Table S1. The methods of the source database.

GEO accession	Tissue	Method of the source database
GSE101986	Mouse native retina	Retinae of C57Bl/6 mice for embryonic days E11, E12, E14, E16 and postnatal days P0, P2, P4, P6, P10, P14, P21, and P28 were excised rapidly, frozen on dry ice, and stored at -80°C until use. Fresh frozen mouse retinae were lysed with a mortar and pestle in Trizol, and total RNA was isolated per manufacture's protocol (Invitrogen).
GSE102794	Mouse retinal organoids	At differentiation day (D)0, PSCs were plated in PrimeSurface low adhesion U-shaped 96-well plate (Wako) at a density of 3000 cells per well in 100 µl retinal differentiation medium constituted by GMEM (Life Technologies), 1x NEAA (Sigma), 1x sodium pyruvate (Sigma) and 1.5%(v/v) knockout serum replacement (Life Technologies). 20 µl diluted Matrigel (120 µl >9.5 mg/ml Matrigel diluted in 900 µl retinal differentiation medium) (Corning) was added to each well at D1. At D7, Retinal organoids were transferred a 100 mm Poly(2-hydroxyethyl methacrylate) (Sigma)-coated petri dish with 10 ml DMEM/F12 with GlutaMAX (Life Technologies) supplemented with 1x N2 supplement (Life Technologies) and 1x PS (Life Technologies). From D10 to D26, retinal organoids were maintained in DMEM/F12 with GlutaMAX (Life Technologies), 1x PS (Life Technologies), 1x N2 supplement (Life Technologies), 1 mM taurine (Sigma), 500 nM 9-cis retinal (Sigma) and 100 ng/ml insulin-like growth factor 1 (Life Technologies). From D26 and onward, 1x NEAA acid (Sigma), 1x B27 supplement without Vitamin A (Life Technologies) and 2%(v/v) FBS (Atlanta Biologicals) were added to the culture. Half-media exchanges were performed every two days. 1x 2-ME was freshly added to media. The cultures were incubated in 5% O_2 from D0 to D10 and in 20% O_2 from D10 onwards.
GSE104827	Human native retina	Whole human fetal retina samples [spanning 14 time points: D52/54, D53, D57 (2 samples), D67 (2 samples), D70, D80, D87, D94 (2 samples), D105, D107, D115, D125, D132 and D136] were dissected and homogenized in Trizol (Invitrogen, Carlsbad, CA) and stored at -80°C. Total RNA was extracted following manufacturer's instructions.
GSE119320	House retinal organoids	On day 1, cells were moved to normoxic conditions (5% CO2). On days 1-3, 50 µl of BE6.2 media containing 3 µM Wnt inhibitor (IWR1e: 681669, EMD Millipore) and 1% (v/v) Matrigel were added to each well. On days 4-9, 100 µl of media were removed from each well, and 100 µl of media were added. On days 4-5, BE6.2 media containing 3 µM Wnt inhibitor and 1% Matrigel was added. On days 6-7, BE6.2 media containing 1% Matrigel was added. On days 8-9, BE6.2 media containing 1% Matrigel and 100 nM Smoothened agonist (SAG: 566660, EMD Millipore) was added. On day 10, aggregates were transferred to 15 mL tubes, rinsed 3X in DMEM (11885084, Gibco), and resuspended in BE6.2 with 100 nM SAG in untreated 10 cm polystyrene petri dishes. From this point on, media was changed every other day. Aggregates were monitored and manually separated if stuck together or to the bottom of the plate. On days 13-16, LTR media with 100 nM SAG was added. Between days 11 and 16, retinal vesicles were manually dissected using sharpened tungsten needles. After dissection, cells were transferred into 15 mL tubes and washed 2X with 5 ml of DMEM. On days 16-20, cells were maintained in LTR and washed 2X with 5 ml of DMEM, before being transferred to new plates to wash off dead cells. To increase survival and differentiation, 1 µM all-trans retinoic acid (ATRA; R2625; Sigma) was added to LTR medium from days 20-130. 10 µM Gammasecretase inhibitor (DAPT: 565770, EMD Millipore) was added to LTR from days 28-42. Organoids were grown at low density (10-20 per 10 cm dish, 2-3 per well in 6 well plate) to reduce aggregation.

Table S2. Specific transcription factors (TFs) of each neural retinal cell type in mouse native retina and retinal organoids.

Table S3. Specific transcription factors (TFs) of each neural retinal cell type in human native retina and retinal organoids.

Table S4. Pearson correlation coefficient between mouse and human retinal organoids.

Table S5. Retinal mitochondria related gene expression of native retina and retinal organoids in mouse and human.

Figure S1. The curves of relative gene average expression in each cluster over time between mouse native retina and retinal organoids.

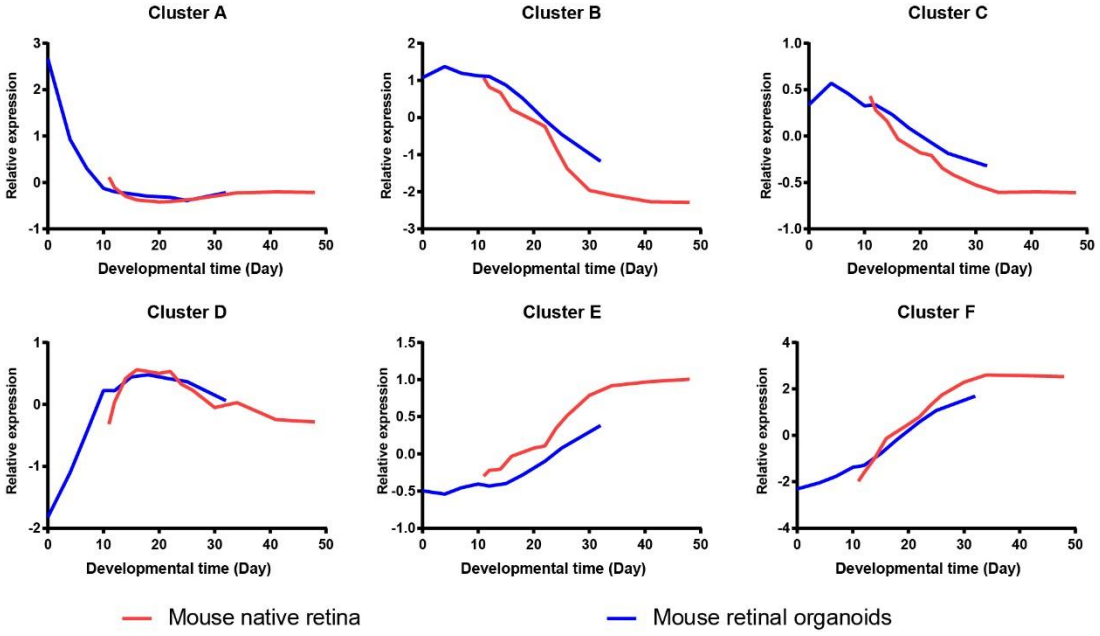

Figure S2. The curves of relative gene average expression in each cluster over time between human native retina and retinal organoids.

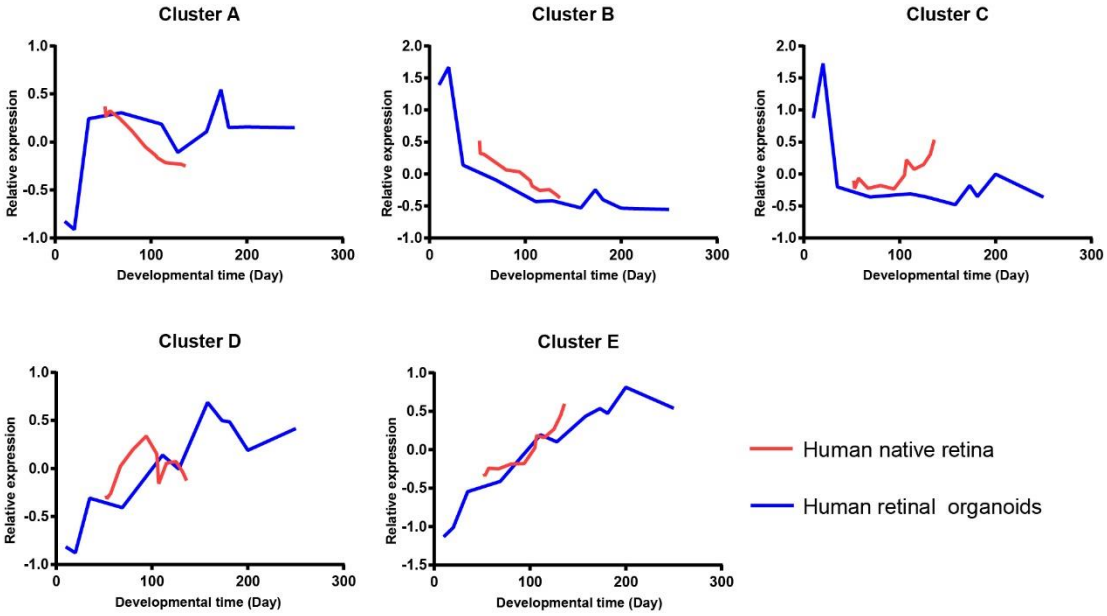

Figure S3. The heatmap of mitochondria-related genes in dataset GSE102727.