4|
| HS_97         | 846.8  | 133.1|
| hsa-miR-369-3p| 845.0  | 191.3|
| hsa-miR-942   | 844.5  | 187.6|
| HS_116        | 842.3  | 321.3|
| hsa-miR-34c-5p| 831.8  | 186.6|
| hsa-miR-603   | 824.5  | 574.6|
| hsa-miR-27a   | 816.8  | 557.3|
| hsa-miR-706   | 809.5  | 249.5|
| HS_85.1       | 806.3  | 108.5|
| HS_260        | 797.8  | 173.7|
| hsa-miR-29c   | 797.8  | 204.0|
| hsa-miR-223   | 796.0  | 418.9|
| hsa-miR-106b  | 790.0  | 334.5|
| hsa-miR-550   | 783.3  | 208.7|
| hsa-miR-30d   | 781.8  | 93.6 |
| hsa-miR-195   | 781.3  | 98.8 |
| hsa-miR-654-3p| 771.8  | 204.8|
### Table 1 (continued)

| TargetID               | Mean  | SD   |
|------------------------|-------|------|
| hsa-miR-665            | 762.8 | 156.5|
| HS_208                 | 757.5 | 72.5 |
| hsa-miR-138-1          | 757.3 | 398.7|
| hsa-miR-302d           | 750.3 | 319.6|
| solexa-15-44487        | 749.5 | 58.3 |
| hsa-miR-554            | 733.8 | 82.8 |
| solexa-9081-91         | 734.5 | 42.2 |
| hsa-miR-1204           | 720.5 | 64.3 |
| hsa-miR-193a-3p        | 718.0 | 357.6|
| hsa-miR-549            | 713.8 | 392.5|
| hsa-miR-507            | 711.5 | 58.1 |
| hsa-miR-497            | 710.3 | 339.4|
| HS_110                 | 706.0 | 133.1|
| hsa-miR-361-3p         | 703.5 | 321.3|
| hsa-miR-663b           | 700.3 | 68.3 |
| HS_250                 | 697.8 | 120.2|
| hsa-miR-483-3p         | 694.8 | 312.6|
| hsa-miR-486-5p         | 685.0 | 276.9|
| hsa-miR-1305           | 684.8 | 58.5 |
| hsa-miR-425            | 682.5 | 305.4|
| hsa-miR-545            | 677.8 | 116.9|
| hsa-miR-491-3p         | 675.5 | 62.8 |
| HS_52                  | 670.8 | 54.0 |
| hsa-miR-573            | 658.5 | 20.5 |
| hsa-miR-34a            | 654.8 | 305.1|
| hsa-miR-1286           | 651.3 | 43.5 |
| HS_209.1               | 644.3 | 291.1|
| hsa-miR-598            | 643.8 | 240.9|
| hsa-miR-371-5p         | 643.3 | 68.0 |
| hsa-miR-641            | 635.0 | 14.9 |
| hsa-miR-525-3p         | 634.5 | 123.4|
| hsa-miR-655            | 633.5 | 296.8|
| hsa-miR-801:9.1        | 631.8 | 58.4 |
| HS_78                  | 626.8 | 69.8 |
| hsa-miR-33a            | 625.3 | 43.6 |
| hsa-miR-16-1           | 620.8 | 296.5|
| hsa-miR-652            | 619.0 | 213.5|
| hsa-miR-411            | 616.8 | 79.5 |
| hsa-miR-1245           | 614.3 | 280.4|
| hsa-miR-302b           | 612.5 | 278.1|
| hsa-miR-518c           | 611.3 | 38.9 |
| hsa-miR-1263           | 611.0 | 39.9 |
| HS_262.1               | 606.0 | 33.8 |
| hsa-miR-516a-3p,hsa-miR-516b | 600.5 | 85.7 |
| hsa-miR-513a-5p        | 598.5 | 29.9 |
| hsa-miR-502-5p         | 594.5 | 192.1|
| hsa-miR-302b           | 590.5 | 107.0|
| hsa-miR-518d-3p        | 578.3 | 59.0 |
| solexa-7534-111        | 577.5 | 222.6|
| hsa-miR-583            | 576.8 | 100.9|
| HS_24                  | 573.5 | 315.9|
| hsa-miR-376a           | 573.5 | 183.2|
| hsa-miR-136            | 572.5 | 530.1|
| HS_20                  | 571.3 | 46.5 |
| hsa-miR-346            | 570.5 | 183.7|
| hsa-miR-576-3p         | 568.8 | 221.2|
| solexa-7509-112        | 564.0 | 40.9 |
| HS_279.a               | 555.8 | 50.5 |
| hsa-miR-659            | 548.5 | 83.4 |
| hsa-miR-188-5p         | 546.5 | 120.0|
| solexa-9578-86         | 545.5 | 223.2|
| TargetID     | Mean | SD  |
|--------------|------|-----|
| hsa-miR-376a:9.1 | 540.3 | 236.5 |
| HS_186       | 536.8 | 60.1  |
| hsa-miR-379   | 535.0 | 218.6 |
| hsa-miR-1225-3p | 534.8 | 118.3 |
| HS_305_b     | 526.5 | 115.1 |
| hsa-miR-26a-2 | 525.3 | 337.8 |
| solexa-1460-671 | 519.8 | 182.3 |
| hsa-miR-525-5p | 516.3 | 24.6  |
| solexa-9124-90 | 509.0 | 124.0 |
| hsa-miR-376a | 504.8 | 315.1 |
| hsa-miR-1180 | 501.8 | 55.2  |
| hsa-miR-668  | 500.5 | 89.6  |
| hsa-miR-101  | 500.3 | 103.7 |
| hsa-miR-330-3p | 500.0 | 130.0 |
| HS_160       | 495.0 | 74.7  |
| hsa-miR-542-5p | 490.5 | 43.0  |
| hsa-miR-518a-5p,hsa-miR-527 | 487.5 | 7.3   |
| solexa-826-1288 | 487.3 | 120.0 |
| hsa-miR-99a | 487.0 | 38.7  |
| HS_17        | 486.3 | 259.7 |
| hsa-miR-1184 | 485.5 | 153.5 |
| hsa-miR-520d-5p | 479.0 | 34.3  |
| hsa-miR-550 | 478.5 | 101.5 |
| HS_287       | 473.5 | 119.3 |
| hsa-let-7c   | 468.5 | 189.5 |
| hsa-miR-374a | 465.5 | 45.5  |
| hsa-miR-651 | 462.0 | 49.0  |
| solexa-8926-93 | 461.3 | 293.0 |
| hsa-miR-200b | **456.8** | **100.3** |
| hsa-miR-17    | 449.5 | 78.6  |
| hsa-miR-19b-2 | 448.0 | 17.3  |
| HS_252.1     | 444.8 | 12.3  |
| hsa-miR-218-1 | 444.8 | 38.8  |
| hsa-miR-616   | 437.5 | 247.5 |
| hsa-miR-1226  | 434.5 | 133.6 |
| hsa-miR-1225-5p | 429.8 | 321.2 |
| hsa-miR-21   | 428.3 | 357.3 |
| hsa-miR-376b | 423.0 | 55.8  |
| hsa-miR-122  | 421.5 | 33.6  |
| hsa-miR-30c-2 | 421.0 | 134.6 |
| hsa-miR-647 | 418.8 | 69.6  |
| hsa-miR-132 | 418.5 | 288.2 |
| hsa-miR-367 | 416.3 | 17.6  |
| HS_276.1    | 412.8 | 50.3  |
| solexa-3022-299 | 409.0 | 26.0  |
| hsa-miR-941 | 408.5 | 154.1 |
| hsa-miR-299-3p | 407.8 | 54.0  |
| HS_60        | 406.5 | 89.3  |
| hsa-miR-591 | 406.5 | 28.0  |
| hsa-miR-1197 | 404.5 | 91.6  |
| hsa-miR-340 | 403.8 | 242.4 |
| HS_142.1     | 402.0 | 82.7  |
| hsa-miR-139-5p | 399.3 | 257.8 |
| solexa-3126-285 | 398.8 | 184.2 |
| HS_145.1   | 395.5 | 30.6  |
| hsa-miR-1294 | 395.0 | 95.9  |
| hsa-miR-30b | 395.0 | 129.0 |
| HS_105       | 394.3 | 44.1  |
| hsa-miR-1268 | 393.0 | 68.3  |
| hsa-miR-302c | 392.8 | 15.3  |
| HS_203       | 384.8 | 25.9  |
| TargetID        | Mean  | SD    |
|-----------------|-------|-------|
| hsa-miR-629     | 384.5 | 213.8 |
| hsa-miR-518e:9.1| 384.3 | 29.2  |
| HS_126          | 383.5 | 34.6  |
| hsa-miR-410     | 382.5 | 217.5 |
| HS_149          | 380.8 | 167.1 |
| hsa-miR-545:9.1| 378.8 | 140.1 |
| HS_48.1         | 377.8 | 65.3  |
| hsa-miR-1207-5p| 376.3 | 32.7  |
| hsa-miR-516a-5p| 372.8 | 60.1  |
| hsa-miR-377     | 369.0 | 77.0  |
| HS_196.1        | 368.5 | 117.1 |
| hsa-miR-182     | 368.0 | 92.5  |
| hsa-miR-452     | 367.8 | 29.0  |
| HS_27           | 363.5 | 15.6  |
| hsa-miR-564     | 360.8 | 60.5  |
| HS_219          | 351.8 | 63.6  |
| HS_285          | 350.3 | 87.8  |
| hsa-miR-1322    | 348.8 | 81.7  |
| hsa-miR-1206    | 348.0 | 25.7  |
| hsa-miR-1243    | 347.0 | 72.4  |
| hsa-miR-614     | 345.3 | 39.1  |
| HS_25           | 344.8 | 71.5  |
| hsa-miR-92a-1   | 340.8 | 119.4 |
| hsa-miR-296-5p  | 337.8 | 54.2  |
| hsa-miR-1248    | 332.5 | 86.2  |
| hsa-miR-144     | 331.5 | 23.9  |
| HS_6            | 328.3 | 74.8  |
| hsa-miR-128a:9.1| 326.3 | 122.1 |
| solexa-5874-144 | 326.3 | 35.0  |
| hsa-miR-567     | 324.0 | 19.4  |
| hsa-miR-202:9.1| 322.3 | 131.5 |
| hsa-miR-220b    | 322.0 | 101.0 |
| HS_90           | 319.3 | 26.8  |
| hsa-miR-653     | 316.3 | 14.3  |
| hsa-let-7a      | 313.0 | 162.2 |
| hsa-miR-107     | 310.8 | 109.9 |
| HS_99.1         | 309.3 | 51.0  |
| HS_201          | 307.5 | 105.4 |
| hsa-miR-767-5p  | 306.5 | 38.6  |
| hsa-miR-34b     | 305.0 | 43.5  |
| hsa-miR-222     | 304.8 | 34.2  |
| hsa-miR-935     | 303.8 | 45.1  |
| HS_2            | 303.5 | 65.8  |
| HS_122.1        | 299.5 | 16.6  |
| hsa-miR-454     | 297.3 | 86.9  |
| hsa-miR-181c    | 296.3 | 53.6  |
| hsa-miR-380     | 294.0 | 38.9  |
| hsa-miR-326     | 293.5 | 84.4  |
| hsa-miR-339-3p  | 293.0 | 72.7  |
| hsa-miR-338-5p  | 291.0 | 28.2  |
| hsa-miR-100     | 285.8 | 63.8  |
| hsa-miR-1231    | 283.5 | 33.4  |
| HS_138          | 279.5 | 21.4  |
| hsa-miR-887     | 278.3 | 36.9  |
| hsa-miR-1273    | 276.0 | 127.5 |
| hsa-miR-129-3p  | 275.5 | 107.2 |
| hsa-miR-1237    | 274.0 | 116.0 |
| HS_119          | 271.0 | 25.6  |
| hsa-miR-646     | 268.5 | 109.8 |
| HS_40           | 261.8 | 33.6  |
| hsa-miR-1304    | 256.0 | 79.5  |
Table 1 (continued)

| TargetID   | Mean  | SD  |
|------------|-------|-----|
| hsa-miR-384| 255.5 | 17.2|
| hsa-miR-371-3p | 251.8 | 143.6|
| hsa-miR-377 | 250.5 | 44.9|
| hsa-miR-760 | 250.5 | 47.3|
| hsa-miR-455-5p | 249.0 | 129.0|
| hsa-miR-147b | 248.3 | 21.7|
| hsa-miR-1323 | 248.0 | 22.9|
| hsa-miR-219-2-3p | 246.8 | 24.5|
| hsa-miR-596 | 246.3 | 42.0|
| hsa-miR-581 | 242.0 | 28.9|
| hsa-miR-519c-3p | 237.3 | 30.7|
| hsa-miR-9 | 234.3 | 46.0|
| HS_153 | 232.8 | 11.0|
| hsa-miR-1272 | 232.5 | 24.2|
| hsa-miR-769-3p | 230.3 | 140.8|
| hsa-miR-643 | 227.3 | 25.3|
| hsa-miR-520a-3p | 222.3 | 30.6|
| HS_23 | 221.8 | 25.9|
| hsa-miR-323-5p | 221.8 | 55.4|
| hsa-miR-559 | 221.0 | 13.5|
| hsa-miR-345-9.1 | 220.8 | 110.5|
| hsa-miR-1297 | 220.5 | 15.5|
| hsa-miR-412 | 218.3 | 13.7|
| hsa-miR-624 | 218.3 | 18.0|
| hsa-miR-548c-5p | 210.3 | 36.5|
| hsa-miR-563 | 210.3 | 34.9|
| hsa-miR-876-3p | 208.0 | 29.9|
| hsa-miR-135b | 207.8 | 42.0|
| HS_200 | 201.3 | 28.0|
| hsa-miR-1208 | 198.0 | 33.8|
| hsa-miR-383 | 196.8 | 80.2|
| hsa-miR-453 | 196.0 | 23.8|
| HS_141 | 195.0 | 25.1|
| hsa-miR-331-5p | 193.8 | 11.0|
| HS_33 | 193.3 | 18.0|
| hsa-miR-548f | 189.3 | 25.2|
| hsa-miR-206 | 188.8 | 17.0|
| hsa-miR-190 | 180.8 | 5.6|
| hsa-miR-548m | 177.5 | 21.3|
| hsa-miR-592 | 171.8 | 14.8|
| hsa-miR-1262 | 159.0 | 13.3|

Fig. 1. MSC viability. MSC transfected with pre-miR-92a, anti-miR-92a or scramble oligos were grown for 48 h post-transfection. The portion of viable cells were calculated as a number of Trypan-blue excluding cells per 100 MSCs using Countess Cell Counter, Invitrogen.
2 Experimental design, materials and methods

2.1 Cell culture

MSCs were isolated from subcutaneous fat tissue of healthy young donors using enzymatic digestion as previously described [2]. All donors gave their informed consent and the local ethics committee approved the study protocol. Cells were cultured in AdvanceSTEM Mesenchymal Stem Cell Media containing 10% AdvanceSTEM Supplement (HyClone), 1% antibiotic–antimycotic solution (HyClone) at 37 °C in 5% CO2 incubator. Cells were passaged at 70% confluency using HyQTase solution (HyClone). For the experiments, MSCs cultured up to 3rd–4th passages were used.

Human umbilical vein endothelial cells (HUVEC) were isolated from human umbilical cord vein as previously described [3]. Cells were cultured on gelatin-coated plastic in endothelial growth medium (EGM-2, Lonza) and used for experiments at 3–4 passages.

2.2 miRNA isolation, hybridization and real-time PCR

Total RNA was extracted from MSCs with Ambion® mirVana™ miRNA Isolation Kit according to manufacture instruction. 200 ng of total RNA was processed according to MicroRNA Assay Guide (Illumina) using Human v2 microRNA panel (1146 probes). Data acquisition and analysis of evidently expressed microRNA were performed by GenomeStudio software (Illumina) using gene expression
module. MiRs with detection p value < 0.05 were considered as evidently expressed. MiR-92a in MSCs was detected using miRVana qRT-PCR miRNA detection kit (Ambion), according to manufacturer’s protocol. Reverse transcription was performed during 30 min at 37 °C using 25 ng of RNA and hsa-miR-92a RT-Primer (Ambion). Real-time PCR was performed using hsa-miR92a – qRT-PCR assay primer (Ambion) and ready-to-use reaction mix, containing DNA polymerase, SYBR Green and ROX (Evrogen) in 7500 Fast Real-time PCR system (Applied Biosystems).

2.3 Cell viability

Viability of MSCs transfected with pre-miR-92a, anti-mi-92a or scramble oligos was assessed 48 h post-transfection. HUVEC viability was analyzed after 24 h incubation in the conditioned medium of

![Fig. 4. Capillary-like tubules formation in the presence of MSC conditioned medium. Representative microphotographs of capillary-like tubules formed in growth medium without serum (negative control), in the presence of 10% FBS (positive control), in the presence of conditioned medium of MSCs transfected either with scramble oligos (scramble), anti-miR-92a (anti-miR92a), pre-miR-92a (pre-miR92a). Conditioned medium of MSCs overexpressing pre-miR-92a with addition of recombinant human HGF and HGF alone was also used. Graph represents morphometric analysis of capillary-like structures total length per view field. Presented are data of 3 experiments. *p < 0.05 vs. conditioned medium of MSCs transfected with pre-miR-92a.](image-url)
Fig. 5. Capillary-like tubules formation in the presence of MSC conditioned medium. Representative microphotographs of capillary-like tubules formed in growth medium without serum (negative control), in the presence of 10% FBS (positive control), in the presence of conditioned medium of MSCs transfected either with scramble oligos (scramble), pre-miR-92a (pre-miR92a) or anti-miR-92a (anti-miR92a) or in the presence of conditioned medium from transfected cells after removing extracellular vesicles by ultracentrifugation.
MSCs. To assess the viability cells were trypsinized and counted using Trypan blue staining on Countess Automated Cell Counter.

2.4 in vitro tube formation assay

HUVEC were seeded in 48-well plates coated with growth factor reduced Matrigel (BD Bioscience, 150 µl per well) in concentration 2 × 10⁴ cells per well and MSC conditioned media (300 µl per well) were added [4]. Three wells were used for each sample of conditioned medium. Supplement-free serum-free endothelial basal medium (EBM-2, Lonza) was utilized as a negative control; endothelial growth medium (EGM-2, Lonza) with 10% of FBS served as positive control. Plates were placed into CO₂-incubator at 37 °C and capillary-like structures were assayed in 24 h under the light microscope (Leica). Total length of tubular structures was counted in 5 random fields of view per well (objective 10 ×) using MetaMorph 5.0 software (Universal Imaging).

To evaluate a significance of HGF and angiopoietin-1 for tube formation we also supplemented the conditioned medium of MSCs overexpressing miR-92a with recombinant growth factors (R&D). To examine an impact of extracellular vesicles on angiogenic action of MSC conditioned medium, we removed them by ultracentrifugation as described in [4].

2.5 ELISA of HGF and angiopoietin-1

Concentrations of HGF and angiopoietin-1 in lysates of MSCs transfected with pre-miR-92a (Ambion), anti-miR-92a or pre-miR negative control 1 were measured using ELISA kits (R&D Systems) according to manufacturer instructions.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2015.12.021.

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