Supplemental Information

Several transporters previously identified in the human BBB, such as SLC7A5, SLCO2B1, ABCB1, and ABCG2, were also enriched in our BMV samples (Figure 1A). Enrichment of these and several other genes (SLC22A3, SLC47A1, SLC47A2 and SLC5A6) was confirmed by TaqMan gene expression analysis of three paired cerebral cortex-brain microvessel (BMV) samples (Figure S2). OpenArray results indicated that SLC19A2, SLCO1A2, and SLCO3A1 were not enriched in BMV samples, and were included as negative controls. Furthermore, linear regression analysis on the OpenArray and TaqMan enrichment values yielded an $r^2 = 0.60$ (Figure S2B), indicating good agreement between the two RT-PCR technologies, and confirming the OpenArray-based expression profiling results.

Materials and Methods

Tissue acquisition. Four partial human cerebral cortex samples were procured from the National Disease Research Interchange (Philadelphia, PA). Donor demographics and medical history are provided in Table S1. Normal human liver and kidney tissue were commercially obtained (Asterand, Detroit, MI) for comparative expression profiling. All tissues were acquired in accordance with UCSF Institutional Review Board and ethics committee guidelines (IRB # 11-06153).

BMV isolation. BMVs were isolated using a previously established protocol (1). Approximately one gram of tissue was homogenized in ice cold Hanks’ balanced salt solution (HBSS; Invitrogen, Carlsbad, CA) with a Potter–Elvehjem homogenizer
(Thomas Scientific, Swedesboro, NJ). The homogenate was centrifuged for 5 min at 1000 g at 4°C, and the supernatant was aspirated. The pellet was resuspended in an autoclaved 17% dextran solution (Sigma-Aldrich, St Louis, MO) and centrifuged for 15 min at 4250 g at 4°C. The myelin-enriched supernatant was aspirated and the resulting BMV-enriched pellet was resuspended in ice cold HBSS. This solution was applied to a 40 μm nylon mesh filter, and BMVs retained on the filter were washed with 40 ml of ice cold HBSS. BMVs were recovered from the filter, and centrifuged for 5 min at 4250 g at 4°C. The resulting pellet was then used immediately for RNA extraction or IHC.

**RNA extraction and reverse transcriptase PCR.** Total RNA was extracted from the BMV-enriched samples (n=3), cerebral cortex (n=3), liver (n=60), and kidney (n=59) tissue homogenates using TRIzol Reagent and RNeasy Plus Micro Kit (Qiagen, Valencia, CA), according to the kit instructions. After separation of the organic and aqueous phases by centrifugation, total RNA was isolated from the aqueous phase using an RNeasy Plus Micro Kit. After isolation, RNA samples were stored at -80°C. Total RNA (up to 1 µg) was reverse transcribed using the SuperScript VILO cDNA Synthesis Kit (Life Technologies, Grand Island, NY) according to the manufacturer’s instructions. The resulting cDNA samples were stored at -80°C.

**Real Time-PCR.** High-throughput, real-time PCR (RT-PCR) was performed using a customized OpenArray® system (Life Technologies) as previously described (2). cDNA at a concentration of 108 ng/µL and SYBR Green qPCR reagent (Fast Start DNA SYBR Green kit, Roche, CA) were dispensed into custom plates containing 448 pre-validated
real-time SYBR Green PCR assays. RT-PCR occurred in a computer-controlled imaging thermal cycler where 9216 PCR amplifications and dissociation curves were implemented in less than four hours. The transporter genes analyzed and the PCR primers used are described in a previous study (2). Post-acquisition data processing generated fluorescence amplification and melt curves for each through-hole in the array, from which cycle threshold ($C_T$) and melt temperature ($T_m$) were computed and used for further data analysis.

Microplate-based SYBR green and TaqMan RT-PCR was used to measure cell type marker gene expression and confirm array-based gene expression results. Two ng of BMV or cerebral cortex cDNA was used as a template, and mixed with PCR primers at for either platelet endothelial cell adhesion molecule ($\text{PECAM1}$), vascular endothelial cadherin ($\text{VEC}$), glucose transporter 1 ($\text{GLUT1}$), synaptophysin ($\text{SYP}$), or glial fibrillary acidic protein ($\text{GFAP}$) for SYBR green RT-PCR (see Table S3 for primer sequences).

For TaqMan RT-PCR, the following TaqMan Gene Expression Assays (Life Technologies) were mixed with two ng of template cDNA: GAPDH (Hs99999905_m1), ACTB (Hs01060665_m1), PGK1 (Hs99999906_m1), ABCB1 (Hs00184491_m1), ABCG2 (Hs01053790_m1), SLC2A1 (Hs00892681_m1), SLC5A6 (Hs00221573_m1), SLC7A5 (Assay ID: Hs01001190_m1), SLC19A2 (Hs00949696_m1), SLC22A3 (Hs01009568), SLC47A1 (Hs00217320), SLC47A2 (Hs00398719_m1), SLCO1A2 (Hs00366488_m1), SLCO2B1 (Hs_00200670), and SLCO3A1 (Hs00203184_m1). RT-PCR reactions were carried out in 96-well reaction plates in a volume of 10 μL using either Fast SYBR green Universal Master Mix or TaqMan Fast Universal Master Mix (Life Technologies). Reaction plates were run on the Applied Biosystems 7900HT Fast
Real-Time PCR System with the following profile: 95°C for 20 seconds followed by 40 cycles of 95°C for 3 seconds and 60°C for 30 seconds.

The relative expression of each gene in the different tissues was calculated by the $\Delta\Delta C_T$ comparative expression method (3). The $\Delta C_T$ values for all the genes in each sample were calculated by subtracting the mean $C_T$ values for three housekeeping genes (GAPDH, β-Actin, and β2 microglobulin) from the $C_T$ for each target gene. The relative quantity of each gene was then determined by calculating the $2^{-\Delta C_T}$ value and multiplying by 100 to obtain the percent of housekeeping genes. To determine the fold change in gene expression relative to a reference tissue, the log2-transformed relative quantity values from each tissue were compared to each other.

**Immunohistochemistry.** IHC analysis of isolated BMVs was performed as previously described (4). BMV-enriched pellets were resuspended in ice cold HBSS and seeded onto positively charged glass slides, and fixed with 4% paraformaldehyde for 15 min at 4°C. Slides were then washed and stored in HBSS at 4°C until use (within one week of fixing). Fixed BMVs were permeabilized and nonspecific antibody binding blocked by treatment with 30% normal goat serum in phosphate-buffered saline (PBS) containing 0.1% tween 20 (PBST) at pH 7.4 for 1 hr at room temperature, and incubated overnight at 4°C in PBS containing 3% normal goat serum and primary antibodies against the following target proteins: LAT1 (Epitomics, Burlingame, CA), OCT3 (Genway, San Diego, CA), RFC (Sigma-Aldrich), MATE1 (Sigma-Aldrich), OATP1B3 (Sigma-Aldrich) and Rfc (LifeSpan Biosciences, Seattle, WA). Negative control sections were stained
without primary antibody at this step. Slides were then washed with PBS 6x 5 min and incubated with an Alexa 488 conjugated secondary antibody (Life Technologies) for 1 hr at room temperature. Slides were washed with PBS 6x 5 min again, and mounted in VECTASHIELD Mounting Medium with DAPI (Vector Labs, Burlingame, CA). Fluorescent imaging was done on a Zeiss AxioImager M1 microscope with AxioCam Mrm camera (Carl Zeiss Microscopy, Thornwood, NY), and bright field imaging was done on a Leica DM IL LED microscope with DFC400 camera (Leica Microsystems, Buffalo Grove, IL). Image files were processed with ImageJ (5).

**Western blot analysis.** Protein was extracted from BMVs, and transporter- and empty vector transfected human embryonic kidney cells by incubating with prechilled Celllytic Mcell lysis buffer (Sigma-Aldrich, St Louis, MO) containing a protease inhibitor cocktail for 20 min at 4°C. Homogenates were centrifuged for 10 min at 15,000 rpm at 4°C, and the protein concentration of the supernatant determined by BCA protein assay (Thermo Fisher Scientific, Rockford, IL) using the manufacturer’s protocol. Up to 50 μg of total protein was subjected to SDS-PAGE using a tris-glycine 4-15% polyacrylamide gel (Bio-Rad, Hercules, CA), and then transferred onto a polyvinylidene difluoride membrane (Bio-Rad, Hercules, CA). Membranes were blocked in Protein-free T20 Blocking Buffer (Thermo Fisher Scientific, Rockford, IL) for 1 hr at room temperature, and then incubated with primary antibodies diluted in blocking buffer overnight at 4°C (see Materials and Methods section for antibody information). Membranes were then washed with tris-buffered saline containing 0.1% tween 20 (TBST) at pH 7.4 6x 5 min prior to incubating with HRP-conjugated goat anti-rabbit IgG diluted in TBST for 1 hr at room
Membranes were then washed 6x 5 min in TBST again, and developed with SuperSignal West Femto Kit (Thermo Fisher Scientific, Rockford, IL) using the manufacturer’s protocol. All scanned membrane images were processed using ImageJ.

Supplemental Figures

**Figure S1.** Validation of BMV enrichment from cerebral cortex samples. (A) Representative image of an aliquot from a BMV enriched sample. The scale bar is set to 50 μm. (B) Expression of cell-type marker genes in BMV and paired cerebral cortex samples from donor #1, #2, and #3 (see Table S1). Messenger RNA expression levels in BMVs are normalized to paired cerebral cortex samples. Platelet endothelial cell adhesion molecule (*PECAM1*) and vascular endothelial cadherin (*VEC*) are pan-endothelial cell markers, while glucose transporter 1 (*GLUT1*) is a brain endothelial cell marker. Synaptophysin (*SYP*) is a neuronal cell marker and glial fibrillary acidic protein (*GFAP*) is an astrocytic cell marker. Values represent the mean ± SEM (n=3).

**Figure S2.** Validation of OpenArray gene expression results. (A) The mRNA expression levels of 12 genes in BMV and paired cerebral cortex samples from donor #1, #2, and #3 (see Table S1) were determined by TaqMan RT-PCR and compared to OpenArray results. (B) Linear regression of the relative mRNA expression in BMV samples determined by TaqMan RT-PCR versus those determined by OpenArray RT-PCR ($r^2$=0.60). All values represent the mean ± SD. Linear regression was done using Prism 5 GraphPad software.
**Figure S3.** Confirmation of SLC transporter protein expression in BMVs and antibody specificity. Western blot analysis of BMVs isolated from donor one detected the expression of OCT3 (A), MATE1 (B), and RFC (C). (D) OATP1B3 was included as a negative control and was not detected in BMVs. In all panels, antibody specificity was determined using HEK cells transfected with OCT3, MATE1, RFC, OATP1B3, or EV. All molecular weights indicated are in kDa. TT, transporter transfected cell lysate; EV, empty vector transfected cell lysate.

**References**

1. Dauchy, S. *et al.* ABC transporters, cytochromes P450 and their main transcription factors: expression at the human blood-brain barrier. *J Neurochem* 107, 1518-28 (2008).
2. Dahlin, A. *et al.* Gene expression profiling of transporters in the solute carrier and ATP-binding cassette superfamilies in human eye substructures. *Mol Pharm* 10, 650-63 (2013).
3. Pfaffl, M.W. A new mathematical model for relative quantification in real-time RT-PCR. *Nucleic Acids Res* 29, e45 (2001).
4. Roberts, L.M. *et al.* Subcellular localization of transporters along the rat blood-brain barrier and blood-cerebral-spinal fluid barrier by in vivo biotinylation. *Neuroscience* 155, 423-38 (2008).
5. Schneider, C.A., Rasband, W.S. & Eliceiri, K.W. NIH Image to ImageJ: 25 years of image analysis. *Nat Methods* 9, 671-5 (2012).
| Donor | Brain Region | Analysis          | Age | Sex | Race | Cause of Death | Comorbidities                                                |
|-------|--------------|-------------------|-----|-----|------|---------------|--------------------------------------------------------------|
| 1     | Cortex       | OpenArray, TaqMan, IHC, WB | 62  | M   | C    | Respiratory arrest | COPD, cardiomyopathy, high blood pressure                     |
| 2     | Cortex       | OpenArray, TaqMan | 63  | M   | C    | Cardiopulmonary arrest | COPD, hypertension, heart disease, hypothyroidism                |
| 3     | Cortex       | TaqMan            | 68  | F   | C    | Intracranial hemorrhage | Hypertension                                                 |
| 4     | Cortex       | IHC               | 65  | M   | C    | Cardiac arrest | Heart disease, hypertension, bladder cancer, anemia, gout, type II diabetes |

IHC, immunohistochemistry; WB, western blot; M, Male; F, Female; C, Caucasian;

COPD, chronic obstructive pulmonary disease.
Table S2. Genes expressed in human BMVs in comparison to housekeeping genes and paired cerebral cortex samples.

| Gene    | Relative Expression (% of Housekeeping genes) | Relative Expression (Fold over cerebral cortex) |
|---------|----------------------------------------------|-------------------------------------------------|
| ABCA10  | 0.377                                        | ND                                              |
| ABCA12  | 0.127                                        | 0.518                                           |
| ABCA13  | 0.281                                        | 0.927                                           |
| ABCA2   | 6.59                                         | 2.07                                            |
| ABCA3   | 0.772                                        | 1.00                                            |
| ABCA5   | 1.11                                         | 1.46                                            |
| ABCA6   | 0.482                                        | 2.65                                            |
| ABCA7   | 0.191                                        | 1.67                                            |
| ABCA8   | 0.224                                        | 0.729                                           |
| ABCA9   | 1.077                                        | 3.12                                            |
| ABCB1   | 13.1                                         | 10.4                                            |
| ABCB10  | 0.821                                        | 1.99                                            |
| ABCB11  | 0.132                                        | 0.447                                           |
| ABCB4   | 0.195                                        | 1.19                                            |
| ABCB6   | 3.87                                         | 2.96                                            |
| ABCB7   | 0.509                                        | 2.57                                            |
| ABCB8   | 0.201                                        | 1.88                                            |
| ABCB9   | 0.209                                        | ND                                              |
| ABCC1   | 0.806                                        | 0.987                                           |
| ABCC10  | 0.895                                        | 3.77                                            |
| ABCC12  | 0.499                                        | 1.53                                            |
| ABCC2   | 0.278                                        | 2.27                                            |
| ABCC3   | 0.110                                        | 1.17                                            |
| ABCC4   | 0.337                                        | 0.678                                           |
| ABCC5   | 5.81                                         | 2.11                                            |
| ABCC6   | 0.187                                        | 1.87                                            |
| ABCC7   | 0.205                                        | 0.647                                           |
| ABCC8   | 2.30                                         | 4.58                                            |
| ABCC9   | 1.10                                         | 1.86                                            |
| ABCD1   | 0.134                                        | ND                                              |
| ABCD2   | 0.481                                        | 0.856                                           |
| ABCD3   | 5.14                                         | 1.36                                            |
| ABCD4   | 0.257                                        | 0.939                                           |
| ABCE1   | 0.549                                        | 1.22                                            |
| ABCF1   | 2.00                                         | 1.26                                            |
| ABCF2   | 0.984                                        | 1.56                                            |
| Gene   | Value1 | Value2 |
|--------|--------|--------|
| ABCF3  | 0.867  | 3.99   |
| ABCG1  | 1.62   | 0.773  |
| ABCG2  | 4.15   | 8.96   |
| ABCG4  | 0.693  | 1.18   |
| ABCG5  | 0.186  | 1.05   |
| ABCG8  | 0.515  | 3.17   |
| SLC10A1| 0.191  | ND     |
| SLC10A3| 0.165  | 1.55   |
| SLC10A4| 0.510  | 1.34   |
| SLC10A5| 0.327  | 0.581  |
| SLC10A6| 0.192  | 1.46   |
| SLC10A7| 0.194  | 1.84   |
| SLC11A2| 0.322  | 0.600  |
| SLC12A1| 0.206  | 2.23   |
| SLC12A2| 0.519  | 1.63   |
| SLC12A5| 12.9   | 0.504  |
| SLC12A6| 0.909  | 1.09   |
| SLC12A7| 6.28   | 1.71   |
| SLC13A3| 0.179  | 1.65   |
| SLC14A1| 1.07   | 0.693  |
| SLC15A1| 0.115  | 1.27   |
| SLC15A3| 0.440  | 2.89   |
| SLC15A4| 0.837  | 0.985  |
| SLC16A1| 0.591  | 1.20   |
| SLC16A10| 0.243 | 0.662  |
| SLC16A11| 0.320 | 1.90   |
| SLC16A13| 0.0957| ND     |
| SLC16A2| 0.880  | 0.967  |
| SLC16A4| 0.298  | ND     |
| SLC16A6| 0.357  | 1.93   |
| SLC16A7| 0.835  | 0.933  |
| SLC16A8| 0.323  | 2.86   |
| SLC16A9| 0.218  | 1.32   |
| SLC17A2| 0.256  | 1.54   |
| SLC17A3| 0.223  | 3.07   |
| SLC17A4| 0.301  | ND     |
| SLC17A5| 0.478  | 0.906  |
| SLC17A6| 0.382  | 0.466  |
| SLC17A7| 28.3   | 1.06   |
| SLC18A2| 0.279  | 1.40   |
| SLC19A1| 0.642  | ND     |
| SLC19A2  | 0.293 | 0.696 |
|---------|-------|-------|
| SLC19A3 | 2.73  | 5.01  |
| SLC1A1  | 2.63  | 0.834 |
| SLC1A2  | 33.8  | 0.788 |
| SLC1A3  | 0.663 | 1.21  |
| SLC1A4  | 5.75  | 1.48  |
| SLC1A6  | 0.172 | 2.15  |
| SLC20A1 | 1.56  | 1.02  |
| SLC20A2 | 5.86  | 1.06  |
| SLC22A1 | 0.206 | 1.76  |
| SLC22A10| 0.357 | 1.46  |
| SLC22A13| 0.178 | 1.03  |
| SLC22A15| 0.788 | 1.30  |
| SLC22A17| 1.34  | 2.20  |
| SLC22A18| 0.280 | 1.04  |
| SLC22A2 | 0.192 | 0.573 |
| SLC22A23| 0.495 | 2.23  |
| SLC22A2 splice | 0.113 | 0.724 |
| SLC22A3 | 0.684 | 2.46  |
| SLC22A5 | 1.20  | 1.51  |
| SLC22A6 | 0.395 | 1.95  |
| SLC22A7 | 0.146 | 1.22  |
| SLC22A8 | 0.219 | 1.85  |
| SLC22A9 | 1.94  | 1.38  |
| SLC23A2 | 3.12  | 0.776 |
| SLC24A1 | 0.183 | 1.16  |
| SLC24A2 | 2.15  | 0.454 |
| SLC24A3 | 0.334 | 0.489 |
| SLC24A4 | 0.383 | 1.16  |
| SLC24A6 | 0.191 | 1.55  |
| SLC25A1 | 0.396 | 1.66  |
| SLC25A10| 0.164 | 1.40  |
| SLC25A11| 0.671 | 1.40  |
| SLC25A12| 2.22  | 0.816 |
| SLC25A13| 0.941 | 1.04  |
| SLC25A14| 0.271 | 1.10  |
| SLC25A15| 0.169 | 1.15  |
| SLC25A16| 0.491 | 1.12  |
| SLC25A17| 0.403 | 0.839 |
| SLC25A18| 1.57  | 1.41  |
| Gene     | Value1 | Value2 |
|----------|--------|--------|
| SLC25A20 | 0.302  | 0.928  |
| SLC25A22 | 4.22   | 0.667  |
| SLC25A23 | 2.94   | 2.20   |
| SLC25A24 | 0.298  | 2.68   |
| SLC25A25 | 0.553  | 1.71   |
| SLC25A27 | 1.10   | 0.476  |
| SLC25A28 | 3.59   | 0.827  |
| SLC25A29 | 0.149  | 1.48   |
| SLC25A3  | 5.82   | 0.559  |
| SLC25A30 | 0.754  | 1.45   |
| SLC25A32 | 0.234  | 1.63   |
| SLC25A36 | 3.01   | 1.55   |
| SLC25A38 | 0.500  | 1.25   |
| SLC25A39 | 0.759  | 2.93   |
| SLC25A4  | 1.85   | 0.807  |
| SLC25A41 | 0.249  | ND     |
| SLC25A42 | 0.207  | 1.50   |
| SLC25A44 | 0.508  | 0.722  |
| SLC25A5  | 3.88   | 0.627  |
| SLC25A6  | 5.45   | 1.27   |
| SLC25A9  | 0.180  | 1.43   |
| SLC26A1  | 0.230  | ND     |
| SLC26A10 | 0.193  | ND     |
| SLC26A11 | 0.149  | 1.72   |
| SLC26A2  | 0.968  | 5.11   |
| SLC26A3  | 0.148  | ND     |
| SLC26A4  | 0.240  | 1.44   |
| SLC26A6  | 0.382  | 3.69   |
| SLC26A7  | 0.218  | 1.15   |
| SLC26A8  | 0.210  | 0.902  |
| SLC27A1  | 2.83   | ND     |
| SLC27A4  | 0.533  | 1.06   |
| SLC27A6  | 0.168  | 1.43   |
| SLC28A2  | 0.477  | 0.879  |
| SLC28A3  | 0.117  | ND     |
| SLC29A1  | 0.419  | 2.34   |
| SLC29A2  | 0.611  | 2.62   |
| SLC29A3  | 0.272  | 1.47   |
| SLC2A1   | 1.09   | 4.80   |
| SLC2A2   | 0.162  | 1.06   |
| SLC2A3   | 22.6   | 1.88   |
| Gene     | Value1 | Value2 |
|----------|--------|--------|
| SLC2A4   | 0.149  | ND     |
| SLC2A5   | 0.356  | 1.04   |
| SLC2A6   | 0.621  | 4.12   |
| SLC2A8   | 0.455  | 0.901  |
| SLC2A9   | 0.184  | ND     |
| SLC30A4  | 0.529  | 1.28   |
| SLC30A7  | 0.279  | 1.30   |
| SLC30A9  | 1.88   | 0.682  |
| SLC31A1  | 1.86   | 1.39   |
| SLC31A2  | 0.274  | 0.325  |
| SLC32A1  | 0.339  | 0.589  |
| SLC33A1  | 0.616  | 0.955  |
| SLC35A1  | 2.42   | 1.51   |
| SLC35A2  | 0.715  | 0.728  |
| SLC35A3  | 0.252  | 2.36   |
| SLC35A4  | 0.961  | 1.21   |
| SLC35A5  | 0.330  | 1.04   |
| SLC35B1  | 0.627  | 0.553  |
| SLC35B2  | 0.268  | 0.622  |
| SLC35B3  | 0.169  | 0.887  |
| SLC35B4  | 0.615  | 0.540  |
| SLC35C1  | 0.235  | 1.82   |
| SLC35C2  | 0.277  | 0.990  |
| SLC35D2  | 0.594  | 3.24   |
| SLC35E1  | 1.24   | 0.538  |
| SLC35E2  | 5.43   | 1.57   |
| SLC35F1  | 0.902  | 0.346  |
| SLC35F2  | 0.391  | 1.04   |
| SLC35F3  | 0.105  | ND     |
| SLC35F5  | 4.03   | 1.51   |
| SLC36A1  | 0.793  | 0.843  |
| SLC36A4  | 0.613  | 0.745  |
| SLC37A1  | 0.527  | 1.30   |
| SLC37A3  | 0.177  | 1.31   |
| SLC37A4  | 0.665  | 1.04   |
| SLC38A1  | 1.20   | 0.453  |
| SLC38A10 | 0.157  | 1.85   |
| SLC38A11 | 1.90   | 10.5   |
| SLC38A2  | 19.9   | 1.15   |
| SLC38A3  | 6.39   | 2.30   |
| SLC38A5  | 11.2   | 11.2   |
|     |     |     |
|-----|-----|-----|
| SLC38A6 | 0.173 | ND |
| SLC38A7 | 0.223 | 2.45 |
| SLC38A9 | 0.739 | 0.828 |
| SLC39A1 | 0.751 | 1.86 |
| SLC39A10 | 2.86 | 1.05 |
| SLC39A12 | 0.285 | 0.444 |
| SLC39A13 | 0.226 | 1.05 |
| SLC39A14 | 0.333 | 0.738 |
| SLC39A2 | 5.45 | 0.779 |
| SLC39A3 | 1.28 | 1.00 |
| SLC39A6 | 0.775 | 0.958 |
| SLC39A7 | 0.933 | 2.97 |
| SLC39A8 | 0.853 | 3.36 |
| SLC39A9 | 0.248 | 0.942 |
| SLC3A1 | 6.01 | 0.530 |
| SLC3A2 | 3.66 | 1.31 |
| SLC40A1 | 0.705 | 2.25 |
| SLC41A1 | 0.714 | 1.21 |
| SLC41A2 | 0.539 | 0.454 |
| SLC41A3 | 0.342 | 0.383 |
| SLC42A3 | 0.173 | ND |
| SLC43A2 | 1.10 | 1.13 |
| SLC43A3 | 0.414 | 1.78 |
| SLC44A1 | 3.80 | 0.688 |
| SLC44A2 | 7.07 | 1.17 |
| SLC44A5 | 0.446 | 1.22 |
| SLC45A1 | 0.186 | 1.19 |
| SLC45A3 | 0.104 | ND |
| SLC45A4 | 2.15 | 1.41 |
| SLC46A2 | 0.192 | ND |
| SLC46A3 | 0.517 | 0.996 |
| SLC47A1 | 0.735 | 8.42 |
| SLC47A2 | 0.205 | 2.06 |
| SLC48A1 | 1.51 | 0.872 |
| SLC4A10 | 13.3 | 0.767 |
| SLC4A4 | 2.06 | 0.711 |
| SLC4A5 | 0.178 | 2.21 |
| SLC4A7 | 0.132 | 1.35 |
| SLC4A8 | 0.580 | 0.391 |
| SLC5A1 | 0.110 | 0.792 |
| SLC5A10 | 0.194 | 2.48 |
| Gene    | Value1 | Value2 |
|---------|--------|--------|
| SLC5A11 | 0.235  | 1.34   |
| SLC5A4  | 0.779  | 1.68   |
| SLC5A6  | 2.04   | 4.42   |
| SLC6A1  | 1.93   | 2.48   |
| SLC6A11 | 0.239  | 0.474  |
| SLC6A12 | 2.61   | 12.0   |
| SLC6A13 | 0.808  | 7.93   |
| SLC6A15 | 0.817  | 0.394  |
| SLC6A16 | 0.141  | 1.75   |
| SLC6A17 | 2.48   | 0.665  |
| SLC6A2  | 0.282  | 2.41   |
| SLC6A20 | 0.251  | 2.05   |
| SLC6A4  | 0.117  | 0.621  |
| SLC6A7  | 1.44   | 0.756  |
| SLC6A8  | 4.70   | 0.805  |
| SLC7A1  | 4.80   | 2.72   |
| SLC7A10 | 0.220  | 1.97   |
| SLC7A11 | 1.54   | 1.16   |
| SLC7A14 | 0.381  | 0.300  |
| SLC7A2  | 0.518  | 3.10   |
| SLC7A4  | 0.180  | 1.59   |
| SLC7A5  | 6.91   | 13.4   |
| SLC7A6  | 4.64   | 1.39   |
| SLC7A7  | 0.656  | 2.32   |
| SLC7A8  | 3.33   | 0.910  |
| SLC7A9  | 0.272  | 1.27   |
| SLC8A1  | 1.35   | 0.429  |
| SLC8A2  | 1.66   | 0.599  |
| SLC8A3  | 0.889  | 1.16   |
| SLC9A1  | 0.893  | 0.773  |
| SLC9A11 | 0.197  | 0.775  |
| SLC9A2  | 0.676  | 1.11   |
| SLC9A3R2| 2.68   | 4.44   |
| SLC9A5  | 0.322  | ND     |
| SLC9A6  | 1.76   | 0.412  |
| SLC9A7  | 0.250  | 0.676  |
| SLC9A8  | 0.287  | 1.98   |
| SLC9A9  | 0.824  | 1.95   |
| SLCO1A2 | 5.62   | 1.39   |
| SLCO1B3 | 0.317  | 2.52   |
| SLCO1C1 | 0.434  | 0.679  |
| SLCO2A1  | 0.400 | 1.07 |
|---------|-------|------|
| SLCO2B1 | 19.1  | 8.34 |
| SLCO3A1 | 0.744 | 0.870|
| SLCO4A1 | 1.00  | 3.10 |
| SLCO5A1 | 0.843 | 3.96 |

ND, not determined.

All values represent the mean of n=2 BMV samples.
**Table S3.** PCR primers for cell-type marker genes analyzed by microplate SYBR green-based RT-PCR.

| Gene Symbol | Forward Primer | Reverse Primer |
|-------------|----------------|----------------|
| GFAP        | AGATGGCCCGCCACG | GCACGGAATGGATCCCGGT |
| PECAM1      | GCGAGTCATGGCCC | GCCACATCGTGCGCCCTTGG |
| SYP         | CACCTCGGTGGTTGTT | CGGGTGCCCCGTGTTTCTCG |
| VEC         | TGGCCTGTGTTCACGG | CTGAGGTCACAGCGAC |
