**Supplementary Table S1**. **Summary of biomarker genes identified and used in this study.** Data-driven markers consist of the top 9 representative DE genes for each cell type, identified using differential expression analysis. Prior knowledge-based gene markers represent gene sets curated from the published literature.

|  |  |
| --- | --- |
| **Marker type** | **Cell type** |
|  | Cycling SC | DCS (types 1 and 2) | EC | EEC | Goblet (types 1 and 2) | Noncycling SC | TA | Tuft cell |
| Data driven | Csrp2Hspd1Mgst1RanPpiaStmn1Rack1C1qbpYbx1 | Hsd11b2Ramp1Spink4Reg4FcgbpLy6eBest2Atoh1Mptx1 | Krt19Krt8Lgals3Lypd8Selenbp1Lgals4Ethe1Fth1Gsdmc4 | CpeChgaPcsk1nMap1bNeurod1Scg5Insm1DdcResp18 | Agr2Muc2Smim14Gfpt1Txndc5Tspan13SpdefTpd52Stard10 | Gas5Eef1b2Gm6368Sdc4Zfas1Eef1a1Rps3a1Snhg1Rack1 | PtmaAtp5g2Hmgb1Wdr89Aldh1b1Hsp90ab1Grh42418UbbGpx2 | Tuba1aSt18Kctd12Rgs13Ltc4sTrpm5Sh2d6FybAvil |
| Prior knowledge | Kcnq1Mki67PCNASmoc2Stmn1TifaTuba1bTubb5Aqp1Lgr5Ascl2Ube2c | Clec2hFhl1Spink1Zg16Tff3Copz2Reg4Dll4Dll1 | MaobCes2aCes2cCes2eChp2Coro2aCyp2c65Cyp2c68DgkqDpep1Emp1Krt20Cdkn1aLgals3Mxd1Sprr2a3Fam3bClec2hFhl1Gde1Guca2aIl18 | ChgbBex2Pcsk1Marcksl1 | Syt7AngMUC2Agr2Ccl9Anxa3Bcas1FcgbpMlphRab27bRep15Sytl2Cbfa2t3Etv5Galnt5Galnt10Kcnh3Kcnk6Mon1aMt3Sec24dSidt1Stk38lTpd52l1Ccl6Fam103a1Foxa3Guca2bRassf6Spink4Guca2aTff3 | UngAcot1Lgr5Birc5Top2aGjb3Ascl2Ccdc34Soat1 | NrarpIfngr2Sfn | LrmpDclk1Alox5ap |

**Supplementary Table S2. Results of Kolmogorov-Smirnov tests associated with the velocity length of WT and Ahr KO samples.** The K-S test was used to decide whether the velocity length from the KO and WT samples comes from the same distribution. The K-S statistics and P-values show that across all cell types, the distribution of the velocity length of the KO sample is different from that of the WT sample. In all cases, the mean of the velocity length of the KO sample is greater than that of the WT sample.

|  |  |  |
| --- | --- | --- |
| **Cell type** | **KS statistic** | **P-value** |
| Cycling SC | 0.57 | 2.80e-154 |
| DCS (type 1) | 0.33 | 3.40e-29 |
| DCS (type 2) | 0.11 | 1.20e-05 |
| EC | 0.49 | 7.40e-149 |
| EEC | 0.81 | 2.50e-114 |
| Goblet (type 1) | 0.68 | 2.10e-167 |
| Goblet (type 2) | 0.59 | 2.60e-89 |
| Noncycling SC | 0.74 | 2.50e-132 |
| TA | 0.69 | 2.10e-160 |
| Tuft cell | 0.89 | 2.90e-63 |

**Supplementary Table S3**. **CellChat-identified significant ligand-receptor pairs in WT crypt cells.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Source** | **Target** | **Ligand** | **Receptor** | **Prob** | **P-value** | **Interaction\_ name** | **Pathway\_ name** |
| 1 | Noncycling SC | EEC | Hbegf | Egfr | 4.22E-09 | 0 | HBEGF\_EGFR | EGF |
| 2 | Noncycling SC | Goblet (type 1) | Hbegf | Egfr | 4.22E-09 | 0 | HBEGF\_EGFR | EGF |
| 3 | EEC | EEC | Pyy | Npy1r | 3.84E-07 | 0 | PYY\_NPY1R | NPY |
| 4 | Cycling SC | DCS (type 1) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 5 | EC | DCS (type 1) | Kitl | Kit | 5.06E-08 | 0 | KITL\_KIT | KIT |
| 6 | Noncycling SC | DCS (type 1) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 7 | TA | DCS (type 1) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 8 | Cycling SC | DCS (type 2) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 9 | EC | DCS (type 2) | Kitl | Kit | 5.06E-08 | 0 | KITL\_KIT | KIT |
| 10 | Noncycling SC | DCS (type 2) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 11 | TA | DCS (type 2) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 12 | Cycling SC | Goblet (type 1) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 13 | EC | Goblet (type 1) | Kitl | Kit | 5.06E-08 | 0 | KITL\_KIT | KIT |
| 14 | Noncycling SC | Goblet (type 1) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 15 | TA | Goblet (type 1) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 16 | Cycling SC | Goblet (type 2) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 17 | EC | Goblet (type 2) | Kitl | Kit | 5.06E-08 | 0 | KITL\_KIT | KIT |
| 18 | Noncycling SC | Goblet (type 2) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 19 | TA | Goblet (type 2) | Kitl | Kit | 6.75E-08 | 0 | KITL\_KIT | KIT |
| 20 | Cycling SC | Tuft cell | Kitl | Kit | 1.69E-08 | 0 | KITL\_KIT | KIT |
| 21 | EC | Tuft cell | Kitl | Kit | 1.27E-08 | 0 | KITL\_KIT | KIT |
| 22 | Noncycling SC | Tuft cell | Kitl | Kit | 1.69E-08 | 0 | KITL\_KIT | KIT |
| 23 | TA | Tuft cell | Kitl | Kit | 1.69E-08 | 0 | KITL\_KIT | KIT |
| 24 | DCS (type 2) | DCS (type 1) | Grn | Sort1 | 3.80E-08 | 0.01 | GRN\_SORT1 | GRN |
| 25 | Noncycling SC | DCS (type 1) | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 26 | Cycling SC | DCS (type 2) | Grn | Sort1 | 1.69E-08 | 0 | GRN\_SORT1 | GRN |
| 27 | DCS (type 2) | DCS (type 2) | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 28 | EC | DCS (type 2) | Grn | Sort1 | 1.69E-08 | 0.01 | GRN\_SORT1 | GRN |
| 29 | Goblet (type 1) | DCS (type 2) | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 30 | Goblet (type 2) | DCS (type 2) | Grn | Sort1 | 1.69E-08 | 0.04 | GRN\_SORT1 | GRN |
| 31 | Noncycling SC | DCS (type 2) | Grn | Sort1 | 6.75E-08 | 0 | GRN\_SORT1 | GRN |
| 32 | TA | DCS (type 2) | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 33 | Cycling SC | Goblet (type 1) | Grn | Sort1 | 1.69E-08 | 0.01 | GRN\_SORT1 | GRN |
| 34 | DCS (type 1) | Goblet (type 1) | Grn | Sort1 | 1.69E-08 | 0.05 | GRN\_SORT1 | GRN |
| 35 | DCS (type 2) | Goblet (type 1) | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 36 | EC | Goblet (type 1) | Grn | Sort1 | 1.69E-08 | 0.01 | GRN\_SORT1 | GRN |
| 37 | Goblet (type 1) | Goblet (type 1) | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 38 | Noncycling SC | Goblet (type 1) | Grn | Sort1 | 6.75E-08 | 0 | GRN\_SORT1 | GRN |
| 39 | TA | Goblet (type 1) | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 40 | DCS (type 2) | Goblet (type 2) | Grn | Sort1 | 3.80E-08 | 0.02 | GRN\_SORT1 | GRN |
| 41 | Noncycling SC | Goblet (type 2) | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 42 | DCS (type 2) | Noncycling SC | Grn | Sort1 | 3.80E-08 | 0.03 | GRN\_SORT1 | GRN |
| 43 | Goblet (type 1) | Noncycling SC | Grn | Sort1 | 3.80E-08 | 0.05 | GRN\_SORT1 | GRN |
| 44 | Noncycling SC | Noncycling SC | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 45 | DCS (type 2) | TA | Grn | Sort1 | 3.80E-08 | 0.01 | GRN\_SORT1 | GRN |
| 46 | Goblet (type 1) | TA | Grn | Sort1 | 3.80E-08 | 0.04 | GRN\_SORT1 | GRN |
| 47 | Noncycling SC | TA | Grn | Sort1 | 5.06E-08 | 0 | GRN\_SORT1 | GRN |
| 48 | Noncycling SC | Tuft cell | Grn | Sort1 | 1.69E-08 | 0.05 | GRN\_SORT1 | GRN |
| 49 | DCS (type 1) | Cycling SC | Guca2a | Gucy2c | 4.81E-07 | 0.04 | GUCA2A\_GUCY2C | GUCA |
| 50 | DCS (type 2) | Cycling SC | Guca2a | Gucy2c | 7.47E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 51 | EC | Cycling SC | Guca2a | Gucy2c | 5.57E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 52 | Goblet (type 1) | Cycling SC | Guca2a | Gucy2c | 1.14E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 53 | Goblet (type 2) | Cycling SC | Guca2a | Gucy2c | 8.35E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 54 | DCS (type 1) | EC | Guca2a | Gucy2c | 6.41E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 55 | DCS (type 2) | EC | Guca2a | Gucy2c | 9.96E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 56 | EC | EC | Guca2a | Gucy2c | 7.43E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 57 | Goblet (type 1) | EC | Guca2a | Gucy2c | 1.52E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 58 | Goblet (type 2) | EC | Guca2a | Gucy2c | 1.11E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 59 | DCS (type 1) | EEC | Guca2a | Gucy2c | 6.41E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 60 | DCS (type 2) | EEC | Guca2a | Gucy2c | 9.96E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 61 | EC | EEC | Guca2a | Gucy2c | 7.43E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 62 | Goblet (type 1) | EEC | Guca2a | Gucy2c | 1.52E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 63 | Goblet (type 2) | EEC | Guca2a | Gucy2c | 1.11E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 64 | DCS (type 1) | Goblet (type 1) | Guca2a | Gucy2c | 1.28E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 65 | DCS (type 2) | Goblet (type 1) | Guca2a | Gucy2c | 1.99E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 66 | EC | Goblet (type 1) | Guca2a | Gucy2c | 1.49E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 67 | Goblet (type 1) | Goblet (type 1) | Guca2a | Gucy2c | 3.04E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 68 | Goblet (type 2) | Goblet (type 1) | Guca2a | Gucy2c | 2.23E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 69 | DCS (type 1) | Goblet (type 2) | Guca2a | Gucy2c | 6.41E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 70 | DCS (type 2) | Goblet (type 2) | Guca2a | Gucy2c | 9.96E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 71 | EC | Goblet (type 2) | Guca2a | Gucy2c | 7.43E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 72 | Goblet (type 1) | Goblet (type 2) | Guca2a | Gucy2c | 1.52E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 73 | Goblet (type 2) | Goblet (type 2) | Guca2a | Gucy2c | 1.11E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 74 | DCS (type 1) | Noncycling SC | Guca2a | Gucy2c | 8.02E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 75 | DCS (type 2) | Noncycling SC | Guca2a | Gucy2c | 1.24E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 76 | EC | Noncycling SC | Guca2a | Gucy2c | 9.28E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 77 | Goblet (type 1) | Noncycling SC | Guca2a | Gucy2c | 1.90E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 78 | Goblet (type 2) | Noncycling SC | Guca2a | Gucy2c | 1.39E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 79 | DCS (type 1) | TA | Guca2a | Gucy2c | 6.41E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 80 | DCS (type 2) | TA | Guca2a | Gucy2c | 9.96E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 81 | EC | TA | Guca2a | Gucy2c | 7.43E-07 | 0 | GUCA2A\_GUCY2C | GUCA |
| 82 | Goblet (type 1) | TA | Guca2a | Gucy2c | 1.52E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 83 | Goblet (type 2) | TA | Guca2a | Gucy2c | 1.11E-06 | 0 | GUCA2A\_GUCY2C | GUCA |
| 84 | DCS (type 1) | Cycling SC | Guca2b | Gucy2c | 6.33E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 85 | DCS (type 2) | Cycling SC | Guca2b | Gucy2c | 1.52E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 86 | Goblet (type 1) | Cycling SC | Guca2b | Gucy2c | 7.59E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 87 | Goblet (type 2) | Cycling SC | Guca2b | Gucy2c | 5.06E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 88 | DCS (type 1) | DCS (type 1) | Guca2b | Gucy2c | 2.11E-08 | 0.04 | GUCA2B\_GUCY2C | GUCA |
| 89 | DCS (type 2) | DCS (type 1) | Guca2b | Gucy2c | 5.06E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 90 | Goblet (type 1) | DCS (type 1) | Guca2b | Gucy2c | 2.53E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 91 | DCS (type 1) | DCS (type 2) | Guca2b | Gucy2c | 2.11E-08 | 0.04 | GUCA2B\_GUCY2C | GUCA |
| 92 | DCS (type 2) | DCS (type 2) | Guca2b | Gucy2c | 5.06E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 93 | Goblet (type 1) | DCS (type 2) | Guca2b | Gucy2c | 2.53E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 94 | DCS (type 1) | EC | Guca2b | Gucy2c | 8.44E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 95 | DCS (type 2) | EC | Guca2b | Gucy2c | 2.03E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 96 | Goblet (type 1) | EC | Guca2b | Gucy2c | 1.01E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 97 | Goblet (type 2) | EC | Guca2b | Gucy2c | 6.75E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 98 | DCS (type 1) | EEC | Guca2b | Gucy2c | 8.44E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 99 | DCS (type 2) | EEC | Guca2b | Gucy2c | 2.03E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 100 | Goblet (type 1) | EEC | Guca2b | Gucy2c | 1.01E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 101 | Goblet (type 2) | EEC | Guca2b | Gucy2c | 6.75E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 102 | DCS (type 1) | Goblet (type 1) | Guca2b | Gucy2c | 1.69E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 103 | DCS (type 2) | Goblet (type 1) | Guca2b | Gucy2c | 4.05E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 104 | EC | Goblet (type 1) | Guca2b | Gucy2c | 3.38E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 105 | Goblet (type 1) | Goblet (type 1) | Guca2b | Gucy2c | 2.03E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 106 | Goblet (type 2) | Goblet (type 1) | Guca2b | Gucy2c | 1.35E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 107 | DCS (type 1) | Goblet (type 2) | Guca2b | Gucy2c | 8.44E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 108 | DCS (type 2) | Goblet (type 2) | Guca2b | Gucy2c | 2.03E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 109 | Goblet (type 1) | Goblet (type 2) | Guca2b | Gucy2c | 1.01E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 110 | Goblet (type 2) | Goblet (type 2) | Guca2b | Gucy2c | 6.75E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 111 | DCS (type 1) | Noncycling SC | Guca2b | Gucy2c | 1.05E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 112 | DCS (type 2) | Noncycling SC | Guca2b | Gucy2c | 2.53E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 113 | EC | Noncycling SC | Guca2b | Gucy2c | 2.11E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 114 | Goblet (type 1) | Noncycling SC | Guca2b | Gucy2c | 1.27E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 115 | Goblet (type 2) | Noncycling SC | Guca2b | Gucy2c | 8.44E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 116 | DCS (type 1) | TA | Guca2b | Gucy2c | 8.44E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 117 | DCS (type 2) | TA | Guca2b | Gucy2c | 2.03E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 118 | Goblet (type 1) | TA | Guca2b | Gucy2c | 1.01E-07 | 0 | GUCA2B\_GUCY2C | GUCA |
| 119 | Goblet (type 2) | TA | Guca2b | Gucy2c | 6.75E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 120 | DCS (type 1) | Tuft cell | Guca2b | Gucy2c | 2.11E-08 | 0.04 | GUCA2B\_GUCY2C | GUCA |
| 121 | DCS (type 2) | Tuft cell | Guca2b | Gucy2c | 5.06E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 122 | Goblet (type 1) | Tuft cell | Guca2b | Gucy2c | 2.53E-08 | 0 | GUCA2B\_GUCY2C | GUCA |
| 123 | Cycling SC | Cycling SC | Lgals9 | Cd44 | 8.44E-09 | 0 | LGALS9\_CD44 | GALECTIN |
| 124 | Goblet (type 1) | Cycling SC | Lgals9 | Cd44 | 8.44E-09 | 0 | LGALS9\_CD44 | GALECTIN |
| 125 | Goblet (type 2) | Cycling SC | Lgals9 | Cd44 | 8.44E-09 | 0 | LGALS9\_CD44 | GALECTIN |
| 126 | Noncycling SC | Cycling SC | Lgals9 | Cd44 | 8.44E-09 | 0 | LGALS9\_CD44 | GALECTIN |
| 127 | TA | Cycling SC | Lgals9 | Cd44 | 8.44E-09 | 0 | LGALS9\_CD44 | GALECTIN |
| 128 | Cycling SC | Noncycling SC | Lgals9 | Cd44 | 3.80E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 129 | Goblet (type 1) | Noncycling SC | Lgals9 | Cd44 | 3.80E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 130 | Goblet (type 2) | Noncycling SC | Lgals9 | Cd44 | 3.80E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 131 | Noncycling SC | Noncycling SC | Lgals9 | Cd44 | 3.80E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 132 | TA | Noncycling SC | Lgals9 | Cd44 | 3.80E-08 | 0 | LGALS9\_CD44 | GALECTIN |

**Supplementary Table S4**. **CellChat-identified significant ligand-receptor pairs in Ahr KO crypt cells.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Source** | **Target** | **Ligand** | **Receptor** | **Prob** | **P-value** | **Interaction\_ Name** | **Pathway\_ name** |
| 1 | EC | Cycling SC | Hbegf | Egfr | 8.41E-09 | 0 | HBEGF\_EGFR | EGF |
| 2 | Noncycling SC | Cycling SC | Hbegf | Egfr | 1.68E-08 | 0 | HBEGF\_EGFR | EGF |
| 3 | EC | EC | Hbegf | Egfr | 8.41E-09 | 0 | HBEGF\_EGFR | EGF |
| 4 | Noncycling SC | EC | Hbegf | Egfr | 1.68E-08 | 0 | HBEGF\_EGFR | EGF |
| 5 | EC | EEC | Hbegf | Egfr | 8.41E-09 | 0 | HBEGF\_EGFR | EGF |
| 6 | Noncycling SC | EEC | Hbegf | Egfr | 1.68E-08 | 0 | HBEGF\_EGFR | EGF |
| 7 | EC | Goblet (type 1) | Hbegf | Egfr | 8.41E-09 | 0 | HBEGF\_EGFR | EGF |
| 8 | Noncycling SC | Goblet (type 1) | Hbegf | Egfr | 1.68E-08 | 0 | HBEGF\_EGFR | EGF |
| 9 | EC | Goblet (type 2) | Hbegf | Egfr | 8.41E-09 | 0 | HBEGF\_EGFR | EGF |
| 10 | Noncycling SC | Goblet (type 2) | Hbegf | Egfr | 1.68E-08 | 0 | HBEGF\_EGFR | EGF |
| 11 | Cycling SC | Noncycling SC | Mif | CD74\_CD44 | 4.20E-07 | 0 | MIF\_CD74\_CD44 | MIF |
| 12 | DCS (type 1) | Noncycling SC | Mif | CD74\_CD44 | 1.35E-07 | 0 | MIF\_CD74\_CD44 | MIF |
| 13 | DCS (type 2) | Noncycling SC | Mif | CD74\_CD44 | 1.35E-07 | 0 | MIF\_CD74\_CD44 | MIF |
| 14 | EC | Noncycling SC | Mif | CD74\_CD44 | 1.51E-07 | 0 | MIF\_CD74\_CD44 | MIF |
| 15 | EEC | Noncycling SC | Mif | CD74\_CD44 | 6.73E-08 | 0 | MIF\_CD74\_CD44 | MIF |
| 16 | Goblet (type 1) | Noncycling SC | Mif | CD74\_CD44 | 1.35E-07 | 0 | MIF\_CD74\_CD44 | MIF |
| 17 | Goblet (type 2) | Noncycling SC | Mif | CD74\_CD44 | 1.51E-07 | 0 | MIF\_CD74\_CD44 | MIF |
| 18 | Noncycling SC | Noncycling SC | Mif | CD74\_CD44 | 5.72E-07 | 0 | MIF\_CD74\_CD44 | MIF |
| 19 | TA | Noncycling SC | Mif | CD74\_CD44 | 3.70E-07 | 0 | MIF\_CD74\_CD44 | MIF |
| 20 | Tuft cell | Noncycling SC | Mif | CD74\_CD44 | 1.68E-08 | 0 | MIF\_CD74\_CD44 | MIF |
| 21 | Cycling SC | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 22 | DCS (type 1) | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 23 | DCS (type 2) | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 24 | EC | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 25 | EEC | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 26 | Goblet (type 1) | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 27 | Goblet (type 2) | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 28 | Noncycling SC | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 29 | TA | EC | Nampt | Insr | 2.52E-08 | 0 | NAMPT\_INSR | VISFATIN |
| 30 | EEC | EEC | Pyy | Npy1r | 8.41E-09 | 0 | PYY\_NPY1R | NPY |
| 31 | Cycling SC | DCS (type 1) | Kitl | Kit | 5.38E-07 | 0 | KITL\_KIT | KIT |
| 32 | EC | DCS (type 1) | Kitl | Kit | 5.38E-07 | 0 | KITL\_KIT | KIT |
| 33 | Noncycling SC | DCS (type 1) | Kitl | Kit | 5.38E-07 | 0 | KITL\_KIT | KIT |
| 34 | TA | DCS (type 1) | Kitl | Kit | 2.69E-07 | 0 | KITL\_KIT | KIT |
| 35 | Cycling SC | DCS (type 2) | Kitl | Kit | 2.69E-07 | 0 | KITL\_KIT | KIT |
| 36 | EC | DCS (type 2) | Kitl | Kit | 2.69E-07 | 0 | KITL\_KIT | KIT |
| 37 | Noncycling SC | DCS (type 2) | Kitl | Kit | 2.69E-07 | 0 | KITL\_KIT | KIT |
| 38 | TA | DCS (type 2) | Kitl | Kit | 1.35E-07 | 0 | KITL\_KIT | KIT |
| 39 | Cycling SC | Goblet (type 1) | Kitl | Kit | 4.04E-07 | 0 | KITL\_KIT | KIT |
| 40 | EC | Goblet (type 1) | Kitl | Kit | 4.04E-07 | 0 | KITL\_KIT | KIT |
| 41 | Noncycling SC | Goblet (type 1) | Kitl | Kit | 4.04E-07 | 0 | KITL\_KIT | KIT |
| 42 | TA | Goblet (type 1) | Kitl | Kit | 2.02E-07 | 0 | KITL\_KIT | KIT |
| 43 | Cycling SC | Goblet (type 2) | Kitl | Kit | 7.40E-07 | 0 | KITL\_KIT | KIT |
| 44 | EC | Goblet (type 2) | Kitl | Kit | 7.40E-07 | 0 | KITL\_KIT | KIT |
| 45 | Noncycling SC | Goblet (type 2) | Kitl | Kit | 7.40E-07 | 0 | KITL\_KIT | KIT |
| 46 | TA | Goblet (type 2) | Kitl | Kit | 3.70E-07 | 0 | KITL\_KIT | KIT |
| 47 | Cycling SC | Goblet (type 2) | Sema3b | NRP2\_PLXNA2 | 1.19E-08 | 0 | SEMA3B\_NRP2\_PLXNA2 | SEMA3 |
| 48 | DCS (type 1) | Goblet (type 2) | Sema3b | NRP2\_PLXNA2 | 1.19E-08 | 0 | SEMA3B\_NRP2\_PLXNA2 | SEMA3 |
| 49 | EC | Goblet (type 2) | Sema3b | NRP2\_PLXNA2 | 3.57E-08 | 0 | SEMA3B\_NRP2\_PLXNA2 | SEMA3 |
| 50 | Goblet (type 1) | Goblet (type 2) | Sema3b | NRP2\_PLXNA2 | 1.19E-08 | 0 | SEMA3B\_NRP2\_PLXNA2 | SEMA3 |
| 51 | Goblet (type 2) | Goblet (type 2) | Sema3b | NRP2\_PLXNA2 | 3.57E-08 | 0 | SEMA3B\_NRP2\_PLXNA2 | SEMA3 |
| 52 | TA | Goblet (type 2) | Sema3b | NRP2\_PLXNA2 | 1.19E-08 | 0 | SEMA3B\_NRP2\_PLXNA2 | SEMA3 |
| 53 | Cycling SC | Goblet (type 2) | Sema3c | NRP2\_PLXNA2 | 1.19E-08 | 0 | SEMA3C\_NRP2\_PLXNA2 | SEMA3 |
| 54 | EC | Goblet (type 2) | Sema3c | NRP2\_PLXNA2 | 4.76E-08 | 0 | SEMA3C\_NRP2\_PLXNA2 | SEMA3 |
| 55 | Noncycling SC | Goblet (type 2) | Sema3c | NRP2\_PLXNA2 | 3.57E-08 | 0 | SEMA3C\_NRP2\_PLXNA2 | SEMA3 |
| 56 | TA | Goblet (type 2) | Sema3c | NRP2\_PLXNA2 | 1.19E-08 | 0 | SEMA3C\_NRP2\_PLXNA2 | SEMA3 |
| 57 | Cycling SC | Goblet (type 2) | Sema3c | Plxnd1 | 8.41E-09 | 0 | SEMA3C\_PLXND1 | SEMA3 |
| 58 | EC | Goblet (type 2) | Sema3c | Plxnd1 | 3.36E-08 | 0 | SEMA3C\_PLXND1 | SEMA3 |
| 59 | Noncycling SC | Goblet (type 2) | Sema3c | Plxnd1 | 2.52E-08 | 0 | SEMA3C\_PLXND1 | SEMA3 |
| 60 | TA | Goblet (type 2) | Sema3c | Plxnd1 | 8.41E-09 | 0 | SEMA3C\_PLXND1 | SEMA3 |
| 61 | Cycling SC | Cycling SC | Grn | Sort1 | 1.68E-07 | 0.01 | GRN\_SORT1 | GRN |
| 62 | DCS (type 1) | Cycling SC | Grn | Sort1 | 1.68E-07 | 0.01 | GRN\_SORT1 | GRN |
| 63 | EC | Cycling SC | Grn | Sort1 | 2.10E-07 | 0 | GRN\_SORT1 | GRN |
| 64 | Noncycling SC | Cycling SC | Grn | Sort1 | 1.68E-07 | 0.01 | GRN\_SORT1 | GRN |
| 65 | Cycling SC | DCS (type 1) | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 66 | DCS (type 1) | DCS (type 1) | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 67 | DCS (type 2) | DCS (type 1) | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 68 | EC | DCS (type 1) | Grn | Sort1 | 3.36E-07 | 0 | GRN\_SORT1 | GRN |
| 69 | Goblet (type 1) | DCS (type 1) | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 70 | Goblet (type 2) | DCS (type 1) | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 71 | Noncycling SC | DCS (type 1) | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 72 | TA | DCS (type 1) | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 73 | EC | DCS (type 2) | Grn | Sort1 | 1.68E-07 | 0.01 | GRN\_SORT1 | GRN |
| 74 | Cycling SC | EC | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 75 | DCS (type 1) | EC | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 76 | DCS (type 2) | EC | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 77 | EC | EC | Grn | Sort1 | 3.36E-07 | 0 | GRN\_SORT1 | GRN |
| 78 | Goblet (type 1) | EC | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 79 | Goblet (type 2) | EC | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 80 | Noncycling SC | EC | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 81 | TA | EC | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 82 | EC | Goblet (type 1) | Grn | Sort1 | 1.68E-07 | 0.02 | GRN\_SORT1 | GRN |
| 83 | Cycling SC | Goblet (type 2) | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 84 | DCS (type 1) | Goblet (type 2) | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 85 | DCS (type 2) | Goblet (type 2) | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 86 | EC | Goblet (type 2) | Grn | Sort1 | 3.36E-07 | 0 | GRN\_SORT1 | GRN |
| 87 | Goblet (type 1) | Goblet (type 2) | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 88 | Goblet (type 2) | Goblet (type 2) | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 89 | Noncycling SC | Goblet (type 2) | Grn | Sort1 | 2.69E-07 | 0 | GRN\_SORT1 | GRN |
| 90 | TA | Goblet (type 2) | Grn | Sort1 | 2.02E-07 | 0 | GRN\_SORT1 | GRN |
| 91 | Cycling SC | Cycling SC | Lgals9 | Cd44 | 5.04E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 92 | DCS (type 2) | Cycling SC | Lgals9 | Cd44 | 5.04E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 93 | EC | Cycling SC | Lgals9 | Cd44 | 5.04E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 94 | Goblet (type 1) | Cycling SC | Lgals9 | Cd44 | 2.02E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 95 | Goblet (type 2) | Cycling SC | Lgals9 | Cd44 | 2.02E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 96 | Noncycling SC | Cycling SC | Lgals9 | Cd44 | 5.04E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 97 | TA | Cycling SC | Lgals9 | Cd44 | 5.04E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 98 | Goblet (type 1) | Goblet (type 1) | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 99 | Goblet (type 2) | Goblet (type 1) | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 100 | Cycling SC | Goblet (type 2) | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 101 | DCS (type 2) | Goblet (type 2) | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 102 | EC | Goblet (type 2) | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 103 | Goblet (type 1) | Goblet (type 2) | Lgals9 | Cd44 | 1.35E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 104 | Goblet (type 2) | Goblet (type 2) | Lgals9 | Cd44 | 1.35E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 105 | Noncycling SC | Goblet (type 2) | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 106 | TA | Goblet (type 2) | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 107 | Cycling SC | Noncycling SC | Lgals9 | Cd44 | 1.43E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 108 | DCS (type 2) | Noncycling SC | Lgals9 | Cd44 | 1.43E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 109 | EC | Noncycling SC | Lgals9 | Cd44 | 1.43E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 110 | Goblet (type 1) | Noncycling SC | Lgals9 | Cd44 | 5.72E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 111 | Goblet (type 2) | Noncycling SC | Lgals9 | Cd44 | 5.72E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 112 | Noncycling SC | Noncycling SC | Lgals9 | Cd44 | 1.43E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 113 | TA | Noncycling SC | Lgals9 | Cd44 | 1.43E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 114 | Cycling SC | TA | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 115 | DCS (type 2) | TA | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 116 | EC | TA | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 117 | Goblet (type 1) | TA | Lgals9 | Cd44 | 1.35E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 118 | Goblet (type 2) | TA | Lgals9 | Cd44 | 1.35E-07 | 0 | LGALS9\_CD44 | GALECTIN |
| 119 | Noncycling SC | TA | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 120 | TA | TA | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 121 | Goblet (type 1) | Tuft cell | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |
| 122 | Goblet (type 2) | Tuft cell | Lgals9 | Cd44 | 3.36E-08 | 0 | LGALS9\_CD44 | GALECTIN |