**Supplementary file 1**

**Supplementary File 1A. Number of embryos examined for anterior phenotypes in Figure 6D.**

|  |  |  |
| --- | --- | --- |
|  |  n | % of embryos |
|  | Normal | Enlarged Head | Moderate Deficiency | Severe Deficiency |
| CoMO | 42 | 93.7 | 6.3 | 0.0 | 0.0 |
| Tmem79 MO | 27 | 22.1 | 50.4 | 27.5 | 0.0 |
| Tmem79 MO+TMEM79 | 29 | 68.2 | 9.5 | 22.3 | 0.0 |
| Tmem79 MO+Usp8 MO | 36 | 55.2 | 29.7 | 4.1 | 11.0 |
| Tmem79MO+β-catenin MO | 31 | 52.1 | 28.4 | 2.4 | 17.1 |

Moderate Deficiency: embryos with anterior structures reduced, such as small eyes and a small cement gland.  Severe Deficiency: embryos with no visible anterior structures, lacking eyes and the cement gland.

Supplementary File 1B. Number of embryos examined for pigmentation phenotype in Figure 6D.

|  |  |  |
| --- | --- | --- |
|   | n | % of embryos |
| Normal | Pigmentation Deficiency |
| Co MO | 42 | 97.6 | 2.4 |
| Tmem79 MO | 27 | 3.7 | 96.3 |
| Tmem79 MO+TMEM79 | 29 | 89.6 | 10.4 |
| Tmem79 MO+Usp8 MO | 36 | 72.2 | 27.8 |
| Tmem79MO+β-catenin MO | 31 | 74.2 | 25.8 |

**Supplementary File 1C. Number of embryos examined for neural versus epidermal marker expression in Figure 6F.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | n | Sox2 | n | Keratin |
|  | % of embryos | % of embryos |
|  | Normal | Reduced | Normal | Expanded |
| Co MO | 34 | 85.7 | 14.3 | 49 | 89.5 | 10.5 |
| Tmem79 MO | 42 | 31.8 | 68.2 | 58 | 38.9 | 61.1 |
| Tmem79 MO+Tmem79 | 53 | 73.9 | 26.1 | 45 | 76.0 | 24.0 |
| Tmem79 MO+Usp8MO | 47 | 70.2 | 29.8 | 42 | 73.8 | 26.2 |

**Supplementary File 1D. Number of embryos examined for spina bifida in Figure 7B.**

|  |  |  |
| --- | --- | --- |
|  |  N | % of embryos |
|  | Normal | Spina Bifida |
| Co MO | 66 | 95.3 | 4.7 |
| Tmem79 MO | 74 | 14.7 | 85.3 |
| Tmem79 MO+Tmem79 | 44 | 63.5 | 36.5 |

**Supplementary File 1E. Number of embryos examined for axial elongation defect in Figure 7D.**

|  |  |  |
| --- | --- | --- |
|  |  N | % of embryos |
|  | Normal | Axial Elongation Defect |
| Co MO | 46 | 100 | 0.0 |
| Tmem79 MO | 64 | 31.3 | 68.7 |
| Tmem79 MO +Tmem79 | 58 | 72.4 | 27.6 |

**Supplementary File 1F. Number of animal pole explants examined for axial mesoderm elongation in Figure 7F.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  n | Length | Width | Ratio |
|  | Average | Average |
| Co MO | 20 | 123.4±11.9 | 123.3±11.6 | 1.00 |
| Co MO (+Act) | 21 | 229.0±19.7 | 75.1±10.7 | 3.05 |
| Tmem79 MO (+Act) | 21 | 155.3±19.3 | 110.3±15.2 | 1.41 |
| Tmem79 MO+Tmem79 (+Act) | 19 | 203.7±21.9 | 98.4±14.4 | 2.07 |
| Tmem79 MO+Usp8 MO (+Act) | 18 | 208.7±24.9 | 88.4±15.4 | 2.36 |

Length and width are in μm

**Supplementary File 1G. Number of embryos examined for enlarged head or spina bifida in Figure 6-figure supplement 1B.**

|  |  |  |
| --- | --- | --- |
|  |  N | % of embryos |
|  | Normal | Enlarged Head | Spina Bifida |
| Uninjected | 76 | 97.6 | 0.0 | 2.4 |
| TMEM79  | 93 | 18.2 | 54.5 | 27.3 |

**Supplementary File 1H. Number of embryos examined for anterior marker expression in Figure 6-figure supplement 1G.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | n | % of embryos |
|  |  | Normal | Reduced |
| XAG | Co MO | 35 | 91.4 | 8.6 |
| Tmem79 MO | 34 | 64.7 | 35.3 |
| Tmem79 MO+Tmem79 | 32 | 81.3 | 18.8 |
| Bf1 | Co MO | 51 | 88.2 | 11.8 |
| Tmem79 MO | 44 | 27.3 | 72.7 |
| Tmem79 MO+Tmem79 | 50 | 68.0 | 32.0 |
| En2 | Co MO | 35 | 95.4 | 4.6 |
| Tmem79 MO | 34 | 54.7 | 45.3 |
| Tmem79 MO+Tmem79 | 32 | 71.3 | 28.8 |
| Krox20 | Co MO | 45 | 91.1 | 8.9 |
| Tmem79 MO | 67 | 32.8 | 67.2 |
| Tmem79 MO+Tmem79 | 50 | 66.0 | 34.0 |
| n-tub | Co MO | 34 | 94.1 | 5.9 |
| Tmem79 MO | 38 | 52.6 | 47.4 |
| Tmem79 MO+Tmem79 | 36 | 83.3 | 16.7 |

**Supplementary File 1I. Number of embryos examined for anterior phenotypes in Figure 6-figure supplement 1F.**

|  |  |  |
| --- | --- | --- |
|  |  n | % of embryos |
|  | Normal | Moderate Deficiency | Severe Deficiency | Enlarged Head |
| Co MO | 64 | 92.2 | 7.8 | 0.0 | 0.0 |
| Usp8 MO | 48 | 6.8 | 0.0 | 0.0 | 93.2 |
| β-catenin MO | 34 | 15.8 | 0.0 | 0.0 | 84.2 |

**Supplementary File 1J. Number of embryos examined for dorsal/organizer marker expression in Figure 6-figure supplement 1G.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | n | % of embryos |
|  |  | Normal | Affected |
| Gsc | Co MO | 38 | 88.9 | 11.1 |
| Tmem79 MO | 39 | 89.5 | 10.5 |
| Tmem79 MO+Tmem79 | 38 | 88.9 | 11.1 |
| Chd | Co MO | 39 | 89.5 | 10.5 |
| Tmem79 MO | 42 | 81.8 | 18.2 |
| Tmem79 MO+Tmem79 | 37 | 82.4 | 17.6 |
| Dkk | Co MO | 36 | 100.0 | 0.0 |
| Tmem79 MO | 40 | 90.0 | 10.0 |
| Tmem79 MO+Tmem79 | 39 | 84.2 | 15.8 |
| Lim1 | Co MO | 36 | 100.0 | 0.0 |
| Tmem79 MO | 40 | 90.0 | 10.0 |
| Tmem79 MO+Tmem79 | 39 | 84.2 | 15.8 |
| Xnr3 | Co MO | 17 | 100.0 | 0.0 |
| Tmem79 MO | 20 | 90.0 | 10.0 |
| Tmem79 MO+Tmem79 | 16 | 87.5 | 12.5 |
| xNot | Co MO | 29 | 90.0 | 10.0 |
| Tmem79 MO | 40 | 85.0 | 15.0 |
| Tmem79 MO+Tmem79 | 39 | 78.9 | 21.1 |

**Supplementary File 1K. Number of embryos examined for neural crest marker expression in Figure 6-figure supplement 1H.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | n | % of embryos |
|  |  | Normal | Reduced |
| FoxD3 | Co MO | 42 | 94.1 | 5.9 |
| Tmem79 MO | 39 | 42.8 | 57.2 |
| Tmem79 MO+Tmem79 | 37 | 85.3 | 14.8 |
| Snail1 | Co MO | 51 | 92.1 | 7.9 |
| Tmem79 MO | 48 | 35.8 | 64.2 |
| Tmem79 MO+Tmem79 | 45 | 78.3 | 21.8 |