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In Vitro Generation of Long-lived Human Plasma Cells

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Plasma cells (PCs), the terminal effectors of humoral immunity, are short-lived unless supported by niche environments in which they may persist for years. No model system has linked B cell activation with niche function to allow the in vitro generation of long-lived PCs. Thus, the full trajectory of B cell terminal differentiation has yet to be investigated in vitro. In this article, we describe a robust model for the generation of polyclonal long-lived human PCs from peripheral blood B cells. After a proliferative plasmablast phase, PCs persist in the absence of cell division, with viability limited only by elective culture termination. Conservative predictions for PC life expectancy are 300 d, but with the potential for significantly longer life spans for some cells. These long-lived PCs are preferentially derived from memory B cells, and acquire a CD138^{high} phenotype analogous to that of human bone marrow PCs. Analysis of gene expression across the system defines clusters of genes with related dynamics and linked functional characteristics. Importantly, genes in these differentiation clusters demonstrate a similar overall pattern of expression for in vitro and ex vivo PCs. In vitro PCs are fully reprogrammed to a secretory state and are adapted to their secretory load, maintaining IgG secretion of 120 pg/cell/day in the absence of *XBPI* mRNA splicing. By establishing a set of conditions sufficient to allow the development and persistence of mature human PCs in vitro, to our knowledge, we provide the first platform with which to sequentially explore and manipulate each stage of human PC differentiation. *The Journal of Immunology*, 2012, 189: 5773–5785.

Plasma cells (PCs), critical effectors of humoral immunity (1–4) and drivers of disease (5), emerge as a subpopulation derived from a wave of short-lived Ab-secreting cells (ASCs) (6–9). In vivo, the life span of these ASCs is a few days, whereas the life span of the longest lived human PCs is predicted to be several years or even decades (2, 3, 10, 11). However, direct evidence for the extended longevity of human PCs is currently lacking (1). A short ASC life span is directly related to the stress of Ab secretion (12–14), whereas the number of PCs maintained in the long-lived pool is constrained by the availability of niches providing survival signals (1, 2, 4). Longevity of established PCs may be restricted by competition for niche space, and in this competitive model, PC intrinsic features contribute to determine life span by controlling migration, homing, and niche affinity (1, 6, 7).

During PC differentiation, acquisition of secretory capacity accompanies the initial loss of B cell phenotype in dividing populations of ASCs that have a short half-life (2, 15, 16). Although the transition between such plasmablasts and PCs is associated with changes in both surface phenotype and gene expression (16, 17), the simplest definition of this transition relies on the concept of cell-cycle exit, stating that PCs are ASCs that are nondividing (2). Indeed, compromise in the ability to exit cell cycle has profound effects on the generation of mature PCs (18).

Although in vitro generation of ASCs is a long-established technique, the major hurdle in the study of human PCs has been the lack of any in vitro system to generate and maintain mature long-lived PCs. Many variations for in vitro ASC generation have been described, but in most cases, the differentiating cells fail to acquire cardinal markers of mature PCs and remain at the plasmablast stage (19–25). Even where phenotypic maturation of in vitro-generated ASCs has been reported, the phenotypes are incomplete, or PC survival is short and variable with no indication of an extended life span (20, 24, 25). Thus, the inability to generate long-lived PCs in vitro presents both a technical challenge to studies of normal and neoplastic PC biology, and raises an important question: Are in vitro-generated ASCs intrinsically programmed only for short life span, and thus do not include cells equivalent to the precursors of normal long-lived PCs and their neoplastic counterparts? Our results demonstrate that in vitro-generated plasmablasts can mature into functional long-lived PCs in vitro. Long-lived in vitro PCs are adapted to their secretory load, are preferentially derived from memory B cells, and share a common core pattern of gene expression with bone marrow PCs.

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Abbreviations used in this article: APRIL, a proliferation-induced ligand; ASC, Ab-secreting cell; ER, endoplasmic reticulum; FDR, false discovery rate; GO, gene ontology; HIFBS, heat-inactivated FBS; IGJ, Ig heavy joining group; IGHV, Ig H chain V (region); PC, plasma cell; UPR, unfolded protein response; XBPI, X-box binding protein 1.

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Materials and Methods

Reagents

Reagents include human IL-2 (Roche); IL-6 and IFN- α (Sigma); IL-21 (PeproTech); goat anti-human F(ab')₂ fragments (anti-IgM and -IgG; Jackson ImmunoResearch); HybridomaMax hybridoma growth supplement (Gentaur); Lipid Mixture 1, chemically defined (200X) and MEM Amino

Acids Solution (50X; Sigma); and CFSE, Hoechst 33342, and CountBright beads (Invitrogen).

Donors and cell isolation

Ten healthy adult donors were used. Six independent donors were used in long-term cultures to day 50 and beyond, results for four of these with assessments at identical time points are shown, but all donors generated viable PCs beyond day 50.

Peripheral blood was obtained from healthy donors after informed consent. Mononuclear cells were isolated by Lymphoprep (Axis Shield) density gradient centrifugation. Total B cells were isolated by negative selection with the memory B cell isolation kit (Miltenyi Biotec).

Bone marrow aspirates were from 13 anonymous donors and were derived from surplus clinical samples, assessed as normal by clinical flow cytometry. RBCs were lysed (ammonium chloride 8.6 g/L) before flow cytometric analysis or flow sorting.

Cell cultures

Twenty-four-well flat-bottom culture plates (Corning) and IMDM supplemented with Glutamax and 10% heat-inactivated FBS (HIFBS; Invitrogen) were used unless otherwise specified.

Days 0–3. B cells were cultured at 2.5×10^5 /ml with IL-2 (20 U/ml), IL-21 (50 ng/ml), F(ab')₂ goat anti-human IgM and IgG (10 µg/ml) on gamma-irradiated CD40L-expressing L cells (6.25×10^4 /well).

Days 3–6. At day 3, cells were detached from the CD40L L cell layer and reseeded at 1×10^5 /ml in media supplemented with IL-2 (20 U/ml), IL-21 (50 ng/ml), HybridoMax hybridoma growth supplement (11 µl/ml), Lipid Mixture 1, chemically defined and MEM amino acids solution (both at $1 \times$ final concentration).

Day 6 onward. At day 6, cells were reseeded at $2.5\text{--}5 \times 10^5$ /ml in media supplemented with IL-6 (10 ng/ml), IL-21 (50 ng/ml), IFN-α (100 U/ml), HybridoMax hybridoma growth supplement (11 µl/ml), Lipid Mixture 1, chemically defined and MEM amino acid solution on gamma-irradiated M2-10B4 cells (4.16×10^4 /well).

Transwell experiments and extended life-span maintenance

For transwell experiments, day 6 plasmablasts were seeded into the upper chamber of a 24-well plate transwell (clear polyester membrane, 0.4-µm pore; Corning) with the cytokines and media conditions described earlier. The lower chamber was left unseeded or seeded with gamma-irradiated M2-10B4 cells (4.16×10^4 /well). Plasmablasts were also seeded in parallel in direct contact with M2-10B4 as described earlier.

For extended life-span maintenance, day 6 cells were harvested and recultured, either at 1.5×10^5 cells/well (total volume 1.5 ml) or at 3×10^5 cells/well (total volume 2.1 ml), in the upper compartment of a 24- or a 12-well plate transwell (clear polyester membrane, 0.4-µm pore; Corning), respectively. gamma-Irradiated M2-10B4 stromal cells were seeded into the lower chamber at 4.16×10^4 /well or at 8.32×10^4 /well, proportionally. Cells were grown in IMDM supplemented with IL-6 (10 ng/ml), IL-21 (50 ng/ml), IFN-α (100 U/ml), HybridoMax hybridoma growth supplement (11 µl/ml), Lipid Mixture 1, chemically defined and MEM amino acids solution. IL-21 was discontinued after day 13. Every 3.5 d, a half (24-well) or a third (12-well) of the media volume was exchanged. A detailed protocol is available on request.

Flow cytometric analysis and microscopy

Cells were analyzed using four- to six-color direct immunofluorescence staining on a BD LSR II flow cytometer (BD Biosciences). Abs used were CD19 PE (LT19), CD27 PE (M-T271), and CD138 allophycocyanin (B-B4; Miltenyi Biotec); CD19 PerCP (SJ25C1), CD23 allophycocyanin (M-L233), CD38 PE-Cy7 (HB7), CD32b FITC (3D3), and HLA-DR FITC (G46-6; BD Biosciences); CD30 FITC (81337; R&D Systems); CD20 effluor V450 (2H7; eBioscience); CD40 FITC (5C3) and Ig Lambda FITC (1-155-2; Becton Dickinson); and Ig Kappa Pacific blue (A8B5; Exbio). Controls were isotype-matched mouse mAbs. Dead cells were excluded by costaining with Annexin V FITC and 7-AAD (BD Biosciences). Absolute cell counts were performed with CountBright beads (Invitrogen). Cell populations were gated on FSC and SSC profiles for viable cells determined independently in preliminary and parallel experiments. Analysis was performed with BD FACSDiva Software 5.0 (BD Biosciences) and FlowJo. Cells were sorted with a MoFlo high-speed cell sorter (Beckman Coulter) on cells stained with CD138 and 7-AAD at indicated time points.

Day 62 PCs were subject to cytospin and Giemsa staining according to standard procedures. Images were acquired on a Nikon Eclipse 80i mi-

croscope with 100× Plan Apo oil immersion objective, DS-2M camera, and DS-L2 controller.

Cell division and cell cycle analysis

Cell division was assessed as described previously (26). Cells were washed and resuspended in PBS containing 5% HIFBS. CFSE dissolved in DMSO was added at a final concentration of 10 µM. Cells were mixed and incubated at room temperature for 5 min. Labeled cells were washed twice with PBS containing 5% HIFBS and resuspended in culture medium as required.

Cell-cycle analysis was evaluated by Hoechst 33342 (Invitrogen) DNA staining. Cells were harvested at different time points, washed in HBSS, resuspended in HBSS containing Hoechst 33342 at the final concentration of 5 µg/ml, and incubated for 2 h in a CO₂ incubator before proceeding with conventional immunophenotyping.

Ig H chain V region amplification and sequencing

Ig H chain V (IGHV) regions were amplified from cDNA with proof-reading Phusion Flash polymerase (Finnzymes) using modified BIOMED-2 primers for framework 1 and common JH (27), with an incorporated 5' M13 sequence (primer sequences available on request). Purified amplicons generated by first-round PCR were amplified with a unique MID-tagged, M13-containing 454 amplicon sequencing primer. Libraries were quantified with Quant-iT pico-green (Biorad), mixed, and sequenced using the standard Roche 454 GSJunior sequencing protocol. Resultant processed, split, trimmed data were analyzed using IMGT HighV-Quest software (28).

ELISA

Ig levels were quantified with the human IgM and IgG ELISA quantitation kit (Bethyl Laboratories) according to manufacturer's instructions, using a Berthold 96-well plate reader. Ig concentrations were calculated from standard curves.

Proteomics

Centrifuged and filtered (0.2 µm) supernatants and media were analyzed by Bioproximity (<http://www.bioproximity.com/>) following standard protocols. Trypsin digested samples were fractionated using strong anion exchange chromatography. Liquid chromatography tandem mass spectrometry was performed on a Thermo Easy Nano LC II system linked to a LTQ Velos mass spectrometer (Thermo Fisher). RAW data files converted to Mascot Generic Format were searched against Ensembl sequence libraries release 47 (human, mouse, and cow) and cRAP. Proteins were required to have one or more unique peptides with peptide E value ≤ 0.01 from X!Tandem or Open Mass Spectrometry Search Algorithm, E value ≤ 0.001 and θ ≥ 0.5 for X!Hunter searches, and protein E value ≤ 0.0001 from X!Tandem and X!Hunter.

RNA, cDNA, and RT-PCR

RNA was extracted with TRIzol and reverse transcribed using Superscript II Reverse Transcriptase (Invitrogen). PCR for X-box binding protein 1 mRNA (*XBPI*) splicing was performed as previously described (29). Gene expression results were validated with Taqman Assays for *PRDM1* (Hs01068508_m1), *BM11* (Hs00995519_g1), *MCL-1* (Hs01050896_m1), *BCL2* (Hs00608023_m1), and *PPP6C* (Hs00254827_m1) according to manufacturer's instructions.

Gene expression analysis

RNAs were amplified using Illumina TotalPrepTM-96 RNA Amplification Kit (Life Technologies). Resultant cRNAs were hybridized onto HumanHT-12 v4 Expression BeadChips (Illumina) according to manufacturer's instructions, scanned with the Illumina BeadScanner, and initial data processing carried out using the Illumina GenomeStudio Gene Expression Module (Gene Expression Omnibus: GSE41208; <http://www.ncbi.nlm.nih.gov/geo/query/acc.cgi?acc=GSE41208>). Final-report files were reannotated using HUGO Gene Nomenclature Committee annotations (2012/08/16 version). Reannotated data were processed using Lumi (30). Probes not detected on three or more arrays were removed and the remaining data quantile normalized ($n = 21,339$ probes). A linear model was fitted using R Limma (31). Differentially expressed genes between time points were gauged using the Limma empirical Bayes module, with Benjamini and Hochberg correction.

Clustering differentiation data

The 15% most variable probes ($n = 3200$) were used as input to the adegenet R package, using k-means clustering with 6 principal components

and $k = 50$ clusters (32). Cluster stability was calculated using adegenet Discriminant Analysis of Principal Components method. Expression values for each of the clusters were plotted using ggplot2 (33). Heat maps were generated with MultiExperiment Viewer using hierarchical clustering (Pearson correlation, full linkage) of median expression values per sample per cluster (34).

Gene ontology analysis

The Cytoscape Bingo plugin was used with gene ontology (GO) annotations version 2012/08/21, with reference set to genes on the HumanHT-12 v4 Expression Beadchip (35).

Curve fitting for population data

Nonlinear regression was carried out using GraphPad Prism V5.04. Potential models (linear regression, segmental linear regression, single/multiple-phase decay) were compared using corrected Akaike's information criterion with the best model ($Y = A \cdot X^B$; B , the scaling exponent, is a constant constrained by optimization among all donors, and A is a constant fit for each donor) having an Akaike's information criterion difference of between -42 and -59 when compared across models.

Ethical approval

Approval for this study was provided by U.K. National Research Ethics Service via the Leeds East Research Ethics Committee (approval reference: 07/Q1206/47).

Results

Generation of a PC population in vitro

In vivo T-dependent B cell activation is linked to the development of long-lived PCs, and IL-21 is involved in the decision to adopt a PC fate (1, 2). We therefore based our studies on plasmablasts generated using a combination of CD40L, IL-21, and IL-2 (21, 36). We modified conditions for optimal cell number and viability including $F(ab')_2$ anti-IgG/IgM to stimulate the B cell receptor and supplementing media. We observed the expected transition from B cell to plasmablast phenotype by day 6 of culture (data not shown). The cells showed minimal acquisition of CD138 expression, which is the cardinal surface marker associated with the more mature PC stage (17, 37).

Next, the plasmablast population was driven toward a mature PC phenotype. We evaluated the ability of a number of cytokines to support PC maturation to day 13 because this falls into the expected survival time of a short-lived PC. We found that the inclusion of IL-6 and IFN- α promoted acquisition of CD138 expression, consistent with published data (20). Furthermore, inclusion of IL-21 up to day 13 increased the size of this population (Fig. 1A, 1B).

Given the importance of the stromal niche in PC survival in vivo (1, 22), the impact of stromal support was investigated. Because hemopoietic stem cells and PCs occupy related niches (38), we used M2-10B4 cells, which support long-term culture of human bone marrow stem cells (39). Inclusion of this stromal layer significantly enhanced the population of maturing PCs recovered at day 13, leading to a consistent 2- to 3-fold increase in CD138⁺ cells (Fig. 1C, 1D). Stromal cells supported survival rather than differentiation because populations showed similar proportions and levels of CD138 expression at day 13.

Under these conditions, the PC population remained viable to day 20 (Fig. 1E). During this differentiation, surface Ags followed expected patterns of expression (Fig. 2). Reduced CD20, loss of CD27, enhanced CD38 and HLA-DR, and acquisition of CD30 distinguished the activated B cell/preplasmablast stage (40); absence of CD20, loss of CD30, strong expression of CD27, increased CD38, and absence of CD138 distinguished the plasmablast stage. Expression of CD138 observed at day 10 correlated with enhanced CD38 and further loss of HLA-DR. Peak CD32b, CD38, CD138, and absence of HLA-DR characterized day 20

PCs. CD19 expression increased, then declined, and was maintained at lower levels on plasmablasts and PCs (Fig. 3C, Supplemental Fig. 1).

Cell division and PC differentiation

Cell division and commitment to Ab secretion are linked (15), and the simplest distinction between plasmablasts and PCs postulates that the former remain in cell cycle, whereas the latter do not (2). We therefore asked whether phenotypic maturation of plasmablasts to PCs in this system was accompanied by additional rounds of proliferation, before cessation of cell division.

After activation, B cells underwent up to four divisions in the first 3 d. Under conditions optimized for largest cell number, the degree of cell division at day 6 resulted in CFSE dilution to the limit of the assay range (data not shown). To track divisions in maturing plasmablasts, we loaded day 6 cells with CFSE. The majority of CD138⁺ cells at day 10 showed significant CFSE dilution relative to day 6. However, there was no further CFSE dilution across the population between days 13 and 20 (Fig. 3A). Cells loaded with CFSE at day 13 were followed to day 20 to confirm this observation. The population remained as a single peak without separation into subpopulations (Fig. 3B). The overall degree of decay in 7 d was equivalent to that in nondividing lymphocyte populations (41). To further confirm this observation, we assessed cell-cycle status (Fig. 3C). Although 20% of the plasmablasts were in G₂/M phase at day 6, this decreased rapidly over the next week. By day 10, the G₀/G₁ fraction constituted 93.9% of the total population, reaching 98% by day 13 and remaining constant up to day 20. Thus, cell division accompanies maturation of plasmablasts to PCs, but PCs persist in the absence of additional cell division.

To exclude the possibility of fast cycling PC precursors because of residual impact of CD40 or BCR-dependent signaling, we assessed PC cultures for expression of surface Ig and CD40, and for proliferative responses to stimuli of CD40 or BCR. Surface L chain staining was lost by day 6 of culture (data not shown); in contrast, CD40 expression was downregulated at day 6, but re-expressed on PCs (Fig. 3D). This is consistent with the known expression of CD40 on human bone marrow PCs (42). The total differentiating populations at day 20 of culture were loaded with CFSE and showed no proliferative response after exposure to agonists of BCR or CD40 (Fig. 3D and data not shown). Thus, the population at day 20 is refractory to stimuli, which at earlier phases of the differentiation promote rapid proliferation.

To address whether the culture conditions are supporting both PC survival and maturation, we sorted differentiating cells at day 10 into CD138⁺ and CD138[−] fractions. Each was independently loaded with CFSE and maintained to day 20 (Fig. 3E). In both populations, CFSE was maintained as a single peak with no evidence of subdivision, thus further excluding proliferation as a mechanism for PC maintenance. Notably, cells that expressed CD138 at day 10 generated CD138^{high} cells at day 20, whereas CD138^{neg/low} cells at day 10 showed 5-fold lower mean fluorescence intensity of CD138 at day 20. Thus, the culture conditions promote PC survival without proliferation, there is a variable rate of CD138 acquisition in the differentiating population, and the intensity of CD138 expression correlates with the preceding duration of expression.

Contact independence of stromal support

Because contact-dependent and -independent mechanisms support PC survival in vivo, we asked whether the stromal support was contact dependent in this system. Plasmablasts were transferred into upper chambers of transwells either in the absence or the

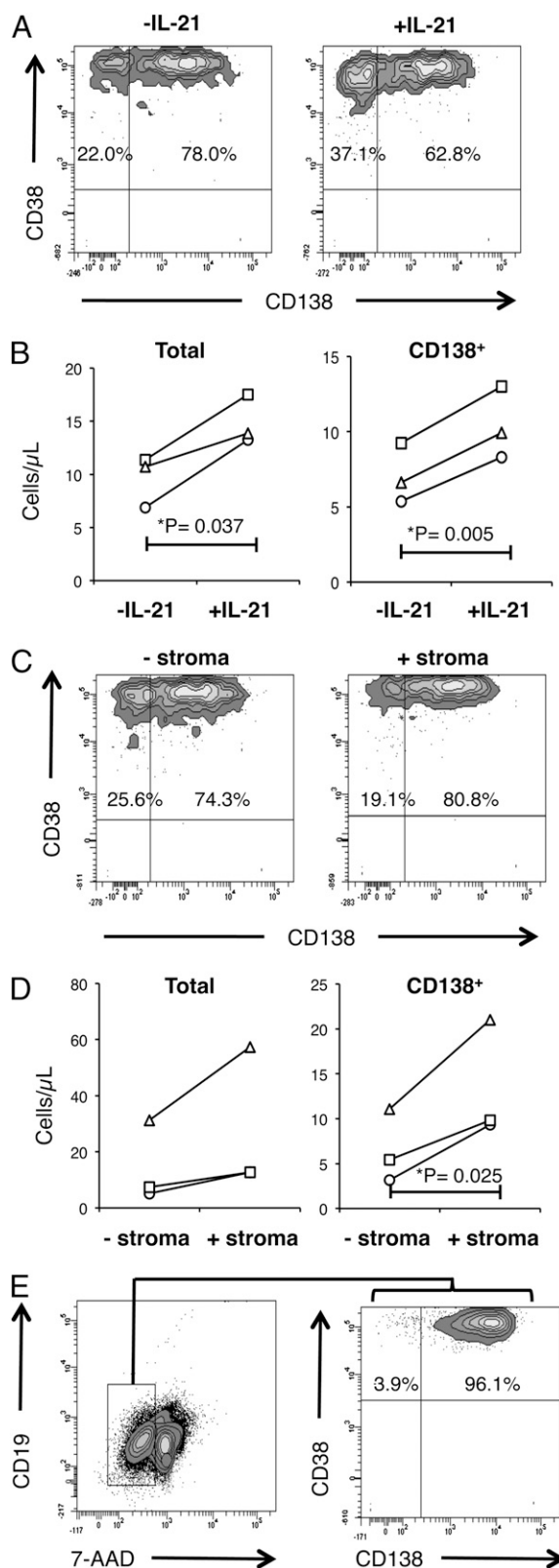


FIGURE 1. Generation of a PC population in vitro. **(A)** Plasmablasts at day 6 were cultured for 7 d in the presence of IL-6 and IFN- α alone (left panel), or with the addition of IL-21 (right panel). Shown are representative flow cytometry plots of CD38 and CD138 expression gated on viable cells using 7-AAD and Annexin V. **(B)** Total cell numbers (from A) were determined by flow cytometry using CountBright beads. CD138⁺ cell numbers were derived using percentages as shown in (A). Results for individual donors are identified with symbols. Significance shown were derived from a paired two-tailed *t* test. **(C)** Plasmablasts at day 6 were

presence of stromal cells in the lower chamber. The stromal support of PCs was contact independent, as 2- to 3-fold more PCs were obtained from the upper chamber, when the stromal cells were maintained in the lower chamber (Fig. 4A). Indeed, absolute PC numbers recovered from transwell cultures with stromal cells were greater than those observed in direct contact cultures (Fig. 4B).

To provide an initial assessment of the M2-10B4 secretome, we subjected supernatant fractions from PC cultures and samples of complete feeding media to shotgun mass spectrometry. All proteins identified in feeding media were ignored. Of the remainder, 44 proteins were identified as murine, and thus M2-10B4 derived; 17 of these were associated with the Uniprot keyword “secreted.” These were filtered for proteins identified by two or more peptides in any sample (data not shown). The remaining 14 murine secreted proteins were AHSG, APOA1, CFH, CSF1, CST3, ECM1, GPLD1, LGALS1, LGALS3BP, PSAP, QSOX1, SPARC, SPP1, and TLL1. Although this represents only the more abundant secreted proteins that are detectable within mixed supernatants, the results demonstrate that the M2-10B4 secretome includes proteins appropriate for a bone/bone marrow environment (AHSG/ECM1/SPARC/SPP1).

Sustained in vitro PC survival

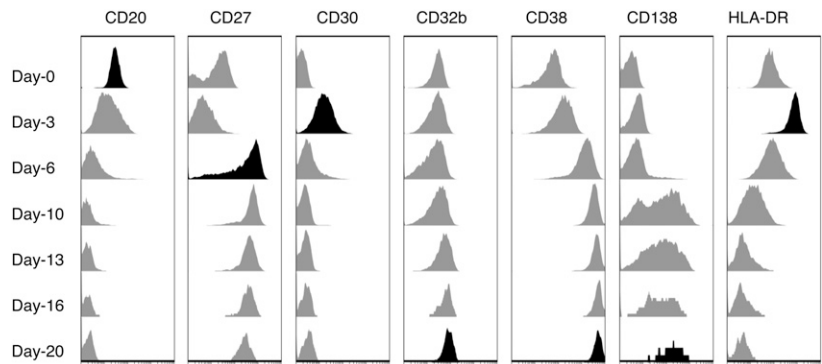
We next modified the transwell cultures to include a regular 50% media exchange to extend the culture duration. Under these conditions, mature PCs persisted as a viable population to the point of elective culture termination at day 62 in all donors (Fig. 5A, Supplemental Fig. 1). At day 62, the PCs were morphologically viable and displayed features of mature PCs (Fig. 5B). Total cell numbers decayed slowly across the extended culture interval, tending to a plateau phase (Fig. 5C). CD38⁺CD138⁻ cells effectively reached zero between days 34 and 48, and CD138^{high} PCs remained as the sole viable population.

PCs retaining a CD19^{low} phenotype showed a gradual increase in CD138 expression over time (Fig. 5A, Supplemental Fig. 1). A defining feature of normal human bone marrow PCs, which includes the long-lived PC population, is very strong expression of CD138 (37). Indeed, from day 34 onward, equivalent levels of CD38 and CD138 expression were observed on in vitro-generated PCs to those observed on bone marrow PCs (Fig. 5A, 5D).

To assess potential PC life expectancy and life span, we established the best mathematical curve fit to the population data. Data from individual donors were most accurately fitted by a power-law function ($R^2 = 0.895\text{--}0.957$) and indicated the potential for extended PC longevity (>5 y). Despite variation between individuals, the power-law function retained reasonable accuracy in fitting averaged data ($R^2 = 0.705\text{--}0.815$; Supplemental Fig. 1C, 1D). Wider predicted confidence intervals for combined donor averages provided more conservative estimates of life expectancy and maximum life span. The maximum life span was predicted as 636 and 702 d, and the average life expectancy of

cultured for 7 d in the presence of IL-6, IFN- α , and IL-21 in the absence (left panel) or presence (right panel) of the stromal cell line M2-10B4. Shown are representative flow cytometry plots of CD38 and CD138 expression gated on viable cells using 7-AAD and Annexin V. **(D)** Total (left panel) and CD138⁺ (right panel) cell numbers generated under conditions described in (C). Numbers in the absence or presence of stroma are shown on the left and right of each panel. Results for individual donors are identified with symbols. Significance shown was derived from a paired two-tailed *t* test. **(E)** Representative example of maturing PCs at day 20 generated in the presence of stromal support; CD38 and CD138 expression (right panel) are shown on CD19⁺ 7-AAD-excluding cells (left panel). Results are representative of data from three independent donors.

FIGURE 2. Phenotypic maturation of differentiating B cell cultures. Representative example of the phenotypic changes observed across the culture from days 0 to 20. Histograms for expression of each Ag are shown as indicated at the top of the figure with the point of peak expression (mean fluorescence intensity) shown in black. Results are representative of experiments with three independent donors.



a day 62 PC was predicted as 287 and 320 d, using total or CD138⁺ cell numbers, respectively.

IGHV polyclonality and hypermutation status

The long-lived PC pool could either reflect the survival of a polyclonal set of PC precursors or represent an oligoclonal selection, with a distinct survival advantage for a limited number of PC precursors. To address this, we assessed expressed *IGHV* rearrangements in day 62 PCs. A wide range of functional

rearrangements were expressed representing multiple *IGHV* families, with diverse joining (*Ig heavy joining group [IGHJ]*) and diversity group partners (Fig. 6A and data not shown). Although we cannot be certain that all functional rearrangements were detected, the observed ratio of unique *IGHV* rearrangements to PCs was in the region of 1:4 to 1:20 (212 unique sequences from 900 PCs in one donor and 104 unique sequences from 2000 PCs in the other), indicating that PCs at day 62 were broadly polyclonal.

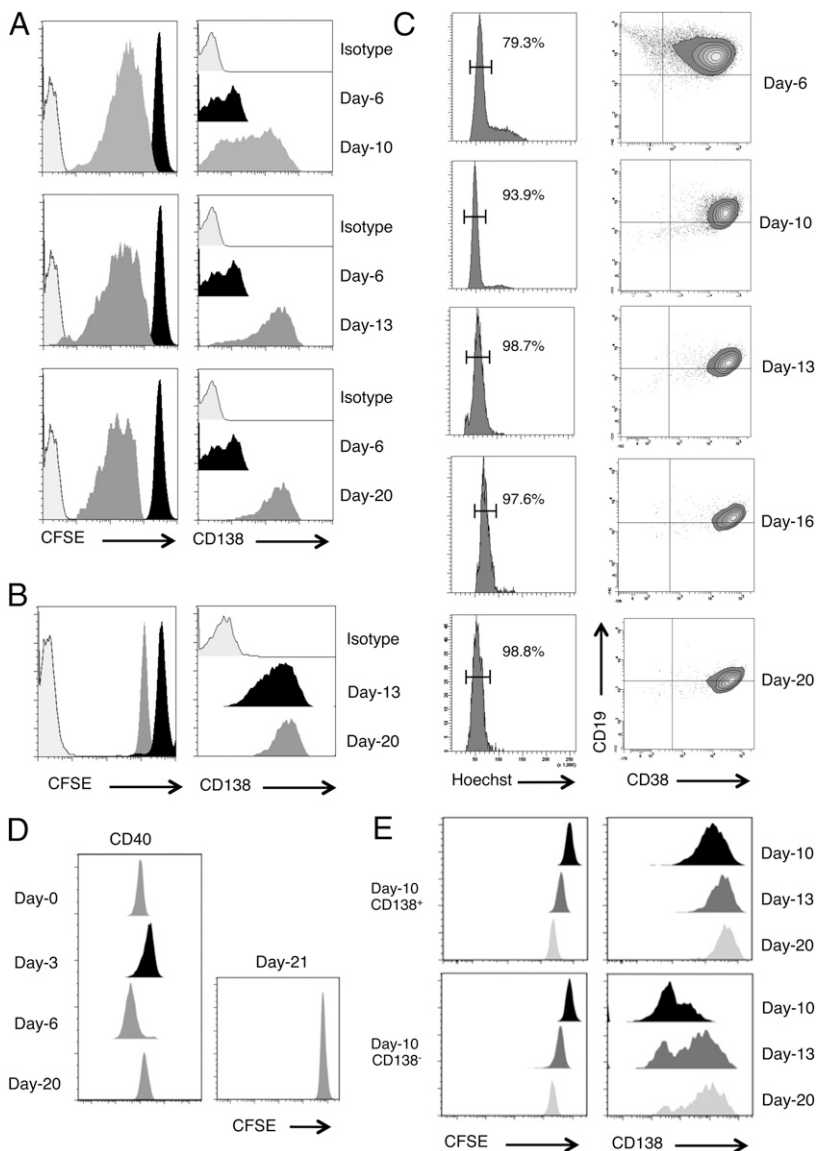


FIGURE 3. PCs persist in the absence of cell proliferation. (A) Plasmablasts loaded with CFSE at day 6 were assessed at days 10, 13, and 20. (Left panels) CFSE staining; (right panels) expression of CD138 in the CFSE-stained population. (Left panels) Unstained cells are shown in pale gray, baseline CFSE loading at day 6 is shown in black, and populations at days 10, 13, and 20 are shown as dark gray histograms. (Right panel) Day 6 isotype control is shown in pale gray with the staining at day 6 for CD138 in black, and staining at days 10, 13, and 20 shown in dark gray. (B) Maturing PCs were loaded with CFSE at day 13 and analyzed at day 20. Populations are shown as described in (A). CD138 staining is shown for day 13 and 20 populations with isotype control for day 13 in pale gray, CD138 staining at day 13 in black, and day 20 in dark gray. (C) DNA content and phenotype were simultaneously determined with Hoechst and appropriate Ab combinations in maturing plasmablasts from day 6. Hoechst staining is shown (left panels) at the days indicated on the right of the figure. G₀/G₁ gates are represented with the relevant percentages. The expression of CD19 and CD38 on the Hoechst-stained population is shown on the right. Results are representative of experiments from two independent donors. (D) Histograms showing expression of CD40 (left panel) monitored at key time points with the point of peak expression (mean fluorescence intensity) shown in black. Day 20 PCs were loaded with CFSE and stimulated for 24 h in direct contact with CD40L cells (right panel). Results are representative of experiments from two independent donors. (E) At day 10, total cells were sorted into CD138⁺ and CD138⁻, and both fractions were stained with CFSE. Proliferation was then assessed at days 13 and 20, and correlated with CD138 expression. Results are representative of experiments from three independent donors.

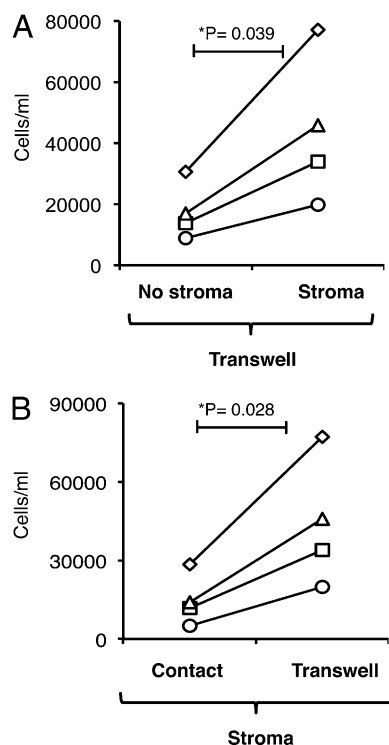


FIGURE 4. The stromal effect is contact independent. **(A)** Day 6 plasmablasts were cultured in standard media and cytokine conditions in the upper chamber of a transwell plate either in the absence (*left*) or presence (*right*) of an M2-10B4 stromal layer in the lower chamber. Shown are the CD19⁺ cell numbers recovered from each condition at day 13 for four independent donors; the significance is shown (paired two-tailed *t* test). **(B)** Day 6 plasmablasts were cultured either in direct contact (*left*) or in a transwell system with M2-10B4 stromal layer (*right*) as described for (A). Shown are the CD19⁺ cell numbers recovered from each condition at day 13 for four independent donors; the significance is shown (paired two-tailed *t* test).

Although PCs were derived from polyclonal activation of total peripheral blood B cells including both naive and memory fractions, 93% of the expressed functional *IGHV* rearrangements in day 62 PCs showed evidence of somatic hypermutation (Fig. 6B). Averaged across the population of rearranged *IGHV* genes, a higher replacement to silent mutation ratio was observed in CDRs relative to framework regions, with a replacement/silent ratio ≤ 2 in framework regions (Fig. 6C). Thus, PCs at day 62 derived from a population of B cells that had undergone somatic hypermutation with an overall pattern of mutations associated with selection for functional Ag receptors, in keeping with preferential survival of memory B cell progeny.

Gene expression dynamics

To examine differentiation in more detail, we performed gene expression profiling at multiple time points across the system. To simplify direct comparisons between the final three time points (days 13, 20, and 41), we focused on flow cytometrically sorted CD138⁺ populations. Phenotypic differentiation was verified (data not shown) and followed the expected patterns as previously defined (Figs. 2, 5).

To assess the dynamics of gene regulation, we defined clusters of genes with similar temporal patterns of regulation among the most variable genes across the series (days 0–41; 3200 probes/2750 genes). Although optimum cluster stability was obtained with >200 clusters (data not shown), for simplicity, we defined 50 clusters (Supplemental Table I), which show a median size of 66

genes and median stability of 97.4% (% of genes that consistently cocluster on iterative assessments). Hierarchical clustering was used to establish the interrelationships between these differentiation clusters, and emphasized recurring general patterns of gene regulation (Fig. 7).

The biological significance of clusters was assessed by analysis of GO enrichment. Ninety percent of clusters were associated with at least one significantly enriched GO term (false discovery rate [FDR] corrected $p < 0.05$) linked to two or more cluster genes. In most instances, there were multiple significantly enriched GO terms (Supplemental Table II). As expected, clusters initially repressed during differentiation were enriched for genes linked with Ag receptor signaling, lymphocyte activation, and plasma membrane components. Clusters expressed in resting B cells and induced in activated B cells were enriched for genes involved in translation elongation, RNA splicing, and de novo protein folding. Clusters induced in activated B cells that were not expressed in resting B cells were very strongly associated with cell-cycle (FDR corrected p value 3.58×10^{-38}) and mitotic cell-cycle (4.77×10^{-29}) terms. These clusters were expressed at lower level in day 6 plasmablasts and were silenced in PCs. Clusters induced specifically in PCs were associated with the endoplasmic reticulum (ER) and Golgi compartments, protein modification, and nucleosome assembly. The specific impact of culture conditions on PCs was evident in clusters 20 and 35, which were enriched for type I IFN-mediated signaling pathway components and targets. Clusters induced in plasmablasts and sustained in PCs included the majority of genes associated with the unfolded protein response (UPR) and ER structural components. In contrast, clusters induced in activated B cells and maintained throughout subsequent differentiation were enriched for genes linked to amino acid metabolic processes, electron transport chain, and response to zinc ions.

The major transitions in gene expression followed the phenotypic changes observed by flow cytometry and transitions in culture conditions. The primary shift in gene expression associated with maturation of plasmablasts to PCs occurred between days 6 and 13. PC maintenance with prolonged culture was associated with limited changes in global gene expression, which was not surprising given that the culture conditions remained generally the same. However, several genes associated with long-lived PCs including *SDC1*, *PRDM1*, *MCL1*, *BCL2*, *BCL2L1* (*BCLX*), *BM11*, and *BMP6* showed gradual increases in expression after day 13 (Fig. 8A–D, Supplemental Table II) (16, 43–45). Thus, regulators of PC fate do show progressive changes in expression accompanying extended life span, and this includes members of the *BCL2* antiapoptotic family.

A common core expression profile

We next assessed the relationship between in vitro-generated and primary human bone marrow PCs at the level of expression profile. We sorted PCs from bone marrow samples, determined to have phenotypically normal PCs by flow cytometry (data not shown). We isolated PCs from 13 donors; 3 were analyzed as individual samples and 10 as a mixed pool. To assess the relationship between bone marrow PCs and the differentiation series, we compared the expression profiles of differentiation clusters by appending the gene expression values of bone marrow PCs to the clusters defined in the differentiation series (Fig. 7, Supplemental Fig. 2). For the majority of temporal differentiation clusters, bone marrow PCs showed similar levels of expression to long-lived in vitro-generated PCs; thus, secretory clusters were strongly expressed, whereas B cell, activated B cell, and plasmablast clusters were equivalently repressed in bone marrow and in vitro-

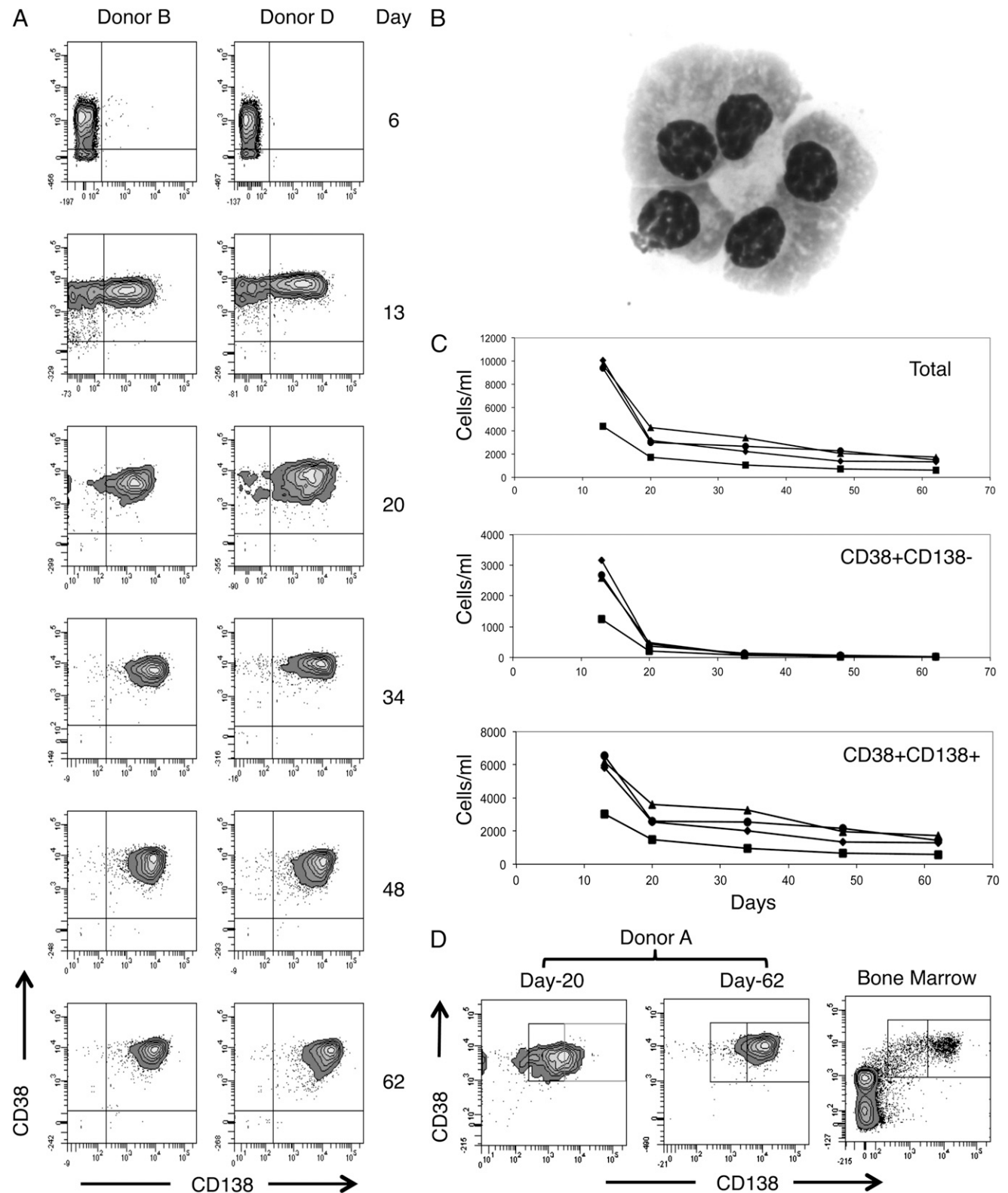


FIGURE 5. Long-term PC viability is accompanied by gradual phenotypic maturation. **(A)** Day 6 plasmablasts were maintained in the upper chamber of transwells with a stromal layer in the lower compartment. Cells were fed at 3.5-d intervals and assessed by flow cytometry at the indicated days. Shown are results from two donors with staining for CD38 and CD138 on viable cells gated using Annexin V and 7-AAD. Flow cytometer conditions were adjusted relative to short-term (20 d) cultures to capture the strong expression of CD138. Results are representative of differentiations from four independent donors. **(B)** PCs at day 62 were subject to cytospin and Giemsa staining; representative cells are shown ($\times 100$ oil objective). **(C)** Cell numbers were flow cytometrically determined using CountBright beads. Shown are data for total (*top panel*), CD38⁺CD138⁻ (*middle panel*), and CD38⁺CD138⁺ cells (*lower panel*), based on percentages assessed using quadrants shown in (A). **(D)** Representative CD38 and CD138 staining on in vitro-generated PCs at days 20 and 62, from another donor, with equivalent gates for CD38 and CD138 expression on CD19⁺ cells in a normal bone marrow aspirate, analyzed on the same cytometer with the same staining and settings.

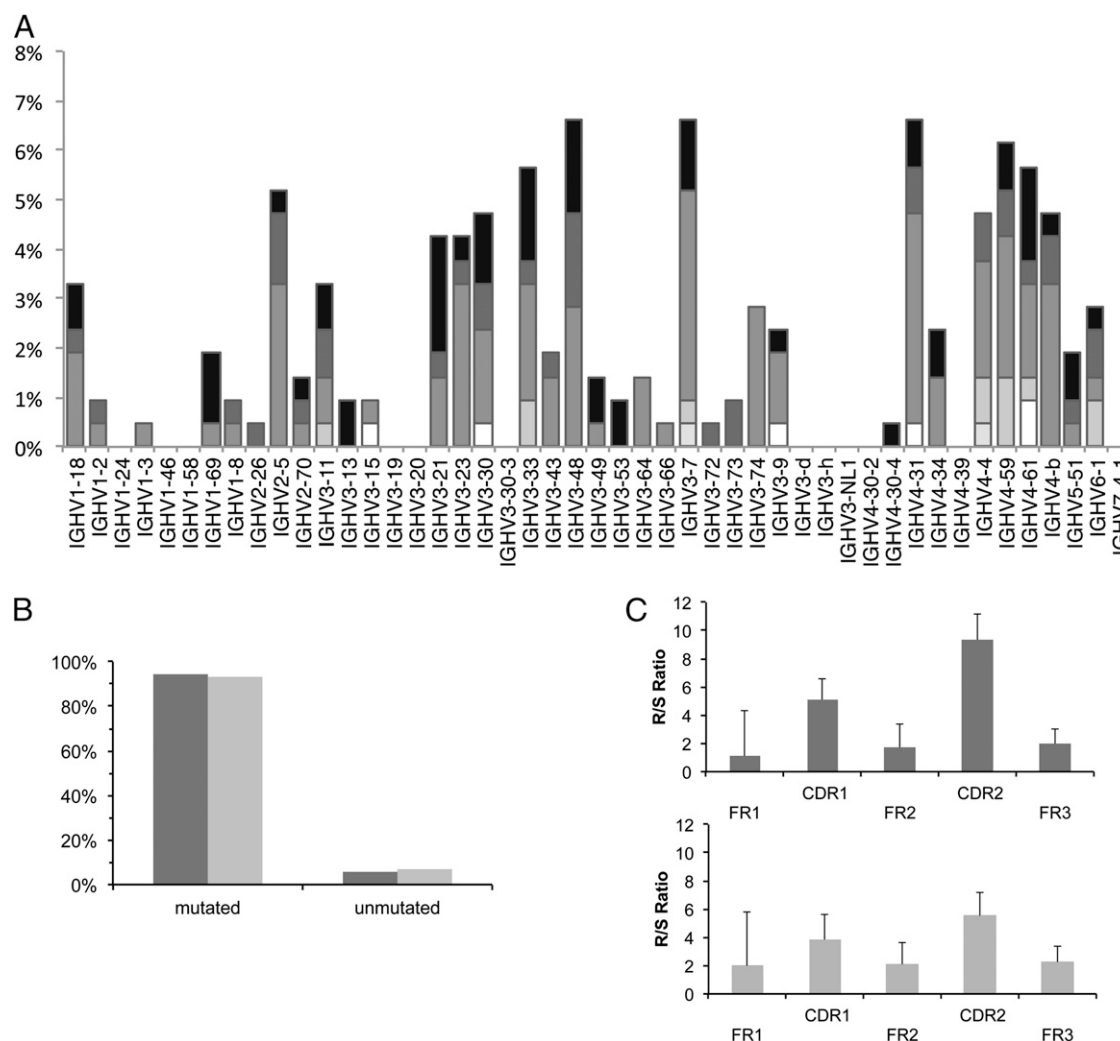


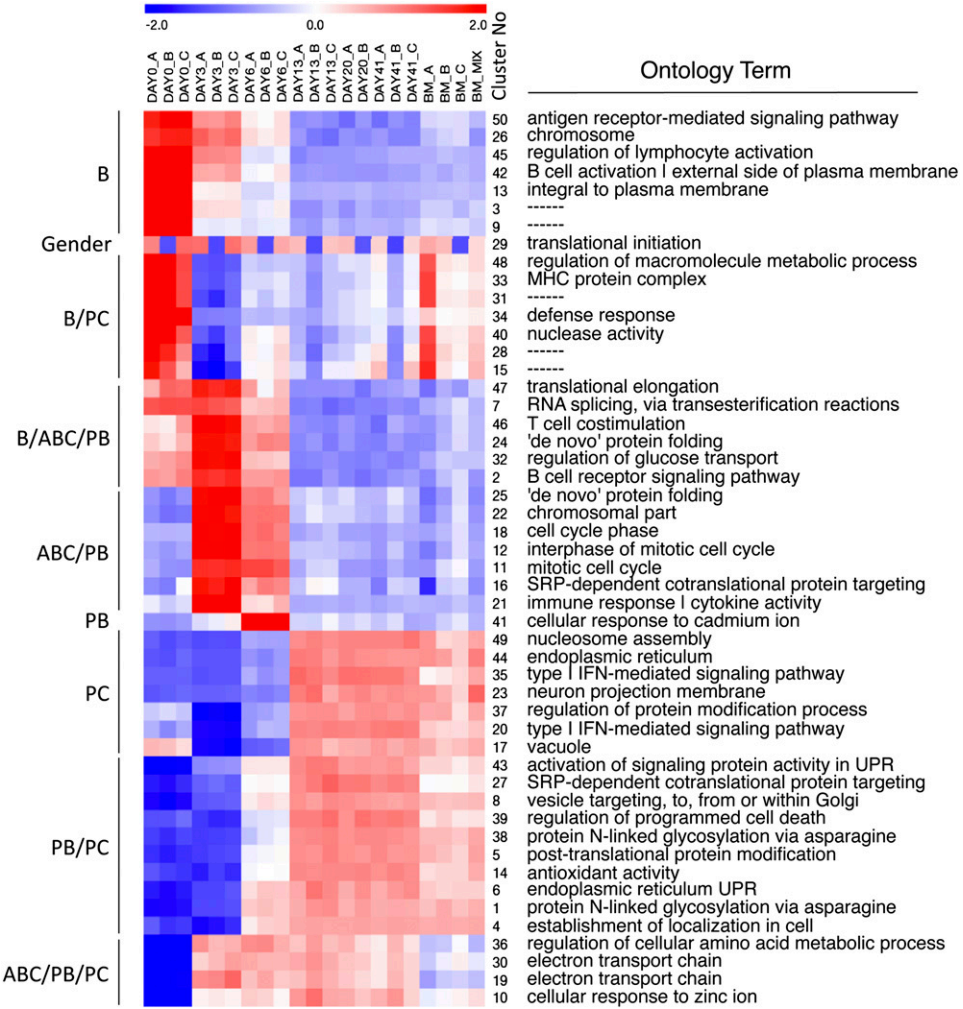
FIGURE 6. Long-lived PCs are polyclonal and mostly express mutated *IGHV* genes. Expressed *IGHV* genes, assessed in mRNA of day 62 PCs derived from two donors, identified 212 (donor A) and 104 (donor B) unique functional rearrangements. **(A)** The distribution of *IGHV* and *IGHJ* gene segments is shown for all unique functional rearrangements for donor A. *IGHJ* segments are indicated by gradation of shade from light to dark; *IGHJ1* = white, *IGHJ6* = black. **(B)** Mutational status of unique functional *IGHV* rearrangements is shown as indicated on the graph for donor A (dark gray) and donor B (light gray), where mutated status is defined as a sequence of <98% identity to germline sequence (% rearrangements on y-axis). **(C)** Average ratio of R/S (replacement/silent) nucleotide changes (plus SD) across the *IGHV* region, shown for three framework (FR) and two CDRs. Donor A is dark gray (upper panel); donor B is light gray (lower panel).

derived PCs. Gene expression profiles from bone marrow PCs were associated with stronger but heterogeneous expression of clusters that were downregulated after B cell activation and variably re-expressed in later phases of in vitro PC differentiation (clusters 15, 28, 31, 33, 34, 40, and 48). In contrast, clusters of genes associated with amino acid metabolism, electron transport chain, and response to metal ions (clusters 19, 30, and 36) were more strongly expressed among in vitro-derived PCs, although it should be noted that these are clusters of genes with modest dynamic ranges and retain significant absolute expression levels in bone marrow PCs (compare Fig. 7 with Supplemental Fig. 2).

Because survival is linked to repression of apoptosis, we additionally considered the proapoptotic and antiapoptotic members of the *BCL2* family independently (Supplemental Table I, cluster = *BCL2* family). Of 17 genes assessed with 32 probes, only a single gene, *BCL2L1*, was differentially expressed (>2-fold FDR corrected p value < 0.05) and was higher among in vitro PCs. Notably, the principle antiapoptotic family member of bone marrow PCs, *MCL1*, was equivalently expressed.

In direct comparison between bone marrow PC profiles and day 41 PCs, 284 protein coding genes (323 probes) were >2-fold higher in bone marrow PC profiles, whereas 245 genes (299 probes) were >2-fold lower (FDR corrected p value < 0.05). Of genes with greater expression in bone marrow PCs, 133 (149 probes) belonged to differentiation clusters (Supplemental Table I). The 151 genes that did not were most significantly associated with GO terms related to nucleosome assembly (FDR corrected p value < 3.5×10^{-12}) arising from histone variant genes, but were also associated with terms such as defense responses to fungi and bacteria, and oxygen transport (FDR corrected p value < 3.7×10^{-3}), which likely derive from contaminating populations in the flow-sorted samples (data not shown). For genes with greater expression in day 41 PCs, 150 belonged to differentiation clusters (184 probes), whereas the 95 genes that did not lacked significant GO term associations. Among differentiation clusters, genes with greater expression in bone marrow PC profiles were more commonly associated with earlier stages of the differentiation, whereas genes overexpressed in day 41 PCs were more commonly associated with clusters expressed late during differentiation (Supple-

FIGURE 7. Long-lived in vitro PCs are reprogrammed for secretory activity and share a core gene expression pattern with bone marrow PCs. RNA from B cells and PCs was isolated at days 0, 3, 6, 13, 21, and 41. For the latter three time points, CD138⁺ cells were flow cytometrically sorted. Expression was assessed on Illumina HumanHT-12 v4 arrays. The 3200 most variable probes encompassing 2750 genes were used in K-means clustering with 6 principle components to generate 50 clusters of genes with similar patterns of expression. The relationship between clusters was assessed by hierarchical clustering of median expression values of each cluster at each time point. In the resulting heat map, cluster expression values are shown as Z scores (−2 to +2), as indicated above the heat map. Z scores derive from median expression values of each cluster across the differentiation series. Absolute levels of expression are provided in Supplemental Fig. 2. Samples are shown from left to right as indicated (one day 20 sample failed quality control and was excluded). Broad categories (B cell [B], activated B cell [ABC], plasmablast [PB], PC) were assigned according to heat-map distribution. The expression of cluster genes in bone marrow PCs is shown to the right. GO enrichment was assessed for each cluster, and a representative ontology term is indicated.



mental Table I). Thus, direct comparison highlights differences relating to the distinct nature and complexity of the in vivo and in vitro environments from which the PCs were derived. In contrast, the major groups of genes dynamically regulated during PC differentiation are similarly expressed between PCs of both origins, confirming that these cells share core gene expression profiles, as well as predicted extended life spans.

PC function and adaptation

To confirm that PC function paralleled the secretory gene expression profile, we tested the Ig content of supernatants removed at each feed. Feeding was performed with a 50% media exchange; thus, in the absence of Ig secretion, concentrations should decline by serial 2-fold dilutions across the culture. IgM and IgG displayed contrasting patterns with IgM declining rapidly toward zero, whereas IgG levels declined slowly toward a plateau phase (Fig. 9A). To assess secretion rates, we divided the amount of IgG secreted in the 3.5 d before each population assessment by the population number at the assessment. The average IgG secretion rate per cell reached a peak at day 20 of around 150 pg/cell/day and then reverted to a slightly lower plateau phase with an average IgG secretion rate of around 120 pg/cell/day. In contrast, IgM secretion rates did not reach a plateau and declined from a peak of 220 pg/cell/day at day 20 to 21 pg/cell/day at day 62 (Fig. 9B). Thus, surviving PCs show no loss of functionality over time, but

in vivo long-term survival is heavily biased toward IgG-secreting PCs.

Differentiation clusters that are induced in plasmablasts and show retained expression in PCs were enriched for genes linked to the UPR and ER/nuclear signaling (e.g., clusters 6 and 43). The transcription factor *XBP1* is integral to normal PC differentiation, linking the process to ER stress and adaptation to secretory load (46). During the UPR, *XBP1* mRNA is subject to an editing event in which a 26-nt sequence is excised (47, 48). Successful adaptation to secretory burden is anticipated to lead to resolution of ER stress when differentiation is complete. The sustained secretory activity and expression profiles thus led us to investigate whether there was evidence of persistent ER stress and an ongoing UPR in the mature PC population. We addressed this by examining the status of *XBP1* mRNA in day 62 PCs. Consistent with successful adaptation to secretory burden, we found that spliced *XBP1* mRNA was essentially undetectable in mature PCs at day 62. However, these cells retained the ability to splice *XBP1* mRNA when treated with the reducing agent, and classical ER stress inducer, DTT (Fig. 9C). Thus, PCs at day 62 show little evidence of persistent ER stress in the steady state and are adapted to their secretory burden with sustained expression of multiple secretory pathway genes. The cells, however, remain capable of acutely activating this energy-dependent stress response pathway and processing *XBP1* mRNA when challenged.

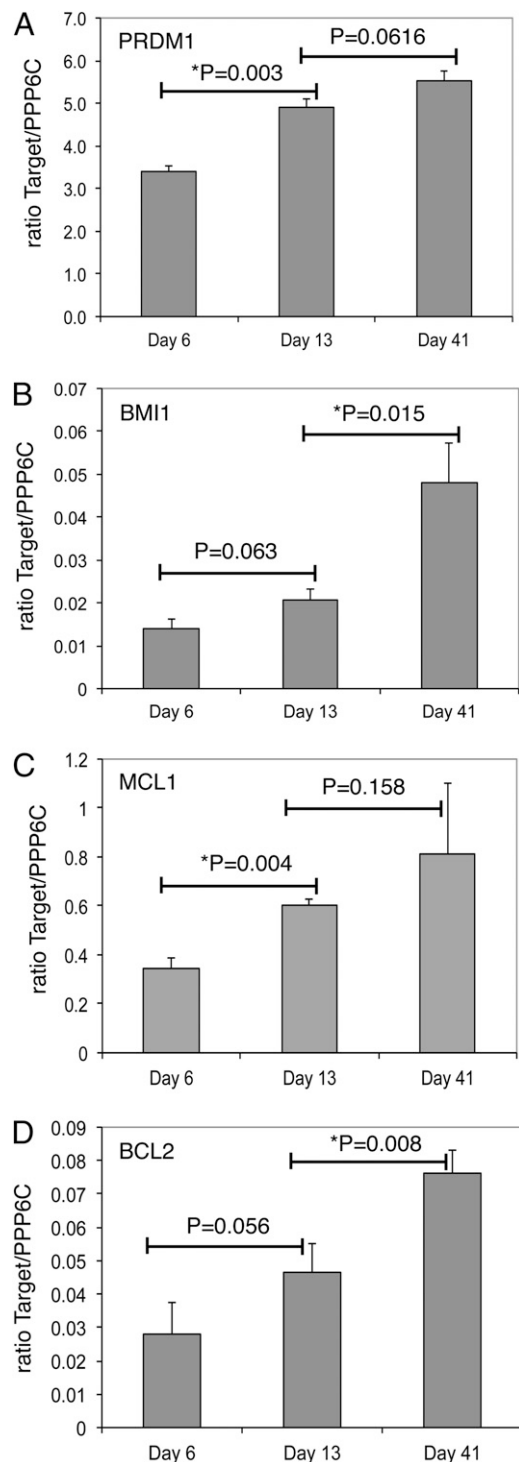


FIGURE 8. Genes associated with long-lived PCs increased in expression under stable culture conditions. Real-time PCR for *PRDM1* (A), *BMI1* (B), *MCL1* (C), and *BCL2* (D) performed on the same samples used to generate the gene expression profile, from day 6 plasmablasts, and CD138⁺ day 13 and 41 PCs. The results validated the gene expression profile and highlighted a subset of genes whose expression was progressively increased during terminal differentiation. Significances shown were derived from a paired one-tailed *t* test.

Discussion

In this article, we have shown that in vitro-generated plasmablasts are capable of generating long-lived PCs. These long-lived in vitro PCs and bone marrow PCs share a common pattern of expression

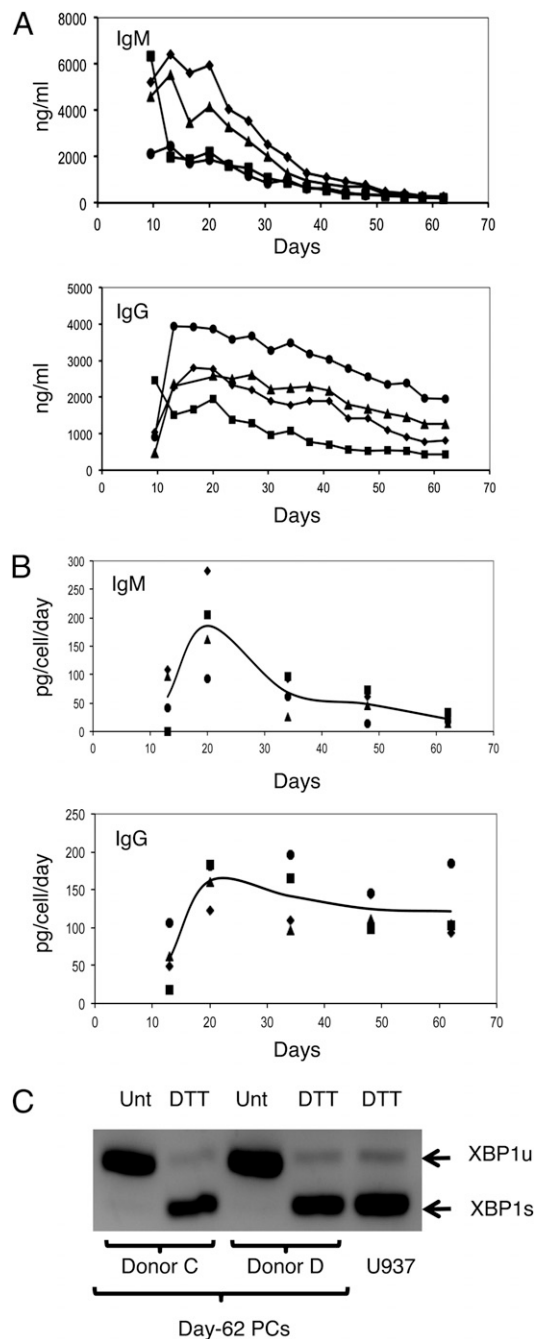


FIGURE 9. Long-lived PCs have adapted to secretory burden. (A) At each feed of the long-term culture, a 50% media exchange takes place; removed media from each donor was tested for IgM (upper panel) and IgG (lower panel) by ELISA. Data are shown with each of four donors indicated by a distinct symbol. (B) Average per cell secretion rates were determined for each point of flow cytometric population assessment by dividing the amounts of IgM and IgG secreted in the 3.5 d before the population assessment (secreted Ig = Ig(timepoint) – Ig(timepoint-1)/2) by the total cell number at the assessment. Each donor is indicated by the appropriate symbol with the accompanying average trend line. (C) The status of *XBP1* mRNA in untreated and DTT-treated PCs at day 62 was determined by RT-PCR. DTT-treated U937 cells acted as a positive control. Bands for unspliced and spliced *XBP1* mRNA are indicated.

of the majority of genes dynamically regulated during terminal B cell differentiation, the level of expression of CD138, preferential origin from memory B cells, and sustained IgG secretion.

Although direct evidence of extended longevity for human PCs in vivo is lacking (1), serological studies indicate that human PCs may persist for decades (3), and the persistence of PCs after B cell depletion has been confirmed in mouse and human (1, 5, 49). Murine PCs can survive without dividing for >90 d, and estimates of their half-lives range from 100 to 400 d (10, 11, 50). It is likely that long-lived human PCs have at least equivalent life spans in vivo, significantly greater than any previous recorded capacity of in vitro-generated PC survival (20, 24, 25). In contrast, in our system, PCs survive as postmitotic cells and were limited only by elective culture termination. The conservative estimates of PC life expectancy of around 300 d are equivalent to directly documented PC life spans (10, 11).

In this system, only a fraction of plasmablasts generates long-lived PCs, recapitulating a common feature of immune responses: PCs contributing to immunological memory emerge after contraction of larger populations of short-term effectors (6, 9, 45). Competitive occupancy of survival niches controls the entry of ASCs into the long-lived PC pool in vivo (1). However, other intrinsic differences are also likely to contribute to PC life span (50). Indeed, Ab titers to specific vaccines show consistent half-lives supporting determinants related to differentiation stimuli (3). The contraction in cell number observed when plasmablasts are provided with equal access to survival and maturation signals indicates that intrinsic differences determine PC life span in our model. These results, although not at odds with the concept of niche competition as a primary determinant of longevity in vivo, do indicate that differences in the ability to generate long-lived PCs are established as a cell intrinsic feature of ASCs, independent of the ability to migrate to and localize within a niche.

Somatic hypermutation of *IGHV* genes indicates that long-lived in vitro PCs are preferentially derived from memory rather than naive B cells. Bone marrow PCs show similar biases in somatic hypermutation load (51). One explanation for this may lie in preferential homing of memory or GC B cell-derived ASCs to bone marrow niches. In our model, naive and memory B cells generate equivalent numbers of plasmablasts (data not shown); thus, selection is occurring after this stage. The failure of naive B cells to contribute equivalently to the long-lived PC pool indicates a difference in the ability to survive independent of niche homing. This might be explained if naive B cell progeny have distinct survival requirements, such as a greater dependence on a proliferation-induced ligand (APRIL), which appears to be a weak or absent signal in our system. The loss of naive B cell-derived PCs correlates with loss of IgM secretion over time. Adaptation to secretory load is essential for PC differentiation, and secretory stress contributes to cell death in ASCs (12–14, 46). In the context of such a model, secretion of IgM may drive greater stress (14), because of the more stringent requirements for assembly of pentameric complexes (52). This, in turn, could explain the poor survival of the majority of naive B cell-derived PCs and predicts that class-switched progeny of naive B cells would have more similar survival to their memory B cell counterparts. If naive B cell-derived ASCs are programmed for a short life span independent of class-switching, this would imply the existence of a heritable determinant of life span related to germinal center transit as a mechanism contributing to licensing of the long-lived PC pool.

In the context of the secretory model of PC survival, it has been suggested that a feature of bone marrow “memory” PCs is the ability to balance ER stress, dependent on interaction with the PC niche (1). Consistent with this model, stable rates of Ig secretion are maintained by long-lived in vitro PCs that retain the ability to undergo an efficient UPR but are not experiencing sufficient intrinsic ER stress to splice *XBP1* mRNA. These PCs have thus

established a balance between secretory burden and capacity, which correlates with the complete reprogramming to a secretory expression profile similar to that of bone marrow PCs. Direct assessment of individual ASC secretion rates has demonstrated subpopulations of high and low IgG secretors among in vitro differentiating human B cells (53). The average per cell secretion rate of 120 pg/cell/day that we observe during the plateau phase of the culture falls toward the upper end of the high secretor range. The plateau of secretory activity at a high but submaximal level, in the absence of significant *XBP1* mRNA splicing, supports a model of selection for secretory fitness (14).

During development of this system, we explored a range of different conditions. The initial phases of the culture are related to those used in previous studies (21, 36), but optimized for cell number and homogeneity of phenotype. Inclusion of BCR stimulation enhanced day 6 cell number and promoted CD38 acquisition but was not essential to allow emergence of mature PCs at later time points (data not shown). At the beginning of our studies, Jourdan et al. (20) published that IL-6 and IFN- α could promote the short-term maturation of plasmablasts to PCs but terminated at day 10 of culture, and thus did not address a role in sustaining PC longevity. It had previously been reported that IL-6 and IFN- α secreted by plasmacytoid dendritic cells promotes B cell terminal differentiation (23), providing a biologic context for this combination of stimuli. A range of other cytokines reported to support ASC survival was tested, including recombinant SDF1, TNF- α , APRIL, B cell-activating factor, and hyaluronic acid (24, 54, 55). None enhanced recovery of PCs over that observed with IL-6, IFN- α , and M2-10B4 cells (data not shown). Of these primary components in the maturation phase of the culture, each contributes to PC viability. Removal of any one component reduces the recovered cell numbers by $\geq 50\%$, although at time points up to day 20 PCs remain recoverable (data not shown). Although we cannot assign a dominant role to any of these three components, it is evident from the gene expression profiles that IFN- α induces sustained signaling. Although the type I IFN signal is greater among in vitro-generated PCs than bone marrow PCs, it is nonetheless the case that bone marrow PCs show stronger expression of these genes than is observed among plasmablasts, suggesting that a type I IFN signal is operating in the context of the bone marrow PC niche.

The mechanism by which M2-10B4 cells contribute to PC survival remains to be established, but dependence on a soluble factor is shared with hemopoietic stem cell cultures (56). Although it was beyond the scope of this study to define all secreted components and how they impact on PCs, we have generated an initial assessment of the M2-10B4 secretome; this remains consistent with its bone marrow stromal derivation. Of particular relevance are LGALS1 (Galectin-1), previously linked to PC generation and survival (57), and SPP1 (osteopontin), which is involved with IL-6 in myeloma, and has a role in the hemopoietic stem cell niche (58–60), which overlaps with the physiologic PC niche (38).

Several other cell types have been implicated in PC survival, many through secretion of APRIL (4, 61). Some, such as neutrophils and eosinophils (62, 63), are difficult to test in long-term in vitro cultures because they have significantly shorter life spans than the cultured PCs and release toxic granules. Others such as osteoclasts act through contact-dependent mechanisms (25). Although each of these cell types may also be capable of supporting long-term PC survival, for practical applications, there is a great benefit in using a stromal cell line such as M2-10B4, which mediates its effects in a contact-independent fashion.

As a secreted factor and an element of the in vivo PC niche, APRIL was a likely candidate for the stromal signal (64, 65).

However, TACI-Ig of either human or mouse origin (inhibitors of both APRIL and B cell-activating factor), at concentrations (50 ng/ml to 5 μ g/ml) equivalent to those observed with intense treatment schedules in human, had no reproducible effect on PCs up to day 20 in our system (data not shown). These results may relate to the clinical setting, where IgG titers are more resistant than IgM or IgA to TACI-Ig fusion protein treatment, and certain autoantibodies and vaccine-related immunity derived from long-lived PCs (3, 5) are not significantly affected (66, 67). Gene expression profiles provide support for the lack of APRIL signaling in our model. Although the primary APRIL receptor on PCs, *TNFRSF17 (BCMA)* (68), was expressed at an equivalent level among in vitro PCs to that observed in bone marrow PCs, NF- κ B target genes such as *TNFAIP3* and *NFKBIA* were expressed at significantly lower levels.

To our knowledge, our data provide the first complete longitudinal tracking of a terminally differentiating human B cell population including long-lived PCs and builds on previous analyses of the initial phases of PC differentiation (16, 20, 40). Our focus on clusters of dynamically coregulated genes underlines the overall similarity between bone marrow and in vitro PCs, and provides a coherent view of progressive genetic reprogramming to a complete secretory phenotype. Interestingly, the gradual maturation to CD138^{high} surface expression was reflected in the profiles of only a subset of genes such as *PRDM1*, *MCL1*, *BCL2*, and *BM11*. In contrast, the majority of gene expression changes were more rapid after the major transitions in culture conditions. Populations with “transitional” CD138^{low} phenotypes are evident in the peripheral blood, and a few can be observed in bone marrow (7, 17). However, the kinetics of transition between CD138^{low} and CD138^{high} in vivo is not known and may be more rapid. Indeed, inclusion of additional components such as an enhanced NF- κ B signal may accelerate expression changes in vitro.

In conclusion, we have identified a set of conditions that recapitulate the essential in vivo function of the PC niche, maintaining a long-lived and phenotypically distinct PC population. This model system provides a tool with which to address a number of critical questions relating to PC biology in health and disease.

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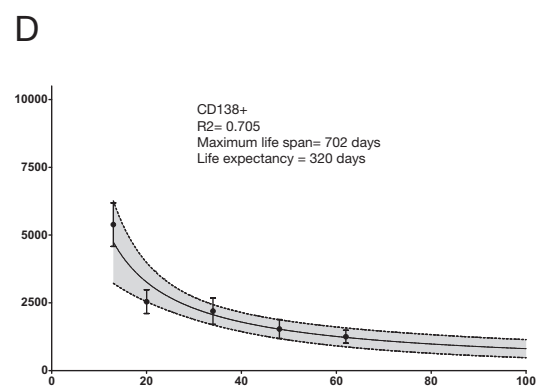
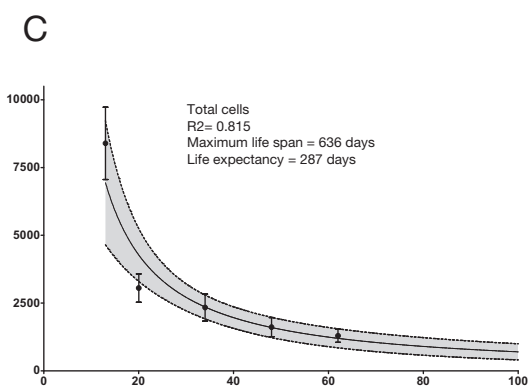
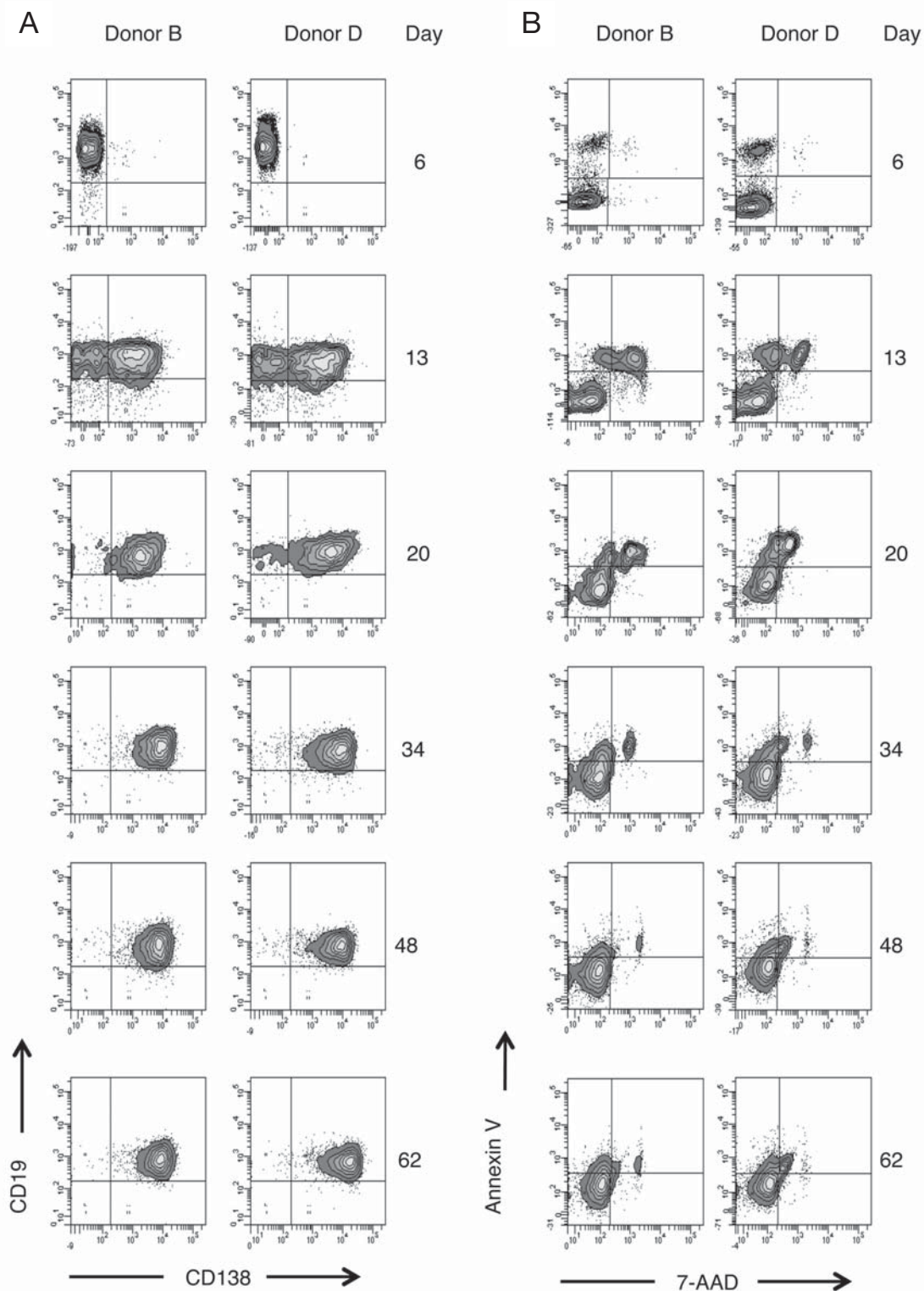
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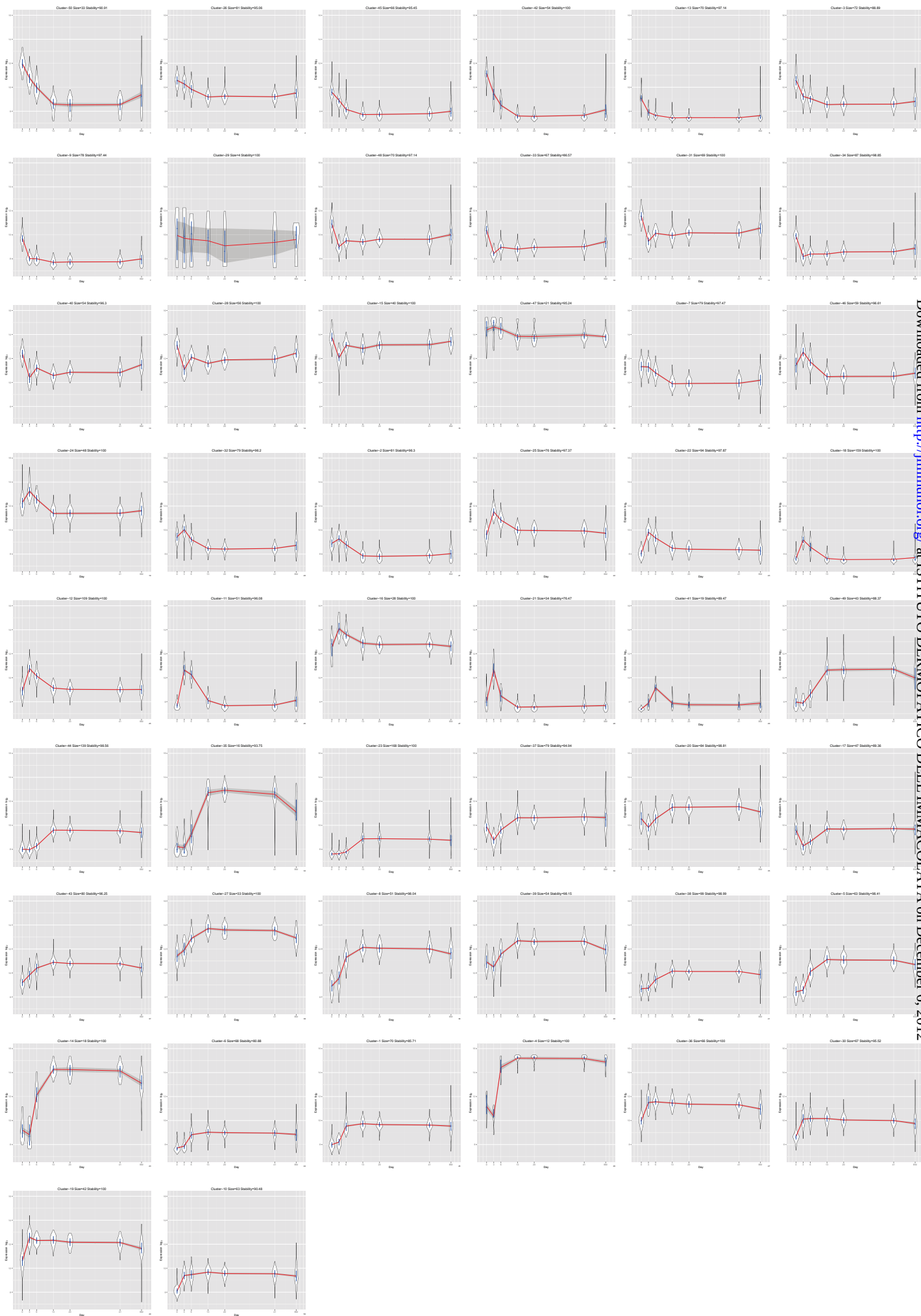
The authors have no financial conflicts of interest.

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Supplemental figure 1. CD19 vs CD138 expression on viable plasma cells to day

62. (A) Day 6 plasmablasts were maintained in the upper chamber of transwells with an M210-B4 stromal layer in the lower compartment. Cells were fed at 3.5 day intervals, and assessed by flow cytometry at the indicated days. Shown are results from two donors with staining for CD19 and CD138 on viable cells gated using Annexin-V and 7-AAD. Results are representative of a total of 4 differentiations from independent donors taken to day 62, and two additional differentiations taken to day 50+. (B) Annexin-V and 7-AAD staining on differentiating B-cells. Gates for negative cells were set based on day 6 staining patterns. Viable cells remain in the bottom left quadrant. (C) and (D) The population decay fits a power-law function. The fitted curves (central line) and 95% confidence intervals (CI) (grey shaded area) based on the average total and CD138⁺ cell numbers from four donors are shown. The R^2 value, the maximum life span predictions (the point at which the 95% confidence interval cross zero on the y-axis), and life expectancy of day 62 PCs are indicated. These figures are given as indicative predictions of extended longevity not of specific life spans.

Supplemental figure 2. Dynamic gene expression patterns during plasma cell

differentiation. Graphic representation of absolute levels of gene expression for all 50 differentiation clusters. Graphs are shown (left to right) in the same order as the heat-map in Figure 7 (top to bottom). The pattern of expression for each cluster is illustrated with a red trend-line with 95% confidence interval (gray surround). For each time point, and for bone marrow plasma cell samples appended to each graph, the distribution of expression values for all cluster genes is shown as a violin plot with

the median and 25th – 75th percentile of expression shown within each violin plot as a blue dot and line respectively. Absolute expression values ($\log_2$) are indicated on the y-axis with time in days on the x-axis. Cluster number, size and stability are indicated above each graph.

This table provides gene expression values for all genes in differentiation clusters, by individual sample and averaged between samples at same time point/source. Also indicated are all probes identified as differentially expressed with absolute fold change >2 and FDR corrected p-value <0.05, please note this includes probes for non-protein coding genes and pseudogenes.

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2	BABCPB	PRMT3-4760133	PRMT3	6760133	8.71	9.29	9.00	9.68	9.57	8.64	9.10	9.22	9.06	7.89	8.04	8.56	8.09	8.37	7.99	8.18	8.11	7.91	8.37	8.46	8.32	ANA	ANA	9.00	9.63	9.13	8.16	8.23	8.09	8.28
2	BABCPB	CD86-4670368	CD86	4670368	8.83	8.88	8.91	8.71	8.89	8.70	8.77	8.83	9.14	7.47	7.90	7.84	7.42	7.74	7.43	7.66	7.79	7.50	7.57	7.69	7.46	ANA	ANA	8.80	8.77	8.92	8.74	7.68	7.83	7.57
2	BABCPB	LOC72004	LOC72004	230400	8.45	8.48	8.57	8.34	8.51	8.48	8.50	8.48	8.34	8.31	8.21	8.32	8.40	8.31	8.09	8.37	7.98	7.82	8.05	8.67	7.89	ANA	ANA	8.80	9.24	8.18	8.18	8.48	8.48	
2	BABCPB	KE200-43003	KE200	590043	8.81	8.40	8.57	8.30	8.29	8.44	8.23	8.37	7.75	7.85	8.23	8.32	8.40	8.31	8.09	8.37	7.98	7.82	8.05	8.67	7.89	ANA	ANA	8.80	9.33	9.35	7.08	7.37	8.04	
2	BABCPB	IFP5-232431	IFP5	232431	7.76	8.27	8.06	7.74	8.00	7.14	7.46	8.08	8.74	7.50	8.01	8.59	7.99	8.52	7.53	8.18	8.07	8.43	8.27	8.57	8.35	ANA	ANA	8.87	8.69	8.10	8.50	8.25	8.43	
2	BABCPB	LOC443779	LOC443779	1324043	8.48	8.48	8.45	8.31	8.42	8.48	8.50	8.45	8.31	8.48	8.48	8.45	8.31	8.48	8.48	8.45	8.31	8.48	8.48	8.45	8.31	ANA	ANA	8.87	8.69	8.10	8.50	8.25	8.43	
2	BABCPB	CELC2D-257132	CELC2D	257132	8.45	9.14	8.99	8.85	7.81	8.18	8.62	9.35	9.05	8.05	8.09	8.25	8.35	7.63	7.54	7.88	8.24	7.91	7.53	7.43	7.24	ANA	ANA	8.86	8.84	8.35	8.13	8.00	7.89	
2	BABCPB	LOC440415	LOC440415	330007	8.52	8.29	8.57	8.43	8.42	8.40	8.50	8.45	7.86	7.90	7.95	8.03	7.95	7.85	7.97	7.94	7.89	7.92	8.29	7.72	8.03	ANA	ANA	8.85	9.15	9.27	8.43	7.83	7.99	
2	BABCPB	TAGLN2-2340180	TAGLN2	2340180	8.88	8.59	8.88	8.98	8.98	9.11	8.71	8.74	8.79	7.87	7.87	7.81	7.39	8.14	7.58	7.95	7.63	7.23	7.65	7.62	8.22	ANA	ANA	8.78	8.03	8.75	7.72	7.72	7.68	
2	BABCPB	MARX-2320026	MARX1	2320026	9.56	9.10	9.27	9.11	9.54	8.90	8.71	8.82	8.00	8.09	8.03	8.24	7.86	8.09	7.54	7.94	7.88	7.38	8.53	7.54	ANA	ANA	8.84	9.14	9.28	8.02	7.87	7.91		
2	BABCPB	PRKCB-4480373	PRKCB	4480373	9.01	9.26	9.50	8.60	9.17	8.68	9.15	9.05	9.08	8.17	7.68	7.79	8.09	7.89	7.99	7.93	8.04	7.30	7.80	7.89	7.44	ANA	ANA	8.79	8.29	8.66	9.09	7.88	7.99	
2	BABCPB	PTPRC-4818028	PTPRC	6180288	8.66	9.16	9.23	8.36	8.78	8.34	8.66	9.24	9.33	7.88	7.65	8.10	7.80	8.20	7.62	7.80	8.02	7.31	7.42	7.34	7.34	ANA	ANA	8.92	8.46	9.08	7.81	8.00	7.81	
2	BABCPB	LOC5813-2320403	LOC5813	2320400	8.27	8.45	8.51	8.24	9.17	8.21	8.09	7.97	8.10	7.34	7.58	7.88	7.53	7.81	7.74	7.80	7.81	7.58	8.29	7.63	ANA	ANA	8.41	9.10	8.96	7.60	7.53	7.80		
2	BABCPB	RECQL-4627074	RECQL	4627074	8.69	8.68	9.00	8.97	9.09	9.31	9.00	8.95	8.96	7.85	7.69	8.00	7.87	7.70	8.15	7.77	7.88	7.82	8.12	7.80	7.60	ANA	ANA	8.73	9.12	9.00	7.78	7.79	8.00	
2	BABCPB	LOC4178064	CDC4	178064	8.63	8.68	8.38	9.12	9.24	8.43	8.29	8.87	7.75	7.75	8.81	7.81	8.01	7.82	7.84	7.73	8.24	7.72	7.62	7.62	ANA	ANA	8.97	9.27	8.86	7.81	7.93	7.80		
2	BABCPB	FXR1-419077	FXR1	419077	8.40	8.62	8.83	9.19	9.37	9.22	8.68	8.70	8.62	7.60	7.88	8.10	7.63	7.54	7.94	8.00	7.99	7.66	7.95	8.27	8.10	ANA	ANA	8.62	9.29	8.67	7.86	7.58	7.59	
2	BABCPB	SPC3A-5910349	SPC3A	5910349	9.25	8.82	8.92	8.98	8.70	9.51	9.17	8.96	9.21	8.11	8.29	7.97	7.63	7.90	7.85	7.90	8.29	8.55	8.51	8.62	ANA	ANA	8.79	9.08	9.11	8.13	7.76	8.01		
2	BABCPB	NTPC-340055	NTPC	340055	8.45	8.33	8.68	9.62	9.28	9.66	8.88	8.99	8.99	8.18	8.37	8.22	8.10	8.02	8.03	7.94	7.79	8.18	8.40	8.98	7.70	ANA	ANA	8.79	8.59	8.55	8.26	8.06	7.92	
2	BABCPB	NUP50-591006	NUP50	591006	8.26	8.58	8.73	9.78	9.58	9.48	8.65	8.88	8.95	8.02	8.10	8.12	8.11	7.97	8.17	8.27	8.01	8.23	8.42	8.45	8.76	ANA	ANA	8.76	9.61	8.87	8.11	8.04	8.15	
2	BABCPB	ESD-1160578	ESD	1160578	8.46	8.65	8.60	9.27	9.27	9.27	8.19	8.40	8.23	7.48	7.55	7.53	7.74	7.81	7.95	7.84	7.86	7.44	7.77	8.13	7.68	ANA	ANA	8.68	9.27	8.27	7.72	7.68	7.52	
2	BABCPB	LOC2060408	PTPRC	2010048	8.46	9.38	9.31	8.21	8.76	8.17	8.51	9.10	9.30	7.80	7.81	7.84	7.72	8.10	7.80	7.57	8.04	7.22	7.37	7.40	7.30	ANA	ANA	8.72	8.38	8.57	7.69	7.91	7.94	
2	BABCPB	ACYP1-489148	ACYP1	489148	9.05	8.94	8.90	9.21	9.22	9.29	8.91	8.62	8.42	7.52	8.14	7.87	7.92	7.87	7.90	7.99	8.25	7.87	8.29	7.39	7.48	ANA	ANA	8.86	9.24	8.58	7.48	7.89	7.86	
2	BABCPB	LOC1013279-3830139	LOC1013279	3830139	8.17	8.41	8.62	9.05	9.25	8.99	8.50	8.62	8.72	7.53	7.42	7.96	7.77	7.53	7.91	7.69	7.90	7.45	7.95	8.12	8.04	ANA	ANA	8.40	9.10	8.62	7.84	7.85	7.89	
2	BABCPB	BTLA-2400484	BTLA	2400484	9.23	9.33	9.50	8.71	8.65	9.09	8.45	8.65	9.03	7.71	8.20	7.90	7.97	8.05	8.22	8.07	8.09	8.02	9.05	8.98	8.71	ANA	ANA	8.99	8.88	8.78	7.93	8.01	8.13	
2	BABCPB	ARMKC2-3930201	ARMKC2	3930201	8.49	8.64	8.68	9.32	9.29	9.15	7.78	7.88	7.87	7.60	7.95	7.95	7.87	7.34	7.95	8.58	8.35	8.36	8.60	8.42	8.27	ANA	ANA	8.60	9.26	7.94	7.71	8.10	8.29	
2	BABCPB	LOC448070	LOC448070	6840520	8.40	8.33	8.53	9.48	9.12	8.99	8.80	8.76	8.37	7.99	7.96	7.86	8.13	8.16	8.03	8.24	7.76	8.35	8.71	8.20	7.73	ANA	ANA	8.89	9.33	8.58	7.84	8.14	8.01	
2	BABCPB	LOC448070	LOC448070	6840520	8.40	8.33	8.53	9.48	9.12	8.99	8.80	8.76	8.37	7.99	7.96	7.86	8.13	8.16	8.03	8.24	7.76	8.35	8.71	8.20	7.73	ANA	ANA	8.89	9.33	8.58	7.84	8.14	8.01	
2	BABCPB	PPPIR1A-6200488	PPPIR1A	6200488	9.00	8.71	9.46	8.28	8.37	8.41	9.08	8.59	8.85	8.34	7.98	7.99	7.63	7.62	7.84	7.81	7.92	7.91	8.08	8.39	8.14	ANA	ANA	9.05	8.35	8.84	8.07	7.83	7.79	
2	BABCPB	LOC728416	LOC728416	640441	8.53	8.33	8.46	9.33	9.15	8.98	8.62	8.77	7.62	7.97	7.91	7.92	8.14	7.66	7.77	8.40	8.79	8.79	8.53	8.18	ANA	ANA	8.43	9.29	8.60	8.43	8.03	8.47		
2	BABCPB	TAF10-387433	TAF10	387433	9.32	9.45	9.18	9.25	8.76	8.83	9.28	8.83	8.98	8.20	7.51	8.05	8.27	8.26	8.26	8.21	8.24	8.81	9.19	8.79	8.58	ANA	ANA	9.32	8.55	9.03	7.82	8.31	8.24	
2	BABCPB	EWRI1-4892037	EWRI1	4892037	8.74	8.84	8.56	9.19	8.99	9.54	8.36	8.20	8.21	7.80	7.83	7.97	7.97	7.97	7.94	7.88	7.74	7.89	7.88	7.88	7.74	ANA	ANA	8.71	9.04	8.26	7.71	7.72	7.76	
2	B	HLA-DRI1-5200484	HLA-DRI1	5200484	12.15	12.12	9.06	10.84	10.50	7.96	10.53	9.69	7.85	8.88	8.40	7.52	8.36	8.55	8.67	8.80	7.87	7.43	7.57	7.43	8.66	ANA	ANA	11.11	9.80	9.36	8.27	8.45	7.77	
2	B	HLA-DRE1-520044	HLA-DRE1	520044	9.27	11.14	12.77	10.24	10.11	11.00	8.43	9.55	11.03	8.07	8.68	9.41	8.08	8.47	7.74	8.81	8.58	8.77	8.15	9.31	8.83	ANA	ANA	11.06	9.45	9.47	8.69	8.28	8.38	
2	B	ALOXAP5-1183493	ALOXAP5	1183493	8.27	8.19	8.27	8.19	8.27	8.19	8.27	8.19	8.27	8.19	8.27	8.19	8.27	8.19	8.27	8.19	8.27	8.19	8.27	8.19	8.27	ANA	ANA	8.27	8.19	8.27	8.19	8.27	8.19	
2	B	CD37-101133	CD37	101133	11.75	11.77	12.18	8.88	8.89	8.94	8.71	8.78	9.13	8.74	8.81	8.48	8.42	8.87	8.61	8.81	8.77	8.29	8.09	8.66	8.93	ANA	ANA	11.97	8.91	8.87	8.68	8.64	8.77	
2	B	PLAC2-48920113	PLAC2	48920113	9.15	9.16	9.17	9.16	9.17	9.16	9.17	9.16	9.17	9.16	9.17	9.16	9.17	9.16	9.17	9.16	9.17	9.16	9.17	9.16	9.17	ANA	ANA	9.15	9.16	9.17	9.16	9.17	9.16	
2	B	TBC1D10C-5006083	TBC1D10C	5006083	10.44	11.24	12.19	8.35	9.16	9.34	8.53	8.97	9.14	8.29	8.43	8.33	8.00	7.97	8.07	8.10	7.90	8.28	8.47	8.67	ANA	ANA	11.32	9.28	9.01	8.35	8.00	8.05		
2	B	SLC44A2	SLC44A2	5200424	11.23	10.21	10.22	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	8.46	ANA	ANA	11.23	9.28	9.01	8.35	8.00	8.05	
2	B	ANKK-450053	ANKK	450053	11.94	11.22	11.71	9.81	9.93	9.29	9.81	9.81	10.17	8.46	8.46	8.99	8.63	8.67	8.81	8.61	8.64	8.68	10.37	11.03	10.33	ANA	ANA	11.64	9.34	9.83	8.64	8.10	8.69	
2	B	SLC11E12-1034637	SLC11E12	1034637	8.48	8.17	8.38	8.17	8.38	8.17	8.38	8.17	8.38	8.17	8.38	8.17	8.38	8.17	8.38	8.17	8.38	8.17	8.38	8.17	8.38	ANA	ANA	8.48	8.17	8.38	8.17	8.38	8.17	
2	B	MYLIP-489204</																																

5	BPBC	TPST3-690347	TPST3	5690347	8.18	8.26	8.66	8.96	8.59	8.68	10.60	10.52	10.76	11.98	12.19	12.04	11.50	11.61	11.56	11.43	11.02	11.17	10.46	10.41	10.67	ANA	ANA	8.37	8.55	10.63	12.07	11.55	11.34	10.68				
	BPBC	TXNDC11-107496	TXNDC11	107496	8.30	8.23	8.24	8.18	8.23	8.20	10.60	10.73	10.65	11.54	11.20	11.75	11.33	11.31	11.55	11.32	11.62	11.11	10.44	9.83	10.84	ANA	ANA	Yes	8.25	8.20	10.66	11.50	11.32	11.49	10.45			
	BPBC	BP1-147024	BP1	147024	8.91	8.83	9.00	8.83	8.86	8.88	9.16	8.86	8.98	12.06	11.71	11.17	11.83	11.48	11.43	11.56	11.42	11.24	11.02	11.28	11.07	11.03	11.25	10.96	11.24	ANA	ANA	8.91	8.83	9.00	11.83	11.52	11.66	11.02
	BPBC	LAMP2-3006292	LAMP2	3006292	8.25	8.13	8.25	8.25	8.25	8.25	10.09	8.45	8.46	11.03	10.55	11.41	10.35	11.41	10.35	11.41	10.35	11.41	10.35	11.41	10.35	11.41	10.35	11.41	10.35	ANA	ANA	8.25	8.13	8.25	11.03	11.41	10.35	11.41
	BPBC	IFNA3-4950056	IFNA3	4950056	8.05	8.27	8.56	8.67	8.55	8.62	10.81	10.66	10.48	11.69	11.66	11.88	11.81	11.62	11.88	11.66	11.64	10.95	11.10	10.56	11.16	11.27	ANA	ANA	ANA	8.06	8.01	10.65	11.78	11.71	11.67	10.95		
	BPBC	HSTRT2AA3-4290148	HSTRT2AA3	4290148	8.17	8.16	8.77	8.83	8.76	8.86	9.52	9.35	9.39	11.48	11.35	11.48	11.35	11.48	11.35	11.48	11.35	11.48	11.35	11.48	11.35	11.48	11.35	11.48	11.35	ANA	ANA	8.17	8.16	8.77	11.35	11.48	11.35	11.48
	BPBC	HSTRT2AA3-10451	HSTRT2AA3	10451	8.04	8.22	8.22	8.09	8.04	7.95	8.28	9.39	9.35	9.39	11.44	11.65	10.99	11.77	11.57	11.77	11.21	11.21	11.33	12.21	11.04	11.52	11.63	ANA	ANA	ANA	8.01	8.09	9.37	11.29	11.67	11.57	11.96	
	BPBC	TRAM2-460205	TRAM2	460205	8.15	8.06	8.15	8.15	8.15	8.15	10.46	10.63	10.63	11.57	11.46	11.34	11.46	11.34	11.46	11.34	11.46	11.34	11.46	11.34	11.46	11.34	11.46	11.34	11.46	ANA	ANA	8.15	8.06	8.15	11.34	11.46	11.34	11.46
	BPBC	SL1-4506003	SL1	4506003	8.02	8.08	8.02	8.10	8.05	8.31	9.97	9.61	9.62	11.65	11.43	11.51	11.04	10.89	11.32	10.80	11.06	11.79	12.20	11.16	11.77	11.77	ANA	ANA	ANA	8.04	8.15	9.73	11.53	10.96	11.66	11.73		
	BPBC	BCL2L1-4699204	BCL2L1	4699204	7.70	8.67	8.81	8.82	8.54	8.42	9.48	9.55	8.90	11.47	11.73	11.62	11.46	11.78	10.96	11.59	11.46	11.78	10.96	11.59	11.46	11.78	10.96	11.59	11.46	ANA	ANA	8.73	8.46	8.81	11.61	11.61	11.61	11.61
	BPBC	LAMP2-3890563	LAMP2	3890563	8.07	7.87	8.13	8.33	8.35	8.54	9.75	9.79	9.67	11.18	10.75	11.14	11.50	10.98	11.62	11.16	11.49	10.23	10.25	11.42	10.89	ANA	ANA	ANA	8.02	8.41	9.73	11.03	11.24	11.42	10.45			
	BPBC	TPST2-2630071	TPST2	2630071	8.14	8.26	8.32	8.30	8.47	8.52	10.26	10.20	10.30	11.51	11.70	11.63	11.27	11.42	11.15	11.05	10.64	10.79	11.25	11.77	11.14	11.14	ANA	ANA	ANA	8.24	8.43	10.25	11.62	11.35	10.95	10.99		
	BPBC	44802028	CHAP4	44802028	9.08	8.56	8.72	8.28	8.15	8.03	10.51	10.63	10.78	11.71	11.65	11.65	10.95	11.56	11.42	11.22	11.38	11.56	11.81	11.62	11.97	ANA	ANA	ANA	8.79	8.15	10.64	11.49	11.26	11.34	11.74			
	BPBC	DNAJB5-270164	DNAJB5	270164	8.77	8.56	9.33	7.96	7.96	8.17	9.97	9.97	10.03	11.14	10.58	11.67	11.47	11.52	11.75	11.45	11.04	10.79	11.25	11.08	11.43	ANA	ANA	ANA	8.22	8.02	9.56	11.13	11.50	11.65	11.24			
	BPBC	PSAT1-4802074	PSAT1	4802074	7.48	7.63	7.58	7.42	7.52	7.75	9.48	9.76	9.72	10.50	11.11	10.57	11.53	10.52	11.33	11.05	11.06	9.88	9.77	9.56	ANA	ANA	ANA	ANA	8.43	8.73	9.56	11.05	11.10	9.44	10.31			
	BPBC	SLC38A10-4500303	SLC38A10	4500303	7.79	7.62	7.55	8.35	8.48	8.30	9.93	10.28	10.13	11.90	11.25	11.10	10.69	10.92	10.80	10.65	10.46	10.47	10.53	10.52	10.97	ANA	ANA	ANA	7.66	8.38	10.12	11.09	10.80	10.64	10.62			
	BPBC	RBM17-4700201	RBM17	4700201	8.25	7.82	8.11	8.02	7.96	8.09	10.35	10.30	10.63	11.40	10.23	11.14	10.88	10.71	11.01	10.57	10.82	9.91	10.01	9.59	9.81	ANA	ANA	ANA	8.06	7.96	10.43	10.65	10.79	10.73	9.79			
	BPBC	HSP90B3P-4905051	HSP90B3P	4905051	8.32	8.36	8.41	9.10	9.02	8.87	11.80	11.99	11.22	11.11	11.62	11.09	11.30	11.19	11.15	10.89	10.62	11.32	11.51	11.17	10.98	ANA	ANA	ANA	8.36	8.90	11.70	10.96	11.25	10.89	11.25			
	BPBC	CG1ALT1C1-4200277	CG1ALT1C1	4200277	8.95	8.16	8.36	8.01	8.27	8.59	10.82	10.52	10.49	11.20	11.02	11.84	11.84	11.81	11.85	11.47	10.88	11.05	11.01	11.01	11.52	ANA	ANA	ANA	8.95	8.16	8.81	11.01	11.52	11.59	11.28			
	BPBC	ELL2-10270	ELL2	10270	8.14	8.26	7.87	7.85	8.41	9.26	9.29	9.61	9.18	9.24	10.22	12.14	11.99	11.52	11.56	11.26	11.21	11.36	11.37	9.56	9.62	9.41	ANA	ANA	ANA	8.91	9.35	9.41	12.05	11.54	11.28	9.95		
	BPBC	VMP-6020474	VMP	6020474	8.03	8.05	7.88	8.35	8.35	8.64	10.53	10.25	10.37	11.09	11.01	11.04	10.85	10.83	11.05	10.84	10.85	11.10	10.79	11.14	11.14	ANA	ANA	ANA	7.85	8.40	10.74	10.93	11.14	11.24	10.54			
	BPBC	SEC14L1-4200441	SEC14L1	4200441	8.07	7.96	8.02	8.18	8.18	8.19	9.79	9.93	10.15	11.03	10.87	10.74	10.38	10.57	10.67	10.46	10.37	10.99	11.34	10.66	10.93	ANA	ANA	ANA	7.88	8.18	9.96	10.88	10.48	10.50	10.98			
	BPBC	RBM17-4200575	RBM17	4200575	8.42	8.09	8.26	7.96	7.96	8.06	10.25	10.30	10.62	10.66	10.22	11.21	10.65	10.59	10.79	10.40	10.81	10.07	10.22	9.47	10.31	ANA	ANA	ANA	8.06	8.00	10.36	10.70	10.68	10.67	10.00			
	BPBC	FNDCA3-7200308	FNDCA3	7200308	9.06	8.97	8.58	8.41	8.47	8.32	9.71	9.80	9.89	10.62	10.83	11.22	11.28	11.74	11.10	11.77	10.88	11.00	10.29	9.79	ANA	ANA	ANA	7.88	8.40	9.80	10.62	11.27	11.53	10.48				
	BPBC	SPRTS3-2000441	SPRTS3	2000441	8.57	8.14	8.23	8.35	8.17	8.52	9.84	10.11	10.07	10.96	10.82	10.96	11.05	10.71	11.23	10.99	11.08	11.11	11.43	11.23	ANA	ANA	ANA	8.31	8.31	10.04	10.76	10.88	11.07	10.98				
	BPBC	FNDCA3-1660113	FNDCA3	1660113	9.02	9.31	8.88	8.48	8.48	8.29	9.81	9.83	9.91	10.78	11.22	11.40	11.21	11.54	11.04	11.08	10.77	11.02	10.27	9.78	ANA	ANA	ANA	7.97	8.82	9.85	10.60	11.31	11.46	10.46				
	BPBC	SEMA4A-2800576	SEMA4A	2800576	7.97	7.97	7.88	9.09	8.82	8.30	9.94	9.66	10.33	10.95	10.71	10.69	11.76	10.76	10.87	10.71	10.85	10.36	9.65	11.02	11.16	ANA	ANA	ANA	8.00	10.04	10.78	10.76	10.81	10.07	10.81			
	BPBC	MMPAPK2-4200681	MMPAPK2	4200681	8.08	8.75	8.80	8.85	9.14	8.73	8.45	9.71	9.62	11.17	11.34	10.86	11.33	11.50	11.24	11.36	10.66	10.90	9.88	10.84	ANA	ANA	ANA	8.74	8.84	9.60	11.16	11.44	11.32	10.38				
	BPBC	SPRPH-2901212	SPRPH	2901212	8.40	8.14	7.97	8.52	8.82	8.66	9.91	10.23	10.26	11.01	11.08	11.14	10.80	10.90	10.69	10.76	10.63	10.31	10.65	10.35	10.86	ANA	ANA	ANA	8.17	8.67	10.13	11.28	10.85	10.70	10.50			
	BPBC	STRALNACA-10379	STRALNACA	10379	8.12	8.34	8.40	8.64	8.70	8.72	9.36	9.65	9.77	10.20	11.41	11.26	10.96	10.78	10.69	10.40	10.84	10.70	10.64	11.61	ANA	ANA	ANA	8.24	8.60	9.60	11.30	10.66	10.64	10.99				
	BPBC	TMEM206-5020355	TMEM206	5020355	8.89	8.33	8.20	8.20	8.96	9.24	10.82	10.67	10.57	11.29	11.48	11.14	11.20	11.15	10.86	10.73	10.76	11.03	10.98	10.74	ANA	ANA	ANA	8.34	8.17	10.72	11.30	11.17	10.76	10.88				
	BPBC	SCARB2-4910435	SCARB2	4910435	8.97	8.98	8.90	8.84	8.71	8.93	10.59	10.49	10.71	11.33	10.59	10.42	11.42	11.28	11.29	11.19	11.50	11.10	11.54	10.91	11.17	ANA	ANA	ANA	8.96	8.82	10.60	11.31	11.35	11.23	11.18			
	BPBC	HPCAL1-520184	HPCAL1	520184	9.20	9.15	9.69	8.92	9.19	9.06	9.37	9.65	9.67	11.48	11.99	11.59	11.33	11.40	11.26	11.56	11.40	10.20	9.82	9.93	10.83	ANA	ANA	ANA	Yes	9.35	9.66	9.56	11.69	11.39	11.40	10.20		
	BPBC	FAM2B-7020309	FAM2B	7020309	8.29	7.99	8.18	8.73	8.49	8.86	9.41	9.42	9.51	10.99	10.95	10.75	10.79	10.77	10.69	10.76	10.88	11.01	10.32	10.90	11.31	ANA	ANA	ANA	8.15	8.69	9.45	10.90	10.78	10.78	10.66			
	BPBC	LAMP2-4480148	LAMP2	4480148	8.27	8.11	8.30	8.42	8.46	8.58	9.49	9.49	9.49	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	ANA	ANA	ANA	8.27	8.11	8.30	8.42	8.46	8.58	8.58			
	BPBC	FAM8A-2970433	FAM8A	2970433	8.14	8.00	8.62	8.25	8.47	8.39	9.50	10.15	10.44	10.63	11.01	10.92	10.76	10.80	11.44	10.99	11.25	11.12	11.05	11.05	9.39	ANA	ANA	ANA	8.72									

7	ABDPB	TUBB-6560474	TUBB	6560474	11.04	10.30	10.65	12.47	10.70	12.46	10.99	11.48	11.68	9.98	9.80	9.41	9.13	9.37	9.53	9.83	9.23	9.85	10.19	11.15	9.85	9.74	9.67	10.67	12.54	11.38	9.36	9.25	9.53	10.26	
7	ABDPB	CSDA-2302129	CSDA	2302129	11.36	12.09	11.71	11.50	11.88	11.58	11.08	11.99	9.24	9.70	9.78	9.16	9.16	9.12	8.75	9.24	8.91	9.81	10.77	10.16	10.15	Yes	9.74	11.72	11.65	10.88	9.57	9.14	8.87	10.22	
7	ABDPB	CSDA1A-2302113	CSDA1A	2302113	11.39	11.48	11.23	11.39	11.48	11.39	11.39	11.39	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	9.85	11.81	11.81	11.81	11.81	9.57	9.14	8.87	10.22
7	ABDPB	LOC434949-2303439	LOC434949	2303439	12.59	12.40	12.16	11.37	11.08	11.76	11.10	11.74	9.60	9.60	9.60	9.60	9.60	9.60	9.60	9.60	9.60	9.60	9.60	9.60	9.60	9.60	9.60	10.77	10.68	11.08	9.57	9.14	8.87	10.22	
7	ABDPB	ITGB2-7200156	ITGB2	7200156	11.79	11.86	12.23	11.58	11.79	11.89	11.40	11.68	10.86	10.86	10.86	10.86	10.86	10.86	10.86	10.86	10.86	10.86	10.86	10.86	10.86	10.86	9.87	11.18	11.38	10.37	9.57	9.14	8.87	10.22	
7	ABDPB	HLA-DQA1-7204023	HLA-DQA1	7204023	12.88	12.79	12.47	11.89	11.71	11.92	10.22	10.78	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	10.36	10.78	9.88	9.57	9.14	8.87	10.22	
7	ABDPB	TAGLN2-4070736	TAGLN2	4070736	11.13	11.13	11.24	11.32	11.19	11.50	10.83	10.80	11.06	9.05	9.71	9.34	9.40	9.23	8.60	9.00	9.13	8.31	9.05	9.08	9.87	9.74	9.16	11.34	10.86	9.37	9.11	8.91	9.11	8.91	9.11
7	ABDPB	ITGB2-3800243	ITGB2	3800243	11.88	11.79	11.82	11.81	11.79	11.82	11.81	11.81	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	9.17	10.36	10.78	9.88	9.57	9.14	8.87	10.22	
7	ABDPB	CDC108B-1780259	CDC108B	1780259	11.89	11.19	11.48	11.43	11.28	11.43	11.28	11.43	11.28	9.31	9.27	9.23	9.17	9.31	9.11	9.60	9.30	9.28	9.76	9.40	9.72	9.74	9.16	11.37	11.38	11.16	9.42	9.24	9.34	9.54	9.54
7	ABDPB	MCB3-3000253	MCB3	3000253	10.82	10.50	10.39	10.42	10.42	10.42	10.42	10.42	11.16	11.85	11.66	9.81	10.02	9.76	9.56	9.33	9.26	9.71	9.24	10.29	9.74	9.74	9.16	11.37	12.18	11.50	9.87	9.59	9.62	9.70	9.62
7	ABDPB	BIRC3-3000255	BIRC3	3000255	12.57	12.21	11.84	12.00	12.27	11.57	10.64	10.43	10.55	9.77	9.70	10.11	9.97	10.25	10.13	9.78	10.64	11.68	9.83	11.33	11.14	Yes	9.74	12.21	11.35	11.56	9.86	10.11	10.18	11.26	11.26
7	ABDPB	MPH4D-4500205	MPH4D	4500205	10.76	10.70	10.14	12.51	12.53	12.42	10.46	10.71	10.62	9.82	10.05	9.98	9.71	9.96	9.54	10.03	10.05	9.88	9.61	10.33	10.25	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	10.09
7	ABDPB	S100A13-4500681	S100A13	4500681	10.45	10.81	11.64	11.41	11.07	11.53	11.42	11.72	11.43	9.63	9.63	9.99	9.67	9.61	9.58	9.70	8.99	10.32	10.57	10.41	10.24	Yes	9.74	10.72	11.37	11.55	9.37	9.64	9.64	9.64	
7	ABDPB	LOC100130154-2307167	LOC100130154	2307167	10.55	10.52	10.61	11.30	10.93	10.85	11.57	11.35	11.12	9.56	9.59	9.07	9.47	9.14	9.27	9.43	8.87	9.71	10.20	10.18	10.25	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	MTFN-5800260	MTFN	5800260	11.88	11.72	11.21	11.21	11.01	11.03	10.67	10.82	9.34	9.51	9.71	9.61	9.75	9.74	9.84	9.17	9.33	9.32	9.31	9.31	9.31	9.31	9.31	11.78	11.78	11.78	11.78	9.57	9.14	8.87	10.22
7	ABDPB	HSP90AB1-4830100	HSP90AB1	4830100	11.02	10.95	10.94	12.69	12.54	12.19	10.38	10.64	10.71	9.97	10.11	9.80	10.10	10.04	10.30	10.38	10.27	10.64	10.58	10.81	11.10	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	S100A13-4830105	S100A13	4830105	10.57	10.10	10.50	11.18	11.00	10.69	11.17	11.12	11.33	9.40	9.51	11.88	9.60	9.56	9.19	9.22	8.70	9.95	10.57	10.31	10.13	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	BIRC3-3000255	BIRC3	3000255	12.57	12.21	11.84	12.00	12.27	11.57	10.64	10.43	10.55	9.77	9.70	10.11	9.97	10.25	10.13	9.78	10.64	11.68	9.83	11.33	11.14	Yes	9.74	12.21	11.35	11.56	9.86	10.11	10.18	11.26	11.26
7	ABDPB	MPH4D-4500205	MPH4D	4500205	10.76	10.70	10.14	12.51	12.53	12.42	10.46	10.71	10.62	9.82	10.05	9.98	9.71	9.96	9.54	10.03	10.05	9.88	9.61	10.33	10.25	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	S100A13-4500681	S100A13	4500681	10.45	10.81	11.64	11.41	11.07	11.53	11.42	11.72	11.43	9.63	9.63	9.99	9.67	9.61	9.58	9.70	8.99	10.32	10.57	10.41	10.24	Yes	9.74	10.72	11.37	11.55	9.37	9.64	9.64	9.64	
7	ABDPB	LOC100130154-2307167	LOC100130154	2307167	10.55	10.52	10.61	11.30	10.93	10.85	11.57	11.35	11.12	9.56	9.59	9.07	9.47	9.14	9.27	9.43	8.87	9.71	10.20	10.18	10.25	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	MTFN-5800260	MTFN	5800260	11.88	11.72	11.21	11.21	11.01	11.03	10.67	10.82	9.34	9.51	9.71	9.61	9.75	9.74	9.84	9.17	9.33	9.32	9.31	9.31	9.31	9.31	9.31	11.78	11.78	11.78	11.78	9.57	9.14	8.87	10.22
7	ABDPB	HSP90AB1-4830100	HSP90AB1	4830100	11.02	10.95	10.94	12.69	12.54	12.19	10.38	10.64	10.71	9.97	10.11	9.80	10.10	10.04	10.30	10.38	10.27	10.64	10.58	10.81	11.10	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	S100A13-4830105	S100A13	4830105	10.57	10.10	10.50	11.18	11.00	10.69	11.17	11.12	11.33	9.40	9.51	11.88	9.60	9.56	9.19	9.22	8.70	9.95	10.57	10.31	10.13	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	FXV05-7385646	FXV05	7385646	12.10	11.80	12.35	11.13	10.64	10.72	11.13	10.41	11.27	10.43	9.84	10.19	9.60	10.28	9.40	10.16	11.94	12.12	12.37	12.20	12.10	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	CD19-7215136	CD19	7215136	11.56	11.77	11.85	11.35	11.54	11.68	10.32	10.72	11.02	10.86	9.82	10.35	9.87	9.74	9.57	10.14	10.83	10.28	9.24	10.57	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09		
7	ABDPB	MYH6-6201336	MYH6	6201336	11.82	11.65	11.25	11.43	11.83	10.73	11.24	11.20	10.09	10.24	9.52	9.70	9.81	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	11.67	11.67	11.67	11.67	9.57	9.14	8.87	10.22
7	ABDPB	LOC46681-4511073	LOC46681	4511073	9.6110673	10.57	11.21	11.10	11.88	11.99	11.97	11.04	11.11	10.96	9.67	10.40	9.87	10.01	9.62	9.94	10.12	10.12	10.00	10.37	10.63	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	CYP19A1-6100768	CYP19A1	6100768	11.54	11.23	11.69	10.53	10.48	10.32	10.27	10.84	10.89	9.55	9.91	9.62	9.42	9.43	9.50	9.43	9.29	9.89	9.93	9.94	9.84	9.74	9.16	11.48	10.45	11.06	9.92	9.41	9.77	10.09	
7	ABDPB	LOC100131609-1710192	LOC100131609	1710192	10.43	10.98	10.88	11.78	11.54	11.63	10.71	11.08	10.99	9.44	9.56	9.57	9.84	10.21	9.41	10.16	9.77	9.88	10.07	9.99	10.30	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09	
7	ABDPB	CYP19A1-6100768	CYP19A1	6100768	11.54	11.23	11.69	10.53	10.48	10.32	10.27	10.84	10.89	9.55	9.91	9.62	9.42	9.43	9.50	9.43	9.29	9.89	9.93	9.94	9.84	9.74	9.16	11.48	10.45	11.06	9.92	9.41	9.77	10.09	
7	ABDPB	LOC278843-2900187	LOC278843	2900187	11.65	11.51	11.00	11.49	10.72	11.53	11.42	10.98	9.44	9.56	9.57	9.84	10.21	9.41	10.16	9.77	9.88	10.07	9.99	10.30	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09		
7	ABDPB	LOC278843-2900187	LOC278843	2900187	11.65	11.51	11.00	11.49	10.72	11.53	11.42	10.98	9.44	9.56	9.57	9.84	10.21	9.41	10.16	9.77	9.88	10.07	9.99	10.30	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09		
7	ABDPB	LOC278843-2900187	LOC278843	2900187	11.65	11.51	11.00	11.49	10.72	11.53	11.42	10.98	9.44	9.56	9.57	9.84	10.21	9.41	10.16	9.77	9.88	10.07	9.99	10.30	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09		
7	ABDPB	LOC278843-2900187	LOC278843	2900187	11.65	11.51	11.00	11.49	10.72	11.53	11.42	10.98	9.44	9.56	9.57	9.84	10.21	9.41	10.16	9.77	9.88	10.07	9.99	10.30	9.74	9.16	10.69	12.49	10.61	9.95	9.83	9.87	10.09		
7	ABDPB	LOC278843-2900187	LOC278843	2900187	11.65	11.51	11.00	11.49	10.72	11.53	11.42	10.98	9.44	9.56	9.57	9.84	10.21	9.41	10.16	9.77	9.88	10.07													

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17	PC	LAMC1-4120086	LAMC1	4120086	8.88	9.42	9.19	7.84	7.91	8.02	8.45	9.02	8.82	9.17	9.15	9.29	8.98	8.62	9.10	9.56	9.58	8.16	8.51	8.84	8.78	ANA	ANA	9.16	7.93	8.76	9.30	9.30	9.41	8.57
18	PC	FCRL4-1866485	FCRL4	1866485	9.04	9.61	8.81	8.04	8.22	7.87	8.38	8.72	8.99	9.25	9.09	9.47	9.02	9.61	9.35	8.93	9.71	8.84	9.15	9.20	9.40	ANA	ANA	9.05	8.04	8.70	9.27	9.31	9.33	9.40
19	PC	DNAH2-2836385	DNAH2	2836385	9.12	9.61	8.82	8.06	8.22	7.87	8.38	8.72	8.99	9.25	9.09	9.47	9.02	9.61	9.35	8.93	9.71	8.84	9.15	9.20	9.40	ANA	ANA	9.05	8.04	8.70	9.27	9.31	9.33	9.40
20	PC	UBA7-2850202	UBA7	2850202	9.80	9.87	10.01	8.87	9.50	8.37	8.74	8.83	8.95	8.85	9.78	9.48	9.81	9.05	8.61	9.05	8.11	10.31	9.52	9.33	9.26	ANA	ANA	9.05	8.04	8.70	9.27	9.31	9.33	9.40
21	PC	TTIC4-4274023	TTIC4	4274023	9.09	10.28	9.70	8.56	8.81	8.28	9.14	8.89	8.82	9.15	8.77	9.45	9.76	9.31	9.78	9.35	9.55	10.09	9.50	9.59	8.55	ANA	ANA	9.01	8.49	8.95	8.12	9.63	9.56	9.52
22	PC	SPR3B-2650343	SPR3B	2650343	9.17	8.80	8.43	8.38	8.20	8.39	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	ANA	ANA	9.17	8.80	8.43	8.38	8.20	8.39	8.38
23	PC	BR3-4270095	BR3	4270095	8.78	9.06	8.95	9.41	9.06	8.98	8.84	8.34	8.17	9.34	9.93	9.35	9.99	9.50	9.79	9.68	9.86	9.50	9.57	9.86	9.67	ANA	ANA	10.01	9.28	8.86	9.74	9.75	9.78	9.81
24	ABCP	ZWNT-2000474	ZWNT	2000474	9.68	9.74	9.68	9.74	9.68	9.74	9.68	9.74	9.68	9.74	9.68	9.74	9.68	9.74	9.68	9.74	9.68	9.74	9.68	9.74	9.68	ANA	ANA	9.68	9.74	9.68	9.74	9.68	9.74	9.68
25	ABCP	CENPA-2600392	CENPA	2600392	7.30	7.30	7.25	9.47	9.39	9.57	9.22	9.55	9.47	7.60	8.07	7.77	7.41	7.43	7.33	7.54	7.41	7.41	7.67	7.80	7.43	ANA	ANA	7.29	9.48	9.58	7.81	7.42	7.42	7.58
26	ABCP	NUF2-2000458	NUF2	2000458	7.70	7.52	7.50	9.49	9.49	9.52	9.93	9.69	9.25	7.52	7.55	7.91	7.46	7.51	7.51	7.32	7.41	7.33	7.42	7.82	7.52	ANA	ANA	7.52	9.48	9.58	7.81	7.42	7.42	7.58
27	ABCP	PLK4-3190470	PLK4	3190470	7.39	7.39	7.39	9.65	9.61	9.33	9.37	9.64	9.50	7.73	7.51	7.66	7.41	7.37	7.38	7.44	7.58	7.31	8.12	7.88	7.38	ANA	ANA	7.59	9.66	9.51	7.63	7.48	7.47	7.70
28	ABCP	BUB1B-108047	BUB1B	108047	7.54	7.54	7.41	9.71	9.63	9.43	8.81	8.40	9.48	7.57	7.64	7.96	7.44	7.42	7.75	7.60	7.44	7.50	7.53	8.46	7.48	ANA	ANA	7.54	9.66	9.51	7.63	7.48	7.47	7.70
29	ABCP	CCDC2-2760803	CCDC2	2760803	7.51	7.36	7.34	9.63	9.62	9.47	9.55	9.36	9.21	7.48	7.65	7.50	7.44	7.47	7.44	7.68	7.47	7.53	7.71	7.70	7.33	ANA	ANA	7.40	9.67	9.57	7.54	7.45	7.53	7.57
30	ABCP	MCMD9-2701811	MCMD9	2701811	7.42	7.45	7.38	9.74	9.63	9.72	8.98	9.19	8.83	7.49	7.50	7.44	7.40	7.56	7.44	7.50	7.56	7.42	7.52	8.30	7.61	ANA	ANA	7.54	9.68	9.58	7.54	7.45	7.54	7.57
31	ABCP	HJURP-2180367	HJURP	2180367	7.44	7.32	7.28	9.18	9.24	9.19	9.54	9.62	9.33	7.36	7.45	7.46	7.38	7.26	7.46	7.43	7.38	7.33	7.67	7.89	7.37	ANA	ANA	7.58	9.20	9.50	7.42	7.32	7.42	7.57
32	ABCP	DUT-4269342	DUT	4269342	8.07	8.10	8.06	9.78	9.56	9.77	9.15	9.08	8.67	7.27	7.49	7.44	7.36	7.37	7.50	7.44	7.50	7.54	8.26	7.79	ANA	ANA	7.58	9.20	9.50	7.42	7.32	7.42	7.57	
33	ABCP	DEPC1B-2270441	DEPC1B	2270441	7.69	7.34	7.47	9.42	9.63	9.40	9.50	9.78	9.36	7.49	7.68	7.85	7.46	7.47	7.57	7.78	7.82	7.48	7.46	7.99	7.59	ANA	ANA	7.58	9.20	9.54	7.40	7.41	7.73	7.63
34	ABCP	6270474	6270474	7.84	7.58	7.28	9.76	9.43	9.81	9.27	9.09	9.11	7.59	7.71	7.72	7.40	7.36	7.26	7.84	7.53	7.24	7.46	8.26	7.46	ANA	ANA	7.42	9.67	9.15	7.57	7.47	7.61	7.67	
35	ABCP	ORC6-4830343	ORC6	4830343	7.69	7.55	7.58	9.25	9.15	9.86	9.35	9.49	9.42	7.42	7.53	7.53	7.40	7.40	7.47	7.54	7.62	7.49	7.56	7.77	7.61	ANA	ANA	7.51	9.42	9.42	7.49	7.54	7.61	7.64
36	ABCP	LOC83820-3404024	LOC83820	3404024	7.54	7.50	7.53	9.63	9.86	9.50	9.13	9.30	8.89	7.51	7.50	7.44	7.52	7.52	7.43	7.32	7.73	7.48	7.83	7.48	ANA	ANA	7.56	9.66	9.11	7.59	7.52	7.58	7.63	
37	ABCP	TPK2-6290308	TPK2	6290308	7.35	7.49	7.48	9.64	9.78	9.37	9.14	9.23	9.01	7.66	7.87	7.78	7.45	7.39	7.41	7.63	7.43	7.51	7.61	7.85	7.39	ANA	ANA	7.44	9.59	9.13	7.77	7.42	7.49	7.54
38	ABCP	MLK1-2340392	MLK1	2340392	7.42	7.49	7.48	9.57	9.55	9.44	9.19	9.40	9.42	7.84	7.81	7.90	7.57	7.31	7.39	7.57	7.71	7.77	7.80	7.97	7.55	ANA	ANA	7.46	9.59	9.13	7.77	7.42	7.49	7.54
39	ABCP	CENPH-4500040	CENPH	4500040	7.71	7.54	7.53	9.33	9.52	8.81	9.04	9.04	8.18	7.46	7.37	7.30	7.38	7.29	7.73	7.49	7.38	7.36	8.19	8.08	7.31	ANA	ANA	7.63	9.41	8.43	7.91	7.34	7.54	7.54
40	ABCP	CDC34-3450408	CDC34	3450408	7.81	7.69	7.87	9.85	9.49	9.47	9.03	8.81	8.73	7.57	7.52	7.53	7.20	7.42	7.34	7.56	7.46	7.55	7.87	8.01	7.54	ANA	ANA	7.79	9.60	8.89	7.54	7.51	7.59	7.87
41	ABCP	LOC72885-6560201	LOC72885	6560201	7.45	7.27	7.78	9.51	9.51	9.20	9.13	9.09	8.83	7.40	7.36	7.50	7.42	7.32	7.46	7.53	7.44	7.44	7.62	7.77	8.46	ANA	ANA	7.49	9.41	9.02	7.42	7.37	7.46	7.61
42	ABCP	POTEM1-7100392	POTEM1	7100392	8.00	8.16	8.34	9.88	10.20	9.36	8.41	8.81	8.76	7.39	7.49	7.55	7.82	7.44	7.28	8.08	7.52	7.49	8.31	8.13	7.98	ANA	ANA	7.57	9.81	8.66	7.48	7.63	7.63	7.98
43	ABCP	KIF15-6300386	KIF15	6300386	7.46	7.66	7.71	9.40	9.74	9.34	9.65	9.29	9.09	7.58	7.70	7.89	7.60	7.54	7.50	7.68	7.47	7.57	8.01	8.45	7.96	ANA	ANA	7.57	9.41	9.05	7.72	7.67	7.62	7.94
44	ABCP	MAZL1-1785076	MAZL1	1785076	7.56	7.59	7.57	9.60	9.07	9.75	9.71	9.57	9.85	7.39	8.15	8.15	7.88	7.82	7.51	7.39	7.93	7.70	7.45	8.24	7.86	ANA	ANA	7.57	9.47	9.14	8.05	7.66	7.67	7.74
45	ABCP	BIRC5-1230682	BIRC5	1230682	7.52	7.35	7.40	9.40	9.09	9.58	9.11	8.96	9.45	8.08	7.82	7.70	7.44	7.47	7.44	7.50	7.42	7.65	8.05	7.92	7.43	ANA	ANA	7.42	9.36	9.17	7.80	7.45	7.47	7.70
46	ABCP	AKL1-160148	AKL1	160148	7.92	7.57	7.35	9.57	9.60	9.29	7.87	8.06	7.86	7.33	8.47	7.79	7.43	7.13	7.52	7.84	7.92	7.67	7.57	7.80	7.38	ANA	ANA	7.61	9.68	9.17	7.86	7.78	7.66	7.95
47	ABCP	CENPH-4500040	CENPH	4500040	7.71	7.54	7.53	9.33	9.52	8.81	9.04	9.04	8.18	7.46	7.37	7.30	7.38	7.29	7.73	7.49	7.38	7.36	8.19	8.08	7.31	ANA	ANA	7.63	9.41	8.43	7.91	7.34	7.54	7.54
48	ABCP	LOC83820-3404024	LOC83820	3404024	7.54	7.50	7.53	9.63	9.86	9.50	9.13	9.30	8.89	7.51	7.50	7.44	7.52	7.52	7.43	7.32	7.73	7.48	7.83	7.48	ANA	ANA	7.56	9.66	9.11	7.59	7.52	7.58	7.63	
49	ABCP	TPK2-6290308	TPK2	6290308	7.35	7.49	7.48	9.64	9.78	9.37	9.14	9.23	9.01	7.66	7.87	7.78	7.45	7.39	7.41	7.63	7.43	7.51	7.61	7.85	7.39	ANA	ANA	7.44	9.59	9.13	7.77	7.42	7.49	7.54
50	ABCP	MLK1-2340392	MLK1	2340392	7.42	7.49	7.48	9.57	9.55	9.44	9.19	9.40	9.42	7.84	7.81	7.90	7.57	7.31	7.39	7.57	7.71	7.77	7.80	7.97	7.55	ANA	ANA	7.46	9.59	9.13	7.77	7.42	7.49	7.54
51	ABCP	CENPH-4500040	CENPH	4500040	7.71	7.54	7.53	9.33	9.52	8.81	9.04	9.04	8.18	7.46	7.37	7.30	7.38	7.29	7.73	7.49	7.38	7.36	8.19	8.08	7.31	ANA	ANA	7.63	9.41	8.43	7.91	7.34	7.54	7.54
52	ABCP	CDC34-3450408	CDC34	3450408	7.81	7.69	7.87	9.85	9.49	9.47	9.03	8.81	8.73	7.57	7.52	7.53	7.20	7.42	7.34	7.56	7.46	7.55	7.87	8.01	7.54	ANA	ANA	7.79	9.60	8.89	7.54	7.51	7.59	7.87
53	ABCP	LOC72885-6560201	LOC72885	6560201	7.45	7.27	7.78	9.51	9.51	9.20	9.13	9.09	8.83	7.40	7.36	7.50	7.42	7.32	7.46	7.53	7.44	7.44	7.62	7.77	8.46	ANA	ANA	7.49	9.41	9.02	7.42	7.37	7.46	7.61
54	ABCP	POTEM1-7100392	POTEM1	7100392	8.00	8.16	8.34	9.88	10.20	9.36	8.41	8.81	8.76	7.39	7.49	7.55	7.82	7.44	7.28	8.08	7.52	7.49	8.31	8.13	7.98	ANA	ANA	7.57	9.81	8.66	7.48	7.63	7.63	7.98
55	ABCP	KIF15-6300386	KIF15	6300386	7.46	7.66	7.71	9.40	9.74	9.34	9.65	9.29	9.09	7.58	7.70	7.89	7.60	7.54	7.50	7.68	7.47	7.57	8.01	8.45	7.96	ANA	ANA	7.57	9					

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20	PC	DHR57-3900731	DHR57	3900731	10.98	10.80	11.09	10.37	10.27	10.51	10.81	10.68	10.92	11.76	11.74	12.07	10.95	12.16	12.39	12.37	12.18	11.25	11.54	11.31	11.36	AN/A	AN/A	10.89	10.39	10.81	11.86	12.11	12.31	11.37
20	PC	HEXB-3800139	HEXB	3800139	9.83	9.78	10.12	10.04	10.13	10.27	10.82	11.18	11.24	11.41	11.33	11.27	11.70	11.41	11.97	11.52	11.17	11.65	11.32	11.11	11.38	AN/A	AN/A	9.91	10.15	11.08	11.50	11.55	11.75	11.36
20	PC	LOC4384-4400094	LOC4384	4400094	10.84	10.74	11.02	10.98	9.95	9.87	9.73	9.75	10.02	10.34	10.34	10.34	10.95	10.11	11.07	11.13	10.50	11.59	11.73	11.40	11.88	AN/A	AN/A	10.40	9.30	9.96	10.81	11.09	11.41	11.36
20	PC	NC1	NC1	107150	10.43	10.34	10.45	9.29	23.3	9.88	10.07	11.02	10.18	11.41	10.92	10.54	10.95	10.11	11.07	11.13	10.50	11.59	11.73	11.40	11.88	AN/A	AN/A	10.40	9.30	9.96	10.81	11.09	11.41	11.36
20	PC	EA2F-4770000	EA2F	6770000	10.85	11.33	10.57	10.06	10.00	10.08	11.46	11.00	10.67	12.28	10.98	12.15	12.10	11.70	11.81	11.60	11.72	11.88	11.72	11.42	11.17	AN/A	AN/A	10.85	10.05	11.04	12.00	11.00	11.89	11.27
20	PC	LOC4404-4100088	LOC4404	4100088	11.64	11.08	11.09	9.86	9.16	9.87	11.08	11.01	10.98	11.06	11.06	11.06	11.06	11.14	11.02	11.41	11.02	11.41	11.02	11.17	11.81	AN/A	AN/A	10.85	10.85	11.04	12.00	11.00	11.89	11.27
20	PC	ATRVIAV-7200131	ATRVIAV	7200131	10.91	9.97	9.80	9.84	10.07	10.86	10.86	10.47	10.66	10.49	11.37	10.88	11.10	11.70	11.82	11.80	11.84	11.15	11.02	11.45	11.97	AN/A	Yes	10.80	10.63	11.04	11.32	11.59	11.82	11.98
20	PC	CLCA-3800193	CLCA	3800193	10.74	10.93	11.02	9.81	9.81	9.81	11.08	11.01	11.08	11.06	11.06	11.06	11.06	11.06	11.06	11.06	11.06	11.06	11.06	11.06	11.06	AN/A	AN/A	10.85	10.85	11.04	12.00	11.00	11.89	11.27
20	PC	ERGIC2-6600674	ERGIC2	6606674	10.29	10.27	9.76	9.47	9.36	9.38	11.00	10.50	10.25	10.10	10.35	11.26	11.35	11.35	11.16	11.39	10.77	11.47	11.06	11.04	10.38	AN/A	AN/A	11.01	11.01	11.08	11.03	11.26	11.21	10.82
20	PC	BP4-595041	BP4	595041	9.79	9.82	9.98	10.59	9.94	10.73	10.12	10.92	11.28	11.80	11.78	11.08	11.26	11.91	11.81	11.50	11.06	11.06	11.06	11.06	11.06	AN/A	AN/A	9.83	10.81	10.78	11.62	11.41	11.51	10.77
20	PC	CMTM7-2140029	CMTM7	2140029	11.29	11.80	11.60	9.91	9.84	9.89	10.24	10.79	10.77	11.69	11.88	11.15	11.61	11.74	11.29	10.29	10.96	10.97	11.03	10.66	10.40	AN/A	AN/A	11.43	9.41	10.58	11.03	11.26	11.21	10.82
20	PC	IRUK1-4400564	IRUK1	4400564	10.00	10.43	10.70	10.13	10.10	9.98	10.63	10.81	11.14	12.22	10.84	12.10	11.93	11.72	11.65	11.47	11.46	11.38	11.56	11.82	11.74	AN/A	AN/A	11.08	10.47	10.86	11.98	11.83	11.53	11.62
20	PC	COBL1-4500060	COBL1	4500060	11.26	10.88	11.10	9.25	9.35	9.45	10.10	11.08	11.44	10.89	10.17	11.28	11.74	11.14	11.58	11.38	11.28	10.80	11.38	10.81	10.40	AN/A	AN/A	11.08	11.08	11.41	11.38	10.78	11.05	10.87
20	PC	ARHGEF2-2140041	ARHGEF2	2140041	11.50	11.41	10.70	10.47	10.58	10.21	9.74	10.70	10.60	11.42	11.99	11.11	11.42	11.91	11.72	11.99	11.97	11.18	11.56	11.81	11.12	AN/A	AN/A	11.54	10.42	10.35	11.71	11.66	11.89	11.69
20	PC	PRPC-1650030	PRPC	1650030	10.06	10.38	10.43	10.32	10.43	10.38	10.88	11.15	11.05	12.02	10.15	11.81	12.02	11.01	12.07	11.88	12.05	12.21	12.61	12.61	12.61	AN/A	AN/A	11.05	11.78	11.78	11.01	11.21	11.21	10.81
20	PC	LMRBD1-2510582	LMRBD1	2510582	10.91	11.04	11.20	10.01	10.07	10.13	11.18	11.28	11.23	11.27	11.39	11.81	12.04	12.18	11.84	11.96	11.85	11.15	11.26	10.13	11.24	AN/A	AN/A	11.05	10.07	11.23	11.69	12.11	11.88	11.11
20	PC	TRNPSF1-4500035	TRNPSF1	4500035	11.34	11.39	11.44	9.77	9.81	9.54	9.95	9.77	9.90	11.09	10.95	11.01	11.02	10.95	11.27	11.08	11.24	11.41	11.65	11.21	11.64	AN/A	AN/A	11.09	9.74	9.88	10.98	11.08	11.23	10.48
20	PC	LOC1013850-3000187	LOC1013850	3000187	11.46	11.56	11.16	10.05	9.91	9.89	11.50	11.80	11.84	10.85	10.57	11.85	11.59	11.28	11.87	10.57	12.00	11.29	11.17	11.52	11.94	AN/A	AN/A	11.38	9.35	11.85	11.41	11.44	11.39	11.31
20	PC	NOUBF1-5550077	NOUBF1	5550077	10.41	10.25	10.39	10.47	10.37	10.50	11.35	11.06	11.12	11.78	12.10	11.93	11.63	12.05	11.71	11.67	11.76	11.76	11.75	11.64	11.64	AN/A	AN/A	11.08	11.08	11.19	11.94	11.69	11.80	11.72
20	PC	MRPS31-6500043	MRPS31	6500043	10.05	10.02	9.87	10.15	10.24	10.09	9.98	10.00	9.78	11.09	11.36	11.18	11.41	11.22	11.51	11.17	11.21	11.01	10.99	10.75	10.75	AN/A	AN/A	9.98	10.16	11.92	11.21	11.43	11.30	10.89
20	PC	TRF-8500133	TRF	8500133	9.86	9.86	10.45	10.81	10.75	10.15	11.10	11.02	10.45	11.10	11.72	11.55	11.30	11.77	11.18	11.82	11.74	11.40	11.39	11.24	11.49	AN/A	AN/A	9.84	10.78	10.62	11.46	11.39	11.46	11.39
20	PC	RNASEK-5670661	RNASEK	5670661	10.31	10.20	10.54	9.95	10.08	9.88	10.00	9.81	10.20	11.36	11.42	11.05	11.53	11.23	11.63	11.31	11.23	11.03	11.09	11.42	11.36	AN/A	AN/A	11.05	9.97	11.01	11.27	11.38	11.39	11.22
20	PC	ATRAD-3800035	ATRAD	3800035	9.82	10.25	10.32	9.81	9.67	9.93	10.68	10.37	10.29	11.28	11.21	11.36	11.17	11.53	11.46	11.58	11.42	11.25	11.32	11.32	11.32	AN/A	AN/A	10.16	9.80	10.44	11.28	11.17	11.45	11.39
20	PC	PRYB-7100431	PRYB	7100431	11.70	11.70	11.63	9.95	9.76	9.73	10.40	10.76	11.21	11.07	11.20	11.51	11.23	11.21	11.53	11.06	11.48	10.57	10.79	11.35	10.86	AN/A	AN/A	11.68	9.81	10.79	11.26	11.22	11.36	10.64
20	PC	MRPS4-3800787	MRPS4	3800787	9.54	9.94	10.50	10.36	10.36	10.41	10.82	10.28	11.45	11.62	11.69	11.29	11.58	11.31	11.74	11.17	11.23	11.16	11.75	11.64	11.64	AN/A	AN/A	9.89	10.39	10.32	11.43	11.38	11.31	11.31
20	PC	ITGB1-610452	ITGB1	610452	11.75	11.80	11.42	9.87	9.87	9.81	11.76	11.33	11.51	11.78	10.97	11.48	11.56	11.51	11.24	11.17	11.23	11.16	11.75	11.64	11.64	AN/A	AN/A	11.32	9.88	11.54	11.41	11.37	11.38	11.31
20	PC	PRPC-6110386	PRPC	6110386	10.11	10.39	10.50	9.29	9.27	9.56	9.62	10.06	10.13	10.83	11.16	11.18	10.93	10.94	11.22	11.02	11.07	11.31	11.88	11.37	11.88	AN/A	AN/A	10.34	9.52	9.44	11.06	10.93	11.10	11.56
20	PC	STAT2-1300119	STAT2	1300119	11.11	10.72	10.90	9.87	9.82	9.17	9.77	9.89	10.06	11.28	11.20	11.04	11.12	11.06	11.18	10.80	11.04	10.87	11.28	11.40	11.49	AN/A	AN/A	10.80	9.89	11.04	11.01	11.09	11.01	11.01
20	PC	SNRPN-1740073	SNRPN	1740073	10.29	10.40	10.55	9.49	9.60	9.90	9.94	9.94	9.88	10.97	11.21	10.94	11.01	11.29	11.21	11.36	10.99	11.22	11.15	10.95	11.16	AN/A	AN/A	11.01	9.66	9.90	11.02	11.04	11.10	11.19
20	PC	ATRAD-2650438	ATRAD	2650438	10.75	11.06	11.01	10.74	10.34	10.50	11.12	10.81	10.95	12.08	11.15	11.22	11.05	11.81	12.15	11.80	11.83	11.90	12.02	11.83	11.82	AN/A	AN/A	10.80	10.52	10.96	11.79	11.96	11.96	11.96
20	PC	ISCU-780168	ISCU	780168	11.00	11.30	11.32	10.02	9.88	10.01	11.19	10.89	10.94	11.40	11.25	11.41	11.59	11.74	11.46	11.78	11.11	11.62	11.85	11.74	11.79	AN/A	AN/A	11.21	9.97	11.00	11.52	11.66	11.58	11.77
20	PC	TCF4-5120672	TCF4	5120672	10.96	10.78	10.43	9.77	9.57	9.63	10.53	10.52	10.51	10.99	11.05	11.07	11.13	11.11	11.29	11.01	11.13	11.11	11.29	11.40	11.44	AN/A	AN/A	10.73	9.65	10.52	11.02	11.27	11.44	11.44
20	PC	TRP1-940669	TRP1	940669	9.77	10.27	10.29	9.71	9.55	9.80	10.22	10.15	10.12	11.00	11.31	10.91	10.90	11.18	11.07	11.38	11.04	11.05	11.33	11.07	11.07	AN/A	AN/A	10.11	9.69	11.10	11.08	11.04	11.09	11.03
20	PC	RNASEK-2470484	RNASEK	2470484	10.75	10.32	10.73	10.08	10.40	9.89	10.29	10.40	10.27	11.48	11.39	11.37	11.59	11.30	11.52	11.34	11.36	11.17	11.10	11.49	11.67	AN/A	AN/A	10.61	10.12	10.26	11.34	11.44	11.41	11.26
20	PC	GOLGA-4500063	GOLGA	4500063	10.31	10.40	10.33	9.85	9.85	9.85	10.34	10.34	10.34	10.34	10.34	10.34	10.34	10.34	10.34	10.34	10.34	10.34	10.34	10.34	10.34	AN/A	AN/A	10.34	10.34	10.34	10.34	10.34	10.34	10.34
20	PC	DRAP1-2990598	DRAP1	2990598	10.43	10.23	10.20	10.43	10.47	10.29	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	AN/A	AN/A	10.29	10.40					

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23	PC	EPHAB-200041	EPHAB	200041	7.50	7.61	7.83	7.66	7.72	7.73	7.76	7.75	7.91	8.54	9.11	8.77	9.09	9.14	8.84	9.07	8.93	9.98	8.88	5.98	9.61	ANU	ANU	7.65	7.70	7.81	7.84	9.11	8.95	9.01	
23	PC	MIR129-2-257030	MIR129-2	257030	7.65	7.61	7.74	7.73	7.63	7.63	7.81	7.70	7.77	9.09	8.90	8.62	9.24	9.10	9.29	8.52	8.88	8.27	9.28	8.52	9.09	ANU	ANU	7.67	7.66	7.76	7.87	9.17	8.98	9.04	
23	PC	LOC29181-420427	LOC29181	420427	7.73	7.68	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	ANU	ANU	7.73	7.68	7.81	7.81	9.17	8.98	9.04	
23	PC	LOC29181-420427	LOC29181	420427	7.73	7.68	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	ANU	ANU	7.73	7.68	7.81	7.81	9.17	8.98	9.04	
23	PC	CROF48-480038	CROF48	480038	7.59	7.62	7.57	7.74	7.64	7.73	7.90	7.72	7.81	8.32	8.85	8.66	9.00	8.88	9.02	8.85	8.99	8.59	8.90	8.57	8.85	ANU	ANU	7.59	7.71	7.81	7.81	8.95	8.94	8.98	
23	PC	TRM181-2101073	TRM181	2101073	7.72	7.68	7.61	7.62	7.61	7.62	7.78	7.61	7.62	7.62	7.78	7.61	7.62	7.78	7.61	7.62	7.78	7.61	7.62	7.78	7.61	ANU	ANU	7.72	7.68	7.61	7.62	8.95	8.94	8.98	
23	PC	ADORA1-2101101	ADORA1	2101101	7.16	7.40	7.16	7.36	7.26	7.21	7.36	7.34	7.28	8.08	8.04	8.32	8.16	8.80	8.11	8.78	8.42	7.98	7.40	7.42	8.27	ANU	ANU	7.24	7.28	7.33	7.48	8.48	8.48	8.44	
23	PC	LOC29181-420427	LOC29181	420427	7.73	7.68	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	8.81	ANU	ANU	7.73	7.68	7.81	7.81	9.17	8.98	9.04	
23	PC	BHLH41-2000220	BHLH41	2000220	7.42	7.32	7.69	7.68	7.23	7.42	7.68	7.84	7.70	8.27	8.49	8.35	8.81	8.67	9.22	9.10	8.92	8.64	8.10	8.12	8.28	ANU	ANU	7.58	7.54	7.82	8.37	8.74	9.08	8.28	
23	PC	SPR43-1190070	SPR43	1190070	7.46	7.34	7.28	7.45	7.60	7.59	7.88	7.77	7.71	8.67	9.01	8.73	9.17	8.97	8.85	8.77	8.85	8.44	8.12	10.44	10.71	ANU	ANU	7.56	7.64	7.78	8.00	8.89	8.82	9.01	
23	PC	HS311855-3420392	HS311855	3420392	7.91	7.84	7.76	7.61	7.66	7.62	7.84	7.76	7.88	8.46	9.15	8.84	9.02	8.97	8.87	8.93	8.69	9.01	8.99	8.70	8.64	ANU	ANU	7.84	7.63	7.83	9.15	9.00	8.83	8.83	
23	PC	CHAD-4800167	CHAD	4800167	7.53	7.46	7.60	7.58	7.38	7.40	7.67	7.64	7.76	8.81	8.89	8.48	8.78	8.63	9.05	8.77	8.87	8.98	8.38	8.50	8.43	ANU	ANU	7.53	7.38	7.69	8.73	8.70	8.80	8.55	
23	PC	MAL1-4800102	MAL1	4800102	7.56	7.59	7.73	7.63	7.19	6.10	8.30	7.85	8.26	8.99	8.88	8.91	9.01	8.75	9.25	8.85	9.00	8.85	8.85	8.15	8.10	ANU	ANU	7.56	7.58	7.69	8.73	8.70	8.80	8.55	
23	PC	LOC24327-4220006	LOC24327	4220006	7.66	7.77	7.69	7.56	7.65	7.65	7.87	7.71	7.78	8.61	9.25	8.97	8.85	9.27	8.59	8.88	9.09	8.46	8.54	8.45	9.16	ANU	ANU	7.70	7.62	7.79	8.94	8.86	8.85	8.65	
23	PC	LOC100121816-4800164	LOC100121816	4800164	7.42	7.60	7.65	7.52	7.61	7.61	8.09	8.13	8.13	8.78	8.80	8.91	8.74	8.80	9.07	8.68	9.37	8.62	8.75	9.02	8.81	ANU	ANU	7.60	7.62	7.79	8.94	8.86	8.85	8.65	
23	PC	TPS38P-5570201	TPS38P2	5570201	7.85	7.79	7.67	8.42	8.30	7.61	7.86	7.78	7.65	9.15	9.53	8.49	8.97	9.11	8.70	9.22	7.88	8.19	8.09	8.73	9.24	ANU	ANU	7.77	8.11	7.76	9.06	9.04	8.60	8.56	
23	PC	RC35-1400240	RC35	1400240	7.66	7.56	7.58	7.59	7.69	7.54	8.70	7.58	7.67	9.23	9.29	7.66	7.81	9.03	7.88	9.02	7.48	7.88	7.70	9.18	9.84	ANU	ANU	7.60	7.66	7.74	8.07	8.64	8.67	8.56	
23	PC	CROF562-1802220	CROF562	1802220	7.70	7.59	7.65	7.64	7.58	7.62	8.00	7.62	7.76	9.16	9.13	8.92	8.67	8.95	8.86	8.81	8.64	8.65	8.47	8.33	9.17	ANU	ANU	7.61	7.65	7.81	9.07	8.81	8.84	8.66	
23	PC	LOC100121816-4800164	LOC100121816	4800164	7.42	7.60	7.65	7.52	7.61	7.61	8.09	8.13	8.13	8.78	8.80	8.91	8.74	8.80	9.07	8.68	9.37	8.62	8.75	9.02	8.81	ANU	ANU	7.60	7.62	7.79	8.94	8.86	8.85	8.65	
23	PC	HS32367-1110050	HS32367	1110050	7.79	7.69	7.65	7.58	7.60	7.64	7.86	7.75	7.82	9.23	9.14	8.70	8.81	8.89	9.21	8.89	8.82	9.17	9.03	8.86	8.82	ANU	ANU	7.73	7.60	7.85	8.93	8.85	8.87	8.55	
23	PC	EPN44-1780278	EPN44	1780278	7.81	7.73	7.79	7.71	7.69	7.67	7.88	7.82	7.83	8.93	9.18	8.90	8.81	9.08	8.79	9.03	8.99	8.49	8.57	8.65	9.16	ANU	ANU	7.87	7.73	7.75	9.00	9.16	8.87	8.89	
23	PC	LOC48608-4800164	LOC48608	4800164	7.42	7.60	7.65	7.52	7.61	7.61	8.09	8.13	8.13	8.78	8.80	8.91	8.74	8.80	9.07	8.68	9.37	8.62	8.75	9.02	8.81	ANU	ANU	7.60	7.62	7.79	8.94	8.86	8.85	8.65	
23	PC	FRS1-1030079	FRS1	1030079	7.59	7.74	7.70	7.78	7.62	7.78	7.93	7.81	7.88	9.17	9.11	8.87	9.15	8.81	8.96	8.78	8.97	9.08	9.23	8.62	9.16	ANU	ANU	7.61	7.73	7.87	9.05	8.98	8.90	8.94	
23	PC	ST52A12-7160292	ST52A12	7160292	7.64	7.77	7.75	7.66	7.71	7.61	7.80	8.03	8.16	8.99	9.30	9.14	8.75	9.05	8.82	8.84	8.63	8.63	8.61	8.69	8.95	ANU	ANU	7.72	7.66	8.00	9.14	8.90	8.86	8.69	
23	PC	HS571622-4210440	HS571622	4210440	7.67	7.68	7.67	7.68	7.67	7.67	7.83	7.54	7.69	7.79	8.32	9.16	8.96	8.64	8.92	8.49	8.96	9.14	8.74	8.27	8.47	9.54	ANU	ANU	7.68	7.71	7.87	8.81	8.78	8.86	8.75
23	PC	HS34462-4500280	HS34462	4500280	7.56	7.74	7.78	7.67	7.68	7.79	7.70	7.70	7.71	9.05	9.00	8.68	9.07	8.80	9.14	8.82	8.81	9.27	9.04	8.63	9.11	ANU	ANU	7.70	7.65	7.79	8.93	8.79	8.79	8.91	
23	PC	HS34462-4500280	HS34462	4500280	7.56	7.74	7.78	7.67	7.68	7.79	7.70	7.70	7.71	9.05	9.00	8.68	9.07	8.80	9.14	8.82	8.81	9.27	9.04	8.63	9.11	ANU	ANU	7.70	7.65	7.79	8.93	8.79	8.79	8.91	
23	PC	HS34462-4500280	HS34462	4500280	7.56	7.74	7.78	7.67	7.68	7.79	7.70	7.70	7.71	9.05	9.00	8.68	9.07	8.80	9.14	8.82	8.81	9.27	9.04	8.63	9.11	ANU	ANU	7.70	7.65	7.79	8.93	8.79	8.79	8.91	
23	PC	HS34462-4500280	HS34462	4500280	7.56	7.74	7.78	7.67	7.68	7.79	7.70	7.70	7.71	9.05	9.00	8.68	9.07	8.80	9.14	8.82	8.81	9.27	9.04	8.63	9.11	ANU	ANU	7.70	7.65	7.79	8.93	8.79	8.79	8.91	
23	PC	HS34462-4500280	HS34462	4500280	7.56	7.74	7.78	7.67	7.68	7.79	7.70	7.70	7.71	9.05	9.00	8.68	9.07	8.80	9.14	8.82	8.81	9.27	9.04	8.63	9.11	ANU	ANU	7.70	7.65	7.79	8.93	8.79	8.79	8.91	
23	PC	PHF1-7610273	PHF1	7610273	8.39	8.50	8.24	7.73	7.81	7.81	7.88	7.87	7.88	9.11	9.33	8.76	9.28	9.16	9.04	9.22	9.00	8.77	8.74	8.62	9.73	ANU	ANU	8.37	7.72	7.87	9.07	9.22	9.09	9.01	
23	PC	LOC10013568-2000767	LOC10013568	2000767	7.77	7.69	7.58	8.06	8.02	7.79	7.71	7.43	9.02	9.27	8.32	8.74	9.14	8.88	8.58	8.16	7.88	8.38	8.54	9.33	ANU	ANU	7.81	7.64	7.84	8.87	9.03	8.57	8.53		
23	PC	ZSWM4-3870603	ZSWM4	3870603	7.43	7.61	7.71	7.74	7.76	7.81	7.81	7.81	7.81	8.84	9.29	9.03	8.46	8.92	8.46	8.67	9.03	8.62	8.40	8.31	9.56	ANU	ANU	7.58	7.67	7.73	9.05	8.69	8.72	8.83	
23	PC	QNR1-4800164	QNR1	4800164	7.48	7.12	8.07	7.51	7.65	7.46	7.65	7.68	7.68	9.18	9.11	8.71	8.34	9.44	8.86	8.64	9.07	8.67	9.50	10.47	9.10	10.60	ANU	ANU	7.68	7.64	7.78	9.15	8.82	8.82	8.82
23	PC	ATP181-420348	ATP181	420348	7.74	7.64	7.76	7.64	7.58	7.60	7.90	7.80	7.89	8.32	8.98	8.52	8.84	8.95	9.04	9.24	9.07	8.78	9.20	8.40	9.56	ANU	ANU	7.71	7.60	7.73	8.81	8.84	8.72	8.80	
23	PC	QNR42-4800379	QNR42	4800379	7.74	7.64	7.76	7.64	7.58	7.60	7.90	7.80	7.89	8.32	8.98	8.52	8.84	8.95	9.04	9.24	9.07	8.78	9.20	8.40	9.56	ANU	ANU	7.71	7.60	7.73	8.81	8.84	8.72	8.80	
23	PC	UGT1A3-2940082	UGT1A3	2940082	7.48	7.60	7.64	7.60	7.56	7.62	8.04	7.76	7.79	9.08	9.72	8.62	9.05	8.82	8.90	8.78	8.84	8.97	8.80	8.28	9.91	ANU	ANU	7.58	7.59	7.87	8.80	8.93	8.84	8.74	
23	PC	LG4S18-3420392	LG4S18	3420392	7.57	7.54	7.72	7.62	7.55	7.60	7.87	7.63	7.79	9.11	8.83	8.83	8.96	8.81	8.95	8.82	8.67	9.14	8.96	8.40	9.25	ANU	ANU	7.61	7.59	7.76	8.82	8.88	8.81	8.84	
23	PC	EMC913-4800164</																																	

24	BABDPB	GDD-518038	GDD	618038	12.00	11.99	12.10	12.99	13.26	12.97	11.82	12.11	11.98	11.15	11.42	11.57	11.46	11.38	11.51	11.56	11.75	11.28	11.20	11.34	11.27	11.40	ANA	ANA
24	BABDPB	LOC20943-4800747	LOC20943	6200747	12.74	12.86	12.54	12.78	13.05	12.70	12.75	13.09	12.16	11.94	12.90	11.42	11.22	12.96	11.79	12.78	11.37	12.02	12.34	12.27	12.38	12.78	ANA	ANA
24	BABDPB	LOC15945	LOC15945	6200747	11.98	12.07	11.98	12.07	12.08	12.07	12.08	12.07	12.08	12.07	12.08	12.07	12.08	12.07	12.08	12.07	12.08	12.07	12.08	12.07	12.08	12.07	ANA	ANA
24	BABDPB	LOC72926-230709	LOC72926	230709	12.51	12.55	12.88	12.84	12.72	12.47	12.57	12.46	11.65	11.61	11.85	11.67	11.84	11.55	11.67	11.72	12.06	11.58	11.54	11.60	11.64	11.71	ANA	ANA
24	BABDPB	NCKS31-488045	NCKS31	488045	12.37	12.38	12.00	12.06	12.07	12.75	12.72	12.81	12.73	11.35	12.00	12.30	11.57	11.83	11.58	11.77	11.87	12.00	11.58	11.71	11.74	ANA	ANA	
24	BABDPB	LOC246031	LOC246031	6200747	12.38	12.40	12.41	12.42	12.43	12.44	12.45	12.46	12.47	12.48	12.49	12.50	12.51	12.52	12.53	12.54	12.55	12.56	12.57	12.58	12.59	12.60	ANA	ANA
24	BABDPB	RPL12-7550448	RPL12	7550448	12.45	12.37	13.00	12.78	13.29	12.94	12.44	12.44	12.44	11.75	11.91	12.30	11.57	11.83	11.58	11.75	11.75	12.40	12.30	12.37	12.78	ANA	ANA	
24	BABDPB	LOC439653	LOC439653	3890360	11.68	11.52	11.15	11.02	11.28	12.84	12.84	12.84	12.84	11.45	11.48	11.47	11.57	11.56	11.42	11.56	11.42	11.56	11.42	11.56	11.42	ANA	ANA	
24	BABDPB	HMB1P1-3890252	HMB1P1	3890252	11.61	11.34	11.10	12.57	12.33	12.38	12.88	12.38	12.50	11.38	11.08	11.19	11.66	11.20	11.59	11.47	11.21	11.61	11.38	11.33	11.31	ANA	ANA	
24	BABDPB	LOC29471-51040	LOC29471	51040	11.33	11.47	11.10	12.70	12.80	12.56	12.88	12.84	12.86	11.90	11.48	11.87	11.71	11.41	11.90	11.37	11.50	11.53	11.57	11.74	11.79	11.54	ANA	ANA
24	BABDPB	LOC48471-3390170	LOC48471	3390170	12.69	12.97	12.94	12.96	13.08	13.21	12.41	12.35	12.50	11.85	11.26	11.98	11.58	11.67	11.82	11.96	11.72	12.42	12.68	12.58	12.60	ANA	ANA	
24	ABCPB	FABP9P-260358	FABP9P	260358	9.75	9.19	9.26	13.33	13.32	13.38	11.88	11.09	11.50	8.73	9.41	9.29	8.66	8.62	8.59	8.83	8.67	8.72	9.10	9.89	9.15	ANA	ANA	
24	ABCPB	TUBA1A	TUBA1A	4460277	9.38	8.83	8.56	11.21	12.22	11.63	11.10	11.00	9.32	9.70	9.27	8.82	8.07	8.56	8.98	9.00	8.85	9.28	9.34	9.17	9.82	ANA	ANA	
24	ABCPB	MCMT-1470195	MCMT	1470195	10.26	10.31	10.30	12.22	12.08	11.84	10.85	11.47	11.48	9.10	9.65	9.32	8.99	9.24	8.86	9.13	9.04	9.08	10.35	10.47	9.52	ANA	ANA	
24	ABCPB	MTFDE-6200559	MTFDE	6200559	8.40	8.81	7.84	11.44	11.75	11.05	10.61	10.55	10.62	9.78	10.07	10.72	11.15	10.46	10.30	9.81	10.13	9.25	9.15	9.15	9.15	ANA	ANA	
24	ABCPB	LOC644746-7202096	LOC644746	7202096	9.80	8.47	9.51	12.49	12.49	12.23	10.92	10.97	10.79	9.46	9.25	9.48	9.59	9.72	9.61	9.38	9.79	9.44	10.20	10.12	9.93	ANA	ANA	
24	ABCPB	RPM1-2850175	RPM1	2850175	10.08	9.59	9.53	12.60	12.67	12.03	11.44	11.85	11.62	9.46	9.55	9.72	9.56	9.49	9.63	9.50	9.59	9.85	10.20	9.92	ANA	ANA		
24	ABCPB	LOC72888-2600086	LOC72888	2600086	9.39	8.60	10.09	12.19	12.29	12.06	10.86	11.36	11.25	9.30	9.80	9.79	9.83	9.71	9.09	9.59	9.69	9.41	9.79	10.03	10.02	ANA	ANA	
24	ABCPB	S100A6-3260270	S100A6	3260270	9.70	9.48	10.08	11.11	11.63	11.26	11.18	11.38	12.06	9.56	9.72	10.00	9.56	9.09	9.29	9.39	9.49	9.63	10.51	10.60	ANA	ANA		
24	ABCPB	LOC1012656-520427	LOC1012656	520427	9.97	9.82	9.92	11.88	12.11	12.12	11.09	10.83	10.85	9.00	9.46	9.33	9.44	9.08	9.32	9.16	9.30	9.91	9.80	9.63	ANA	ANA		
24	ABCPB	CK32-400048	CK32	400048	8.70	7.86	8.20	11.37	11.32	11.58	10.99	10.80	10.37	9.72	10.43	9.67	10.27	9.97	10.30	10.88	10.78	9.75	8.62	9.51	8.92	ANA	ANA	
24	ABCPB	PTTG1-1510291	PTTG1	1510291	8.51	8.22	8.27	11.10	11.34	11.29	11.10	11.34	11.21	9.97	10.44	9.60	9.81	9.86	9.86	10.22	9.42	9.53	9.72	10.26	9.93	ANA	ANA	
24	ABCPB	WARS-3710068	WARS	3710068	8.93	8.65	7.98	11.10	12.20	11.05	10.43	10.69	10.88	10.53	10.70	10.40	10.30	10.76	10.57	10.29	10.58	9.73	9.82	10.62	ANA	ANA		
24	ABCPB	TUBA1C-4100073	TUBA1C	4100073	9.40	9.29	9.29	12.12	12.03	12.35	10.87	11.27	11.27	8.89	10.44	9.69	9.70	9.83	9.79	9.99	9.69	10.43	11.22	11.09	11.03	ANA	ANA	
24	ABCPB	LOC434041-7100376	LOC434041	7100376	8.85	8.64	9.65	12.41	12.23	12.38	10.84	10.98	10.81	9.75	9.72	9.97	10.13	10.03	9.91	9.89	10.57	10.45	10.38	10.38	ANA	ANA		
24	ABCPB	PQDM1-340593	PQDM1	340593	8.75	8.14	8.65	11.79	11.82	11.40	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	10.72	ANA	ANA	
24	ABCPB	GPBP2-1940162	GPBP2	1940162	8.11	8.01	8.09	11.52	11.05	10.85	10.67	10.83	10.53	9.37	9.74	9.32	9.31	9.75	8.98	9.29	9.31	9.66	10.43	10.30	9.62	ANA	ANA	
24	ABCPB	FEN1-3370703	FEN1	3370703	9.10	8.54	8.66	11.46	11.40	11.31	10.83	11.01	11.12	9.77	10.13	9.92	9.80	9.77	9.60	9.70	9.70	9.48	9.82	10.33	10.00	ANA	ANA	
24	ABCPB	PRDX3-6200200	PRDX3	6200200	9.17	8.56	9.16	11.75	11.78	11.71	11.17	11.11	11.16	10.48	10.58	10.81	10.64	10.38	10.68	10.42	9.95	9.37	9.34	9.43	9.86	ANA	ANA	
24	ABCPB	LOC732007-48130446	LOC732007	48130446	8.41	8.47	8.77	12.10	12.14	11.35	10.99	10.42	10.30	9.95	10.16	10.03	10.31	9.98	9.86	10.12	9.84	8.18	8.61	8.99	8.95	ANA	ANA	
24	ABCPB	BLH4E0-2600735	BLH4E0	2600735	9.38	8.93	9.12	12.30	12.30	12.30	12.30	12.30	12.30	9.36	9.78	10.49	9.84	10.10	9.78	10.14	10.12	10.52	10.56	9.27	9.33	ANA	ANA	
24	ABCPB	HSPB1-110110	HSPB1	110110	9.30	9.25	9.71	11.10	12.14	12.28	10.84	10.93	10.54	9.98	10.38	9.45	10.20	9.51	9.66	10.15	10.13	9.56	10.01	10.01	8.95	ANA	ANA	
24	ABCPB	HMB1-1400286	HMB1	1400286	9.27	8.79	9.22	11.77	11.13	10.12	10.41	10.25	10.41	9.84	9.95	9.30	9.73	9.72	9.51	9.43	9.53	9.68	9.63	9.23	9.69	ANA	ANA	
24	ABCPB	LOC63305-4800770	LOC63305	4800770	10.29	10.40	10.82	10.62	10.82	11.95	11.48	11.41	11.45	10.58	9.98	10.00	9.85	9.84	9.46	10.01	9.91	9.38	9.65	10.20	9.90	ANA	ANA	
24	ABCPB	LOC43897-2510022	LOC43897	2510022	9.78	9.88	10.00	11.58	11.58	11.11	11.08	10.32	9.47	9.68	9.24	9.52	9.18	9.36	9.45	9.14	9.05	9.52	9.71	9.12	9.12	ANA	ANA	
24	ABCPB	BOA1-4800073	BOA1	4800073	9.82	9.79	8.82	11.55	11.55	11.55	11.55	11.55	11.55	9.82	9.79	8.82	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	ANA	ANA	
24	ABCPB	PRDX3-6200200	PRDX3	6200200	9.52	9.02	8.85	11.37	11.43	11.34	10.93	10.88	10.84	10.28	10.10	10.33	10.47	10.13	10.03	10.25	9.46	9.23	9.41	9.41	9.41	ANA	ANA	
24	ABCPB	LOC732007-48130446	LOC732007	48130446	8.41	8.47	8.77	12.10	12.14	11.35	10.99	10.42	10.30	9.95	10.16	10.03	10.31	9.98	9.86	10.12	9.84	8.18	8.61	8.99	8.95	ANA	ANA	
24	ABCPB	HSPB1-110110	HSPB1	110110	9.30	9.25	9.71	11.10	12.14	12.28	10.84	10.93	10.54	9.98	10.38	9.45	10.20	9.51	9.66	10.15	10.13	9.56	10.01	10.01	8.95	ANA	ANA	
24	ABCPB	HMB1-1400286	HMB1	1400286	9.27	8.79	9.22	11.77	11.13	10.12	10.41	10.25	10.41	9.84	9.95	9.30	9.73	9.72	9.51	9.43	9.53	9.68	9.63	9.23	9.69	ANA	ANA	
24	ABCPB	LOC63305-4800770	LOC63305	4800770	10.29	10.40	10.82	10.62	10.82	11.95	11.48	11.41	11.45	10.58	9.98	10.00	9.85	9.84	9.46	10.01	9.91	9.38	9.65	10.20	9.90	ANA	ANA	
24	ABCPB	LOC43897-2510022	LOC43897	2510022	9.78	9.88	10.00	11.58	11.58	11.11	11.08	10.32	9.47	9.68	9.24	9.52	9.18	9.36	9.45	9.14	9.05	9.52	9.71	9.12	9.12	ANA	ANA	
24	ABCPB	BOA1-4800073	BOA1	4800073	9.82	9.79	8.82	11.55	11.55	11.55	11.55	11.55	11.55	9.82	9.79	8.82	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	ANA	ANA	
24	ABCPB	PRDX3-6200200	PRDX3	6200200	9.52	9.02	8.85	11.37	11.43	11.34	10.93	10.88	10.84	10.28	10.10	10.33	10.47	10.13	10.03	10.25	9.46	9.23	9.41	9.41	9.41	ANA	ANA	
24	ABCPB	LOC732007-48130446	LOC732007	48130446	8.41	8.47	8.77	12.10	12.14	11.35	10.99	10.42	10.30	9.95	10.16	10.03	10.31	9.98	9.86	10.12	9.84	8.18	8.61	8.99	8.95	ANA	ANA	
24	ABCPB	HSPB1-110110	HSPB1	110110	9.30	9.25	9.71	11.10	12.14	12.28	1																	

26	B	RNTSK-2603719	RNTSK	2603719	10.07	10.19	9.94	8.97	9.47	8.96	10.75	10.15	10.30	8.83	8.91	9.14	8.80	8.89	8.80	8.98	8.94	10.70	10.26	10.25	10.19	Yes	PNIA	10.07	9.13	10.41	9.29	8.84	8.91	10.37	
26	B	SELL-040258	SELL	040258	9.91	10.77	10.83	9.26	10.14	9.78	9.67	10.47	10.62	9.02	9.73	9.18	8.81	9.41	8.81	9.42	9.16	7.97	7.97	7.99	7.48	PNIA	Yes	10.08	9.73	10.25	9.31	9.16	9.13	7.90	
26	B	LC01017980	LC017980	7980	440307	10.10	10.52	10.61	10.08	10.17	10.19	10.17	10.17	9.37	9.08	9.10	9.46	9.09	9.39	9.08	10.76	10.07	10.08	10.58	PNIA	Yes	11.02	10.49	10.72	10.08	9.47	9.15	10.61		
26	B	LDH-10028	LDH	10028	10.22	10.64	10.81	10.78	10.62	10.85	10.62	10.85	9.55	9.45	9.52	9.44	9.05	9.24	9.05	9.16	9.28	9.17	9.09	9.09	PNIA	Yes	11.00	10.22	10.58	9.48	9.27	9.15	10.10		
26	B	OSBPL-340339	OSBPL	340339	340339	10.83	10.40	10.57	9.74	9.72	9.35	9.67	9.69	9.76	9.78	8.74	9.41	9.73	9.25	9.37	8.52	8.52	8.50	8.31	8.94	8.20	PNIA	Yes	10.60	9.67	9.70	8.97	8.99	9.05	8.63
26	B	R4M8-1740487	R4M8	1740487	1740487	10.85	10.73	10.85	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	PNIA	Yes	10.77	10.07	9.99	9.99	9.99	9.99	9.99	
26	B	PNR2-360280	PNR2	360280	10.83	10.33	10.83	10.41	10.56	10.14	10.09	10.08	10.11	9.28	8.85	9.05	9.28	9.36	9.25	9.16	9.29	8.67	8.65	8.81	8.25	PNIA	Yes	10.60	9.67	9.70	8.97	8.99	9.05	8.63	
26	B	LC044666	LC044666	4666	100300	10.79	10.96	10.96	10.39	10.64	9.80	9.52	9.44	9.37	9.76	9.71	9.31	9.43	9.08	9.12	10.19	10.24	10.24	9.83	PNIA	Yes	10.77	10.01	9.99	9.19	9.51	9.32	10.10		
26	B	MED30-123052	MED30	123052	123052	10.21	10.12	10.19	10.41	10.24	10.46	9.65	9.37	9.51	8.96	9.17	9.08	8.84	8.93	8.75	8.89	8.65	8.73	9.44	9.16	8.62	PNIA	Yes	10.17	10.38	9.51	9.07	8.89	8.76	9.99
26	B	LC01018410-490242	LC018410	490242	10.31	10.39	10.92	10.96	10.96	10.88	10.84	9.76	9.70	9.30	9.31	9.46	9.69	9.39	9.39	9.49	9.49	9.49	9.49	9.49	9.49	PNIA	Yes	10.17	11.08	10.43	9.49	9.49	9.49	9.49	
26	B	ARHAP25-380148	ARHAP25	380148	11.35	10.48	10.92	10.25	9.87	10.03	9.29	9.28	9.59	9.37	9.42	9.15	9.30	9.42	9.46	9.50	9.00	9.00	9.43	9.03	PNIA	Yes	10.92	10.05	9.26	9.46	9.23	9.46	9.13		
26	B	LC046231-300408	LC046231	300408	11.17	10.86	10.26	10.44	10.23	10.19	10.97	10.40	9.69	9.60	9.75	9.79	10.06	9.52	10.12	9.53	9.14	10.32	10.04	10.35	9.83	PNIA	Yes	10.79	10.29	10.35	9.38	9.79	9.60	10.13	
26	B	LC01013158-260002	LC013158	260002	11.40	11.11	10.49	10.29	9.80	10.89	9.50	9.44	9.56	8.66	9.38	9.89	8.82	10.24	9.87	9.40	10.38	10.42	10.50	9.88	PNIA	Yes	11.00	10.22	10.08	9.44	9.85	9.77	10.30		
26	B	SHKRP1-340059	SHKRP1	340059	10.67	10.99	10.80	10.44	10.23	10.30	9.33	9.27	9.33	9.22	9.02	9.16	9.34	9.18	9.63	9.38	9.28	9.94	10.09	9.42	9.83	PNIA	Yes	10.69	10.29	10.35	9.38	9.13	9.26	9.43	
26	B	LC01013819-276719	LC013819	276719	10.14	10.08	10.10	10.06	10.82	10.52	9.59	10.35	10.63	9.32	9.55	9.06	9.18	9.23	9.23	9.22	9.14	9.32	9.67	9.02	PNIA	Yes	10.12	10.80	10.32	9.46	9.22	9.25	10.25		
26	B	USP1-117069	USP1	117069	9.90	9.78	9.93	10.09	10.73	10.04	10.25	10.15	10.03	8.98	8.53	9.06	8.59	9.06	8.91	8.68	9.11	8.53	8.80	9.31	8.23	PNIA	Yes	9.87	10.05	10.14	8.86	8.82	8.90	8.62	
26	B	LC01013261-488507	LC013261	488507	11.52	10.93	11.13	10.62	10.37	10.29	10.19	10.16	10.20	9.81	9.15	9.54	9.71	9.37	9.59	9.55	9.64	9.86	9.59	9.37	8.82	PNIA	Yes	10.13	10.82	10.18	9.54	9.54	9.53	10.02	
26	B	LC044843-372021	LC044843	372021	10.61	10.36	9.94	10.07	9.75	9.58	10.17	9.54	9.16	9.22	9.41	8.80	9.11	9.04	9.43	9.23	8.88	9.83	10.08	10.04	9.12	PNIA	Yes	10.30	9.80	9.62	9.01	9.08	9.02	9.77	
26	B	EY2A-435224	EY2A	435224	10.90	9.65	10.12	9.77	10.70	9.77	10.10	10.92	9.84	9.19	9.42	9.56	9.49	9.47	9.20	9.30	9.49	9.78	9.73	9.28	9.40	PNIA	Yes	10.09	9.75	10.89	9.57	9.48	9.23	9.72	
26	B	KDM3-1180246	KDM3	1180246	10.82	10.32	10.82	9.89	10.16	9.71	9.86	9.75	9.72	9.42	9.35	9.12	9.29	9.29	9.44	9.49	9.82	9.22	8.97	9.25	PNIA	Yes	10.88	9.85	9.52	9.38	9.41	9.09	10.86		
26	B	TCG10G1-4720276	TCG10G1	4720276	11.00	10.10	11.06	10.82	10.63	10.42	10.60	10.25	10.31	9.77	9.25	9.27	9.66	9.31	9.19	9.31	9.39	91.66	10.69	11.00	10.54	Yes	PNIA	10.66	10.50	10.30	9.43	9.48	9.49	10.89	
26	B	USP1-117069	USP1	117069	9.90	9.78	9.93	10.09	10.73	10.04	10.25	10.15	10.03	8.98	8.53	9.06	8.59	9.06	8.91	8.68	9.11	8.53	8.80	9.31	8.23	PNIA	Yes	9.87	10.05	10.14	8.86	8.82	8.90	8.62	
26	B	LC01013261-488507	LC013261	488507	11.52	10.93	11.13	10.62	10.37	10.29	10.19	10.16	10.20	9.81	9.15	9.54	9.71	9.37	9.59	9.55	9.64	9.86	9.59	9.37	8.82	PNIA	Yes	10.13	10.82	10.18	9.54	9.54	9.53	10.02	
26	B	LC044843-372021	LC044843	372021	10.61	10.36	9.94	10.07	9.75	9.58	10.17	9.54	9.16	9.22	9.41	8.80	9.11	9.04	9.43	9.23	8.88	9.83	10.08	10.04	9.12	PNIA	Yes	10.30	9.80	9.62	9.01	9.08	9.02	9.77	
26	B	LC01012686-6602730	LC012686	6602730	11.17	10.17	11.05	10.34	9.99	10.52	10.59	10.21	9.80	9.79	9.60	9.17	9.68	9.58	9.98	9.77	11.13	10.49	10.48	10.20	9.25	PNIA	Yes	10.79	10.12	10.23	9.52	9.77	9.63	10.32	
26	B	XPO1-360023	XPO1	360023	11.01	10.63	10.54	10.88	10.83	10.59	10.33	10.45	10.25	9.63	9.04	9.48	9.36	9.54	9.59	9.63	9.90	9.48	9.25	9.46	9.08	PNIA	Yes	10.73	10.76	10.34	9.38	9.50	9.71	9.32	
26	B	KDM3-1180246	KDM3	1180246	10.82	10.32	10.82	9.89	10.16	9.71	9.86	9.75	9.72	9.42	9.35	9.12	9.29	9.29	9.44	9.49	9.82	9.22	8.97	9.25	PNIA	Yes	10.88	9.85	9.52	9.38	9.41	9.09	10.86		
26	B	TCG10G1-4720276	TCG10G1	4720276	11.00	10.10	11.06	10.82	10.63	10.42	10.60	10.25	10.31	9.77	9.25	9.27	9.66	9.31	9.19	9.31	9.39	91.66	10.69	11.00	10.54	Yes	PNIA	10.66	10.50	10.30	9.43	9.48	9.49	10.89	
26	B	USP1-117069	USP1	117069	9.90	9.78	9.93	10.09	10.73	10.04	10.25	10.15	10.03	8.98	8.53	9.06	8.59	9.06	8.91	8.68	9.11	8.53	8.80	9.31	8.23	PNIA	Yes	9.87	10.05	10.14	8.86	8.82	8.90	8.62	
26	B	LC01013261-488507	LC013261	488507	11.52	10.93	11.13	10.62	10.37	10.29	10.19	10.16	10.20	9.81	9.15	9.54	9.71	9.37	9.59	9.55	9.64	9.86	9.59	9.37	8.82	PNIA	Yes	10.13	10.82	10.18	9.54	9.54	9.53	10.02	
26	B	LC044843-372021	LC044843	372021	10.61	10.36	9.94	10.07	9.75	9.58	10.17	9.54	9.16	9.22	9.41	8.80	9.11	9.04	9.43	9.23	8.88	9.83	10.08	10.04	9.12	PNIA	Yes	10.30	9.80	9.62	9.01	9.08	9.02	9.77	
26	B	LC01012686-6602730	LC012686	6602730	11.17	10.17	11.05	10.34	9.99	10.52	10.59	10.21	9.80	9.79	9.60	9.17	9.68	9.58	9.98	9.77	11.13	10.49	10.48	10.20	9.25	PNIA	Yes	10.79	10.12	10.23	9.52	9.77	9.63	10.32	
26	B	XPO1-360023	XPO1	360023	11.01	10.63	10.54	10.88	10.83	10.59	10.33	10.45	10.25	9.63	9.04	9.48	9.36	9.54	9.59	9.63	9.90	9.48	9.25	9.46	9.08	PNIA	Yes	10.73	10.76	10.34	9.38	9.50	9.71	9.32	
26	B	KDM3-1180246	KDM3	1180246	10.82	10.32	10.82	9.89	10.16	9.71	9.86	9.75	9.72	9.42	9.35	9.12	9.29	9.29	9.44	9.49	9.82	9.22	8.97	9.25	PNIA	Yes	10.88	9.85	9.52	9.38	9.41	9.09	10.86		
26	B	TCG10G1-4720276	TCG10G1	4720276	11.00	10.10	11.06	10.82	10.63	10.42	10.60	10.25	10.31	9.77	9.25	9.27	9.66	9.31	9.19	9.31	9.39	91.66	10.69	11.00	10.54	Yes	PNIA	10.66	10.50	10.30	9.43	9.48	9.49	10.89	
26	B	USP1-117069	USP1	117069	9.90	9.78	9.93	10.09	10.73	10.04	10.25	10.15	10.03	8.98	8.53	9.06	8.59	9.06	8.91	8.68	9.11	8.53	8.80	9.31	8.23	PNIA	Yes	9.87	10.05	10.14	8.86	8.82	8.90	8.62	
26	B	LC01013261-488507	LC013261	488507	11.52	10.93	11.13	10.62	10.37	10.29	10.19	10.16	10.20	9.81	9.15	9.54	9.71	9.37	9.59	9.55	9.64	9.86	9.59	9.37	8.82	PNIA	Yes	10.13	10.82	10.18	9.54	9.54	9.53	10.02	
26	B	LC044843-372021	LC044843	372021	10.61	10.36	9.94	10.07	9.75	9.58	10.17	9.54	9.16	9.22	9.41	8.80	9.11																		

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31	BPC	RP523-360070	RP523	360070	10.95	11.40	11.66	9.98	9.47	10.14	9.25	9.58	10.21	9.45	10.08	10.22	9.92	10.08	9.88	10.47	10.98	10.27	9.99	10.12	10.12	ANA	ANA	ANA	11.34	9.67	9.68	9.82	10.00	10.31	10.12
31	BPC	GOLGAMB-590671	GOLGAMB	590671	11.68	11.27	11.14	10.09	9.62	9.44	10.22	9.99	10.55	10.41	8.95	10.44	10.66	10.16	10.13	9.49	10.41	11.36	10.88	11.07	10.56	ANA	ANA	ANA	11.30	9.72	10.25	9.93	10.01	10.97	
31	BPC	HAUS2	HAUS2	440051	11.47	11.42	11.35	10.61	9.88	9.44	10.22	9.99	10.55	10.41	8.95	10.44	10.66	10.16	10.13	9.49	10.41	11.36	10.88	11.07	10.56	ANA	ANA	ANA	11.30	9.72	10.25	9.93	10.01	10.97	
31	BPC	ATM	ATM	640005	11.43	11.29	11.46	10.48	9.62	9.44	10.22	10.02	10.11	10.18	10.79	10.27	11.12	10.44	10.33	9.88	10.27	11.12	10.44	10.33	9.88	ANA	ANA	ANA	11.29	9.75	10.07	10.17	10.76	10.72	
31	BPC	FBI011-210427	FBI011	210427	11.06	10.91	10.82	10.93	9.28	8.83	9.70	9.75	9.64	9.96	9.35	10.23	10.19	10.23	10.09	10.06	10.60	10.03	9.76	9.25	9.09	ANA	ANA	ANA	11.06	9.94	9.69	9.85	10.21	10.35	
31	BPC	GP386A	GP386A	640286	11.35	11.40	11.35	9.93	9.18	9.88	9.82	9.82	9.82	9.82	9.82	10.24	10.24	10.24	10.24	9.88	10.24	9.47	10.24	9.47	9.41	ANA	ANA	ANA	11.35	9.81	9.81	9.81	9.81	9.81	
31	BPC	SLCAAS-503036	SLCAAS	503036	11.49	11.22	10.50	9.24	9.21	9.11	9.91	9.68	9.79	10.21	9.35	9.85	10.28	10.45	10.37	9.87	10.33	11.28	10.60	10.21	10.37	ANA	ANA	ANA	11.06	9.19	9.79	9.89	10.36	10.25	
31	BPC	MOGA4	MOGA4	640056	11.75	11.75	11.75	10.83	9.90	9.88	10.54	10.28	10.43	10.13	10.29	10.10	10.23	10.37	10.13	10.47	10.24	10.66	9.80	9.62	9.84	ANA	ANA	ANA	11.64	10.16	10.16	10.16	10.16	10.16	
31	BPC	VHL-2490176	VHL	2490176	11.59	11.57	11.18	9.68	9.93	9.71	10.56	10.65	10.33	9.85	10.02	9.66	10.11	9.94	10.08	10.06	9.81	10.54	10.17	10.09	10.29	ANA	ANA	ANA	11.45	9.78	10.11	9.84	10.02	9.99	
31	BPC	FQD3-720171	FQD3	720171	11.75	11.75	11.66	10.16	9.90	9.96	10.54	10.10	10.34	10.11	10.29	10.10	10.27	10.14	10.66	10.11	10.34	10.26	10.29	10.27	10.14	ANA	ANA	ANA	11.75	10.39	10.29	10.17	10.16	10.39	
31	BPC	FNBP4-7650291	FNBP4	7650291	11.41	11.11	11.13	9.91	10.08	9.49	9.54	9.93	9.85	9.85	9.16	9.99	9.83	9.67	9.97	10.06	10.10	10.11	10.01	10.36	9.99	ANA	ANA	ANA	11.48	9.78	10.31	9.89	10.02	9.99	
31	BPC	PNR9-158204	PNR9	158204	10.97	11.51	11.33	9.93	9.85	9.34	10.05	10.13	10.15	10.38	9.57	10.25	10.33	10.47	10.37	9.77	10.56	10.45	10.35	10.32	9.85	ANA	ANA	ANA	11.27	9.57	10.11	10.07	10.40	10.23	
31	BPC	BCLAP1-4760209	BCLAP1	4760209	11.01	11.12	10.63	9.87	9.29	9.68	10.06	10.55	10.53	10.53	9.89	9.50	10.34	9.86	10.62	9.22	9.41	10.97	10.77	10.10	10.58	ANA	ANA	ANA	11.02	9.61	10.49	9.84	10.29	9.44	
31	BPC	CHQ9-1710474	CHQ9	1710474	10.89	10.83	10.54	9.11	9.34	8.95	9.59	10.03	9.67	9.73	9.89	10.55	9.48	10.55	10.45	10.58	10.36	10.46	10.45	10.37	10.10	ANA	ANA	ANA	11.27	9.75	9.76	9.99	10.11	10.23	
31	BPC	WASH1-7280026	WASH1	7280026	10.74	10.68	10.97	9.31	9.05	9.22	9.39	9.31	9.67	10.02	10.01	10.05	10.33	10.22	10.17	10.25	11.01	10.65	10.63	10.57	ANA	ANA	ANA	10.74	9.82	10.06	10.38	10.26	10.38		
31	BPC	REEPS-520324	REEPS	520324	11.21	10.63	10.84	9.34	9.13	9.15	9.82	9.92	9.97	10.10	9.69	10.39	9.86	10.49	10.34	10.27	10.35	10.95	10.27	9.87	9.94	ANA	ANA	ANA	11.28	9.61	10.59	10.03	10.18	10.39	
31	BPC	TTQ-290343	TTQ	290343	11.04	11.20	11.21	9.53	9.78	9.51	10.33	10.57	10.26	9.96	9.59	10.52	9.91	10.32	10.26	9.97	10.32	10.95	10.11	10.43	10.17	ANA	ANA	ANA	11.08	9.64	10.29	10.02	10.12	10.21	
31	BPC	CHP11-226900	CHP11	226900	11.21	11.58	11.22	10.06	9.91	10.36	9.97	9.85	10.27	9.90	9.62	10.06	9.94	9.76	9.70	9.40	10.09	9.85	10.29	9.96	9.66	ANA	ANA	ANA	11.29	10.11	10.03	9.86	9.85	9.73	
31	BPC	IAA1151-7510424	IAA1151	7510424	11.26	11.58	11.47	9.83	9.72	9.59	10.31	10.01	10.27	9.86	10.08	10.52	10.25	10.41	10.63	9.96	10.31	9.29	9.77	10.14	10.53	ANA	ANA	ANA	11.26	9.71	10.20	10.14	10.35	10.29	
31	BPC	HS-13484-476054	HS-13484	476054	11.28	11.20	11.52	9.77	9.62	10.14	10.58	9.52	10.45	9.64	9.76	10.39	9.96	10.19	10.12	10.04	10.23	9.19	9.00	9.66	9.80	ANA	ANA	ANA	11.23	9.91	10.32	9.93	10.48	10.13	
31	BPC	SP110-134091	SP110	134091	11.64	11.72	11.65	10.77	10.52	10.28	9.53	10.02	9.84	10.64	10.65	10.03	10.59	10.71	10.54	10.86	10.03	9.25	9.08	8.86	9.43	ANA	ANA	ANA	11.67	10.52	9.95	10.74	10.65	10.67	
31	BPC	CLK1-4320382	CLK1	4320382	10.88	11.47	10.57	9.37	9.37	9.43	10.22	9.91	9.75	10.27	9.43	10.10	10.39	9.92	9.76	10.22	10.05	10.98	11.42	10.19	10.98	ANA	ANA	ANA	10.87	9.46	9.86	10.16	10.01	10.09	
31	BPC	CLECL1-4370414	CLECL1	4370414	10.70	9.87	10.28	11.16	10.94	11.31	10.58	9.76	10.18	8.99	7.96	7.93	7.98	7.81	8.18	8.36	8.04	8.98	8.97	9.46	9.20	ANA	ANA	ANA	10.22	11.13	10.17	7.94	7.90	8.19	
31	BPC	RP541-4670204	RP541	4670204	10.34	9.15	9.14	10.98	10.56	10.78	9.96	9.53	9.39	9.57	9.01	9.31	9.18	9.36	8.36	8.12	9.42	9.36	9.21	9.49	9.36	ANA	ANA	ANA	9.61	9.62	9.76	9.27	9.26	9.26	
31	BPC	TPM3-340692	TPM3	340692	9.88	9.68	10.08	10.56	10.59	10.61	9.47	9.53	10.03	8.02	8.16	9.05	8.66	7.50	8.14	8.30	8.16	9.04	8.57	9.38	9.75	ANA	ANA	ANA	10.22	11.13	10.17	7.94	7.90	8.19	
31	BPC	PPYP-2360432	PPYP	2360432	9.86	9.48	9.58	10.08	10.56	10.79	9.14	9.49	9.41	8.20	8.36	8.78	7.70	7.87	7.68	8.24	7.91	8.16	8.16	8.22	9.75	ANA	ANA	ANA	9.84	9.55	9.42	8.84	8.32	8.34	
31	BPC	LOC33381-4750470	LOC33381	4750470	9.48	9.42	9.68	10.34	10.47	8.88	9.11	9.34	1.76	8.02	8.47	8.82	7.96	8.03	8.15	8.15	8.37	8.62	8.81	8.98	ANA	ANA	ANA	9.44	10.08	9.67	8.08	8.14	8.11		
31	BPC	RECOL-3890750	RECOL	3890750	9.94	9.96	10.19	10.13	10.28	10.43	9.81	9.84	9.90	8.37	7.91	8.44	8.44	8.22	8.47	8.15	8.75	8.04	8.34	7.90	7.48	ANA	ANA	ANA	10.03	10.31	9.86	8.31	8.32	8.46	
31	BPC	MRPL1-1100161	MRPL1	1100161	9.86	9.27	9.84	10.24	10.18	10.77	9.67	9.46	9.08	8.03	8.47	8.14	7.98	7.99	8.25	8.30	8.25	8.02	8.11	8.96	8.77	ANA	ANA	ANA	9.10	10.48	9.26	8.46	8.21	7.90	
31	BPC	LOC1013277-1850634	LOC1013277	1850634	10.04	9.21	9.66	10.01	10.28	10.62	9.74	8.20	9.25	8.99	7.62	8.45	8.43	7.81	8.62	7.83	8.79	9.47	9.30	8.67	8.13	ANA	ANA	ANA	10.04	10.31	9.86	8.22	8.12	8.48	
31	BPC	MRPL1-4670204	MRPL1	4670204	9.34	9.15	9.14	10.98	10.56	10.78	9.96	9.53	9.39	9.57	9.01	9.31	9.18	9.36	8.36	8.12	9.42	9.36	9.21	9.49	9.36	ANA	ANA	ANA	9.61	9.62	9.76	9.27	9.26	9.26	
31	BPC	LOC42057-3610475	LOC42057	3610475	10.18	10.10	10.20	9.98	9.78	10.07	10.47	9.21	8.76	7.4	8.59	7.90	7.29	8.39	8.78	7.97	9.07	9.02	9.31	9.32	9.32	ANA	ANA	ANA	9.83	10.08	9.48	9.37	8.84	8.45	
31	BPC	MDP11-4580121	MDP11	4580121	9.24	9.77	9.85	9.88	9.97	8.55	9.00	9.03	7.69	8.18	8.60	7.90	8.22	7.58	8.16	8.16	8.65	7.75	7.44	8.15	7.41	ANA	ANA	ANA	9.02	9.95	8.86	8.16	8.06	8.17	
31	BPC	LOC42059-1047024	LOC42059	1047024	10.14	10.11	10.14	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	9.84	ANA	ANA	ANA	9.84	9.84	9.84	9.84	9.84	9.84	
31	BPC	IFNGR1-2470568	IFNGR1	2470568	9.72	9.74	9.97	10.82	10.88	10.78	9.04	9.22	9.51	8.79	7.96	8.70	8.57	8.73	9.08	8.81	8.98	8.51	8.99	8.85	8.90	ANA	ANA	ANA	9.81	10.82	9.26	8.48	8.85	8.86	
31	BPC	LOC1013277-1850634	LOC1013277	1850634	10.04	9.21	9.66	10.01	10.28	10.62	9.74	8.20	9.25	8.99	7.62	8.45	8.43	7.81	8.62	7.83	8.79	9.47	9.30	8.67	8.13	ANA	ANA	ANA	10.04	10.31	9.86	8.22	8.12	8.48	
31	BPC	LACTB-1570669	LACTB	1570669	8.83	8.96	9.44	10.41	10.64	10.40	8.47	8.34	8.83	8.36	8.30	8.60	8.35	8.58	8.44	8.17	8.36	8.46	9.40	8.73	8.89	ANA	ANA	ANA	9.08	10.82	9.26	8.48	8.85	8.86	
31	BPC	LOC1013277-1850634	LOC1013277	1850634	10.04	9.21	9.66	10.01	10.28	10.62	9.74	8.20	9.25	8.99	7.62	8.45	8.43	7.81	8.62	7.83	8.79	9.47	9.30	8.67	8.13	ANA	ANA</								

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37	PC	ADAM-230103	ADAM	230103	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9	47.0	47.1	47.2	47.3	47.4	47.5	47.6	47.7	47.8	47.9	48.0	48.1	48.2	48.3	48.4	48.5	48.6	48.7	48.8	48.9	49.0	49.1	49.2	49.3	49.4	49.5	49.6	49.7	49.8	49.9	50.0	50.1	50.2	50.3	50.4	50.5	50.6	50.7	50.8	50.9	51.0	51.1	51.2	51.3	51.4	51.5	51.6	51.7	51.8	51.9	52.0	52.1	52.2	52.3	52.4	52.5	52.6	52.7	52.8	52.9	53.0	53.1	53.2	53.3	53.4	53.5	53.6	53.7	53.8	53.9	54.0	54.1	54.2	54.3	54.4	54.5	54.6	54.7	54.8	54.9	55.0	55.1	55.2	55.3	55.4	55.5	55.6	55.7	55.8	55.9	56.0	56.1	56.2	56.3	56.4	56.5	56.6	56.7	56.8	56.9	57.0	57.1	57.2	57.3	57.4	57.5	57.6	57.7	57.8	57.9	58.0	58.1	58.2	58.3	58.4	58.5	58.6	58.7	58.8	58.9	59.0	59.1	59.2	59.3	59.4	59.5	59.6	59.7	59.8	59.9	60.0	60.1	60.2	60.3	60.4	60.5	60.6	60.7	60.8	60.9	61.0	61.1	61.2	61.3	61.4	61.5	61.6	61.7	61.8	61.9	62.0	62.1	62.2	62.3	62.4	62.5	62.6	62.7	62.8	62.9	63.0	63.1	63.2	63.3	63.4	63.5	63.6	63.7	63.8	63.9	64.0	64.1	64.2	64.3	64.4	64.5	64.6	64.7	64.8	64.9	65.0	65.1	65.2	65.3	65.4	65.5	65.6	65.7	65.8	65.9	66.0	66.1	66.2	66.3	66.4	66.5	66.6	66.7	66.8	66.9	67.0	67.1	67.2	67.3	67.4	67.5	67.6	67.7	67.8	67.9	68.0	68.1	68.2	68.3	68.4	68.5	68.6	68.7	68.8	68.9	69.0	69.1	69.2	69.3	69.4	69.5	69.6	69.7	69.8	69.9	70.0	70.1	70.2	70.3	70.4	70.5	70.6	70.7	70.8	70.9	71.0	71.1	71.2	71.3	71.4	71.5	71.6	71.7	71.8	71.9	72.0	72.1	72.2	72.3	72.4	72.5	72.6	72.7	72.8	72.9	73.0	73.1	73.2	73.3	73.4	73.5	73.6	73.7	73.8	73.9	74.0	74.1	74.2	74.3	74.4	74.5	74.6	74.7	74.8	74.9	75.0	75.1	75.2	75.3	75.4	75.5	75.6	75.7	75.8	75.9	76.0	76.1	76.2	76.3	76.4	76.5	76.6	76.7	76.8	76.9	77.0	77.1	77.2	77.3	77.4	77.5	77.6	77.7	77.8	77.9	78.0	78.1	78.2	78.3	78.4	78.5	78.6	78.7	78.8	78.9	79.0	79.1	79.2	79.3	79.4	79.5	79.6	79.7	79.8	79.9	80.0	80.1	80.2	80.3	80.4	80.5	80.6	80.7	80.8	80.9	81.0	81.1	81.2	81.3	81.4	81.5	81.6	81.7	81.8	81.9	82.0	82.1	82.2	82.3	82.4	82.5	82.6	82.7	82.8	82.9	83.0	83.1	83.2	83.3	83.4	83.5	83.6	83.7	83.8	83.9	84.0	84.1	84.2	84.3	84.4	84.5	84.6	84.7	84.8	84.9	85.0	85.1	85.2	85.3	85.4	85.5	85.6	85.7	85.8	85.9	86.0	86.1	86.2	86.3	86.4	86.5	86.6	86.7	86.8	86.9	87.0	87.1	87.2	87.3	87.4	87.5	87.6	87.7	87.8	87.9	88.0	88.1	88.2	88.3	88.4	88.5	88.6	88.7	88.8	88.9	89.0	89.1	89.2	89.3	89.4	89.5	89.6	89.7	89.8	89.9	90.0	90.1	90.2	90.3	90.4	90.5	90.6	90.7	90.8	90.9	91.0	91.1	91.2	91.3	91.4	91.5	91.6	91.7	91.8	91.9	92.0	92.1	92.2	92.3	92.4	92.5	92.6	92.7	92.8	92.9	93.0	93.1	93.2	93.3	93.4	93.5	93.6	93.7	93.8	93.9	94.0	94.1	94.2	94.3	94.4	94.5	94.6	94.7	94.8	94.9	95.0	95.1	95.2	95.3	95.4	95.5	95.6	95.7	95.8	95.9	96.0	96.1	96.2	96.3	96.4	96.5	96.6	96.7	96.8	96.9	97.0	97.1	97.2	97.3	97.4	97.5	97.6	97.7	97.8	97.9	98.0	98.1	98.2	98.3	98.4	98.5	98.6	98.7	98.8	98.9	99.0	99.1	99.2	99.3	99.4	99.5	99.6	99.7	99.8	99.9	100.0	100.1	100.2	100.3	100.4	100.5	100.6	100.7	100.8	100.9	101.0	101.1	101.2	101.3	101.4	101.5	101.6	101.7	101.8	101.9	102.0	102.1	102.2	102.3	102.4	102.5	102.6	102.7	102.8	102.9	103.0	103.1	103.2	103.3	103.4	103.5	103.6	103.7	103.8	103.9	104.0	104.1	104.2	104.3	104.4	104.5	104.6	104.7	104.8	104.9	105.0	105.1	105.2	105.3	105.4	105.5	105.6	105.7	105.8	105.9	106.0	106.1	106.2	106.3	106.4	106.5	106.6	106.7	106.8	106.9	107.0	107.1	107.2	107.3	107.4	107.5	107.6	107.7	107.8	107.9	108.0	108.1	108.2	108.3	108.4	108.5	108.6	108.7	108.8	108.9	109.0	109.1	109.2	109.3	109.4	109.5	109.6	109.7	109.8	109.9	110.0	110.1	110.2	110.3	110.4	110.5	110.6	110.7	110.8	110.9	111.0	111.1	111.2	111.3	111.4	111.5	111.6	111.7	111.8	111.9	112.0	112.1	112.2	112.3	112.4	112.5	112.6	112.7	112.8	112.9	113.0	113.1	113.2	113.3	113.4	113.5	113.6	113.7	113.8	113.9	114.0	114.1	114.2	114.3	114.4	114.5	114.6	114.7	114.8	114.9	115.0	115.1	115.2	115.3	115.4	115.5	115.6	115.7	115.8	115.9	116.0	116.1	116.2	116.3	116.4	116.5	116.6	116.7	116.8	116.9	117.0	117.1	117.2	117.3	117.4	117.5	117.6	117.7	117.8	117.9	118.0	118.1	118.2	118.3	118.4	118.5	118.6	118.7	118.8	118.9	119.0	119.1	119.2	119.3	119.4	119.5	119.6	119.7	119.8	119.9	120.0	120.1	120.2	120.3	120.4	120.5	120.6	120.7	120.8	120.9	121.0	121.1	121.2	121.3	121.4	121.5	121.6	121.7	121.8	121.9	122.0	122.1	122.2	122.3	122.4	122.5	122.6	122.7	122.8	122.9	123.0	123.1	123.2	123.3	123.4	123.5	123.6	123.7	123.8	123.9	124.0	124.1	124.2	124.3	124.4	124.5	124.6	124.7	124.8	124.9	125.0	125.1	125.2	125.3	125.4	125.5	125.6	125.7	125.8	125.9	126.0	126.1	126.2	126.3	126.4	126.5	126.6	126.7	126.8	126.9	127.0	127.1	127.2	127.3	127.4	127.5	127.6	127.7	127.8	127.9	128.0	128.1	128.2	128.3	128.4	128.5	128.6	128.7	128.8	128.9	129.0	129.1	129.2	129.3	129.4	129.5	129.6	129.7	129.8	129.9	130.0	130.1	130.2	130.3	130.4	130.5	130.6	130.7	130.8	130.9	131.0	131.1	131.2	131.3	131.4	131.5	131.6	131.7	131.8	131.9	132.0	132.1	132.2	132.3	132.4	132.5	132.6	132.7	132.8	132.9	133.0	133.1	133.2	133.3	133.4	133.5	133.6	133.7	133.8	133.9	134.0	134.1	134.2	134.3	134.4	134.5	134.6	134.7	134.8	134.9	135.0	135.1	135.2	135.3	135.4	135.5	135.6	135.7	135.8	135.9	136.0	136.1	136.2	136.3	136.4	136.5	136.6	136.7	136.8	136.9	137.0	137.1	137.2	137.3	137.4	137.5	137.6	137.7	137.8	137.9	138.0	138.1	138.2	138.3	138.4	138.5	138.6	138.7	138.8	138.9	139.0	139.1	139.2	139.3	139.4	139.5	139.6	139.7	139.8	139.9	140.0	140.1	140.2	140.3	140.4	140.5	140.6	140.7	140.8	140.9	141.0	141.1	141.2	141.
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9.24	8.81	9.15	10.17	10.28	10.13	10.05
8.93	9.18	8.88	9.83	10.06	9.92	10.01
8.71	9.44	9.44	10.10	10.27	10.17	9.83
8.86	9.51	9.58	10.40	10.45	10.25	10.26
8.92	9.62	9.60	10.45	10.55	10.35	10.30
8.73	9.07	10.06	9.91	10.07	10.13	9.75
8.81	8.82	9.49	9.76	9.76	10.20	9.75
8.51	9.01	9.54	9.86	9.99	10.03	9.68
9.00	9.23	9.60	9.88	10.41	10.45	9.84
8.81	9.19	9.57	10.23	10.13	10.13	10.51
9.09	9.20	9.27	10.17	10.24	10.42	9.57
9.16	8.53	9.16	9.88	9.84	9.84	9.50
9.22	8.55	9.25	10.09	9.98	9.83	10.56
9.34	9.50	10.29	9.50	9.52	9.45	9.45
8.52	9.08	9.42	10.09	9.76	9.82	9.94
11.15	9.75	10.44	13.87	12.69	13.37	10.37
10.87	8.33	10.48	12.08	12.63	12.84	11.43
10.78	8.19	12.26	12.19	12.25	12.65	11.45
10.20	9.00	10.51	12.18	12.53	13.15	12.33
10.24	10.16	11.56	13.71	13.63	13.59	13.44
10.23	10.70	11.60	13.71	13.43	13.73	13.68
10.53	10.22	12.17	13.97	13.52	13.56	11.91
10.53	9.38	11.52	12.69	12.69	12.91	12.04
10.11	9.60	11.11	11.78	12.52	12.65	12.39
10.68	9.75	11.32	13.21	12.82	12.74	12.89
11.08	11.08	12.21	12.74	13.15	13.15	11.33
10.03	9.97	12.33	12.73	12.81	12.65	12.12
10.10	10.30	10.43	13.19	12.82	13.05	12.65
10.10	10.82	11.21	13.28	13.47	13.17	11.16
9.81	11.40	12.59	12.47	12.60	12.60	11.40
10.35	11.40	10.62	12.71	12.71	12.88	10.45
10.50	10.77	12.78	12.25	12.26	12.61	10.80
9.84	10.48	11.97	12.63	12.32	12.28	11.99
10.38	10.04	10.53	12.18	12.48	12.60	12.89
10.42	10.52	10.83	12.75	12.39	12.74	12.88
10.25	10.21	11.31	12.68	12.56	12.25	12.66
10.58	11.38	11.10	13.28	12.81	12.75	12.67
10.26	10.60	11.50	12.81	12.59	12.63	12.04
10.71	10.84	11.65	12.84	12.83	12.74	11.45
10.93	11.30	10.19	12.80	12.52	12.51	11.33
10.81	11.29	12.83	12.60	12.60	12.56	12.15
10.07	10.41	11.65	12.42	12.17	12.11	11.34
11.36	10.80	11.36	12.46	13.17	12.87	12.44
10.25	10.15	10.87	12.08	12.22	12.22	12.22
10.74	11.22	12.42	13.03	12.81	12.77	12.33
10.17	10.37	11.03	12.29	12.10	12.15	12.11
11.44	10.61	11.15	12.38	12.22	12.14	11.59
10.54	10.54	11.01	12.81	12.61	12.61	10.55
10.85	10.65	11.80	12.69	12.56	12.50	12.04
10.85	10.85	12.32	12.64	12.55	12.45	12.48
10.68	10.49	11.68	12.39	12.41	12.43	11.99
10.38	10.45	11.30	12.74	12.39	12.33	12.56
11.21	10.60	10.73	12.38	12.31	12.41	10.86
10.79	11.28	12.38	12.81	12.77	12.55	12.27
10.50	11.00	11.28	12.51	12.44	12.28	11.84
10.26	11.04	11.24	12.33	12.13	12.00	11.54
11.82	10.52	11.64	12.65	12.55	12.45	12.48
10.49	11.36	11.63	12.42	12.29	12.28	11.89
10.89	11.83	12.07	12.56	12.52	12.52	11.82
11.52	11.39	11.74	12.99	12.76	12.67	12.07
11.81	10.92	12.51	12.62	12.69	12.58	11.39
10.79	10.42	11.60	11.41	12.15	12.28	11.39
10.94	10.32	11.60	11.84	11.91	11.96	11.68
10.92	10.69	11.28	11.16	12.15	12.28	11.54
11.77	11.35	11.39	12.54	12.54	12.80	12.12
11.80	11.64	11.74	12.60	12.60	12.80	12.11
11.18	11.18	11.39	12.35	12.29	12.32	11.90
10.98	11.40	11.00	12.50	12.50	12.18	12.15
11.44	11.00	11.41	12.24	12.12	12.07	11.52
10.38	9.84	12.18	10.45	10.81	9.90	13.41
12.75	9.98	10.97	9.88	10.03	9.98	10.88
12.81	12.08	11.20	9.88	10.13	10.45	11.03
12.01	11.29	10.43	10.43	10.15	10.28	11.29
13.04	10.62	11.51	10.23	10.56	10.56	11.51
12.45	10.10	12.29	10.02	10.04	10.27	11.36
13.13	10.75	11.82	10.70	11.17	11.10	12.14
12.69	9.52	10.97	10.81	10.84	11.06	11.92
12.54	9.90	11.23	10.23	10.44	10.50	11.77
12.64	9.82	10.86	10.95	10.62	10.39	10.17
12.54	10.31	10.49	10.48	10.36	10.36	11.36
12.60	10.16	11.61	10.59	10.62	10.65	11.82
12.66	10.674	11.68	10.74	10.86	11.04	11.66
12.42	9.66	11.25	10.89	11.30	11.30	11.57
12.44	9.70	10.59	10.54	10.99	11.08	11.74
12.50	10.02	11.90	9.94	10.59	10.50	11.34
12.22	10.30	11.24	9.84	11.13	11.08	11.55
12.78	10.30	11.61	11.26	11.38	11.38	11.75
12.70	10.23	11.60	10.68	11.07	11.10	11.93
12.64	10.18	11.45	10.79	11.15	11.26	11.73
12.11	9.56	10.63	10.59	10.74	10.83	11.51
12.65	10.51	11.25	10.41	10.72	10.73	11.33
12.34	9.82	10.66	10.68	10.98	11.01	11.82
12.15	10.09	10.73	10.07	10.41	10.31	11.28
12.42	10.07	11.10	10.81	11.39	11.29	11.62
12.28	9.86	11.29	10.87	11.00	11.07	11.56
12.93	10.31	11.45	10.56	10.85	10.92	11.76
12.17	10.00	10.72	10.15	10.33	10.37	11.80
12.70	10.32	11.38	10.81	11.02	11.02	11.67
12.43	10.04	11.28	11.13	11.40	11.46	11.80
12.30	10.74	11.37	10.65	10.90	10.65	11.63
12.36	10.33	11.67	11.00	11.17	11.30	12.14
12.13	10.37	11.04	10.82	10.86	10.90	11.57
12.37	10.58	11.10	10.32	10.74	10.59	11.42
12.44	11.19	11.64	11.05	11.06	10.99	11.84
12.13	9.95	10.81	10.52	10.77	11.05	11.77
12.28	10.99	11.22	10.42	10.52	10.89	11.73
12.39	11.11	11.29	10.39	11.01	10.77	11.77
12.53	10.68	10.72	10.85	10.77	10.80	10.76
12.17	10.19	11.02	11.17	11.82	11.77	12.16
12.64	11.32	11.83	10.93	10.97	10.80	11.57
12.62	11.48	11.82	10.84	10.82	11.01	11.52
11.97	10.07	10.75	10.89	10.78	10.90	11.74
12.44	11.18	11.44	11.01	11.23	10.94	11.62
11.89	11.44	11.17	10.46	10.70	10.65	11.36
12.16	11.19	11.17	10.79	10.65	10.56	11.71
11.77	10.36	10.01	10.75	10.80	10.75	9.55
12.62	10.22	11.44	10.45	10.82	11.00	11.10
11.53	9.96	11.78	10.88	11.28	11.04	11.18
11.97	10.70	10.61	10.41	10.65	10.73	11.41
11.97	11.02	11.02	10.61	10.81	10.69	11.06
12.41	10.78	11.44	11.09	11.52	11.51	11.95
11.41	11.14	11.15	10.47	10.76	10.69	11.36
11.86	10.80	11.08	10.65	10.76	10.40	10.65
7.84	8.14	9.53	7.60	7.59	7.39	7.63
7.85	7.84	7.85	7.85	7.85	7.74	7.74

41	PB	LOC23117-232041	LOC23117	232041	7.66	7.73	7.63	7.67	7.70	7.64	9.86	9.20	9.48	7.42	7.37	7.59	7.47	7.56	7.59	7.39	7.46	7.48	7.71	7.90	7.78	ANA	ANA	7.68	7.61	9.52	7.46	7.72	7.48	7.72
41	PB	SHEBP1-499025	SHEBP1	499025	7.49	7.46	7.38	7.17	8.10	8.28	9.20	9.66	9.38	7.33	7.59	7.80	7.43	7.47	7.40	7.38	7.33	7.27	7.79	7.94	7.38	ANA	ANA	7.44	7.81	9.48	7.68	7.55	7.54	7.59
41	PB	RMW-419101	RMW	419101	7.26	7.31	7.26	7.26	7.31	7.26	7.31	7.26	7.31	7.26	7.31	7.26	7.31	7.26	7.31	7.26	7.31	7.26	7.31	7.26	7.31	ANA	ANA	7.21	7.26	9.24	7.26	7.26	7.26	7.26
41	PB	IGF1-331040	IGF1	331040	7.29	7.34	7.13	7.27	7.33	7.27	9.38	7.22	9.23	6.40	7.49	7.82	6.46	7.34	6.45	7.70	6.08	8.27	8.23	8.35	7.42	ANA	ANA	7.28	7.32	9.11	8.26	8.10	8.07	8.07
41	PB	TMD4-480332	TMD4	480332	7.17	7.34	7.22	7.34	7.51	7.28	9.17	9.09	8.97	8.59	9.00	7.78	7.80	8.01	7.96	8.44	7.84	7.43	7.44	7.75	7.61	ANA	ANA	7.24	7.48	8.94	8.79	7.96	8.06	7.52
41	PB	MTH-130038	MTH	130038	7.36	7.31	7.35	7.47	7.35	7.38	9.17	9.01	8.98	8.73	7.31	7.35	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	ANA	ANA	7.31	7.35	7.38	7.38	7.38	7.38	7.38
41	PB	LLR84-182014	LLR84	182014	7.18	7.42	7.32	8.47	8.42	8.52	9.01	9.28	9.29	7.71	8.42	7.75	7.83	7.79	7.99	7.77	7.40	7.60	7.97	7.74	7.51	ANA	ANA	7.41	8.47	9.20	7.96	7.66	7.59	7.71
41	PB	AB2B-420508	AB2B	420508	7.31	7.36	7.41	8.36	8.29	8.56	8.57	9.02	9.13	8.52	7.47	7.57	8.48	7.96	8.52	8.50	8.48	7.60	7.97	7.67	7.61	ANA	ANA	7.31	7.72	9.41	8.11	8.22	8.16	8.22
41	PB	PRR11-237072	PRR11	237072	7.37	7.30	7.32	8.29	8.46	8.40	8.50	8.92	8.97	7.40	7.25	7.32	7.34	7.30	7.33	7.41	7.38	7.45	7.50	7.45	ANA	ANA	7.33	8.59	8.82	7.32	7.32	7.36	7.41	
41	PB	AP08ECB-747058	AP08ECB	747058	7.1009	7.36	7.23	7.24	7.37	7.57	7.99	8.63	8.72	9.45	7.43	7.42	7.76	7.29	7.22	7.32	7.33	7.39	7.38	7.49	7.54	ANA	ANA	7.27	7.72	8.93	7.54	7.56	7.56	7.56
41	PB	HPGD-425034	HPGD	425034	7.46	7.36	7.44	8.01	8.00	7.80	9.40	9.51	9.06	7.80	7.39	7.80	6.06	7.73	7.99	7.75	7.89	7.36	7.38	7.44	7.40	ANA	ANA	7.43	7.97	9.33	7.87	7.89	7.88	7.39
41	PB	RN7SK-590176	RN7SK	590176	7.96	7.35	7.48	7.40	7.47	9.35	8.52	9.14	7.29	7.77	7.66	7.60	7.39	7.38	7.54	7.43	7.44	9.69	8.61	9.61	Yes	ANA	ANA	7.40	7.51	9.01	7.57	7.50	7.45	9.35
41	PB	NLRP7-4762041	NLRP7	4762041	7.73	7.31	7.38	7.36	7.42	7.31	8.18	8.88	7.98	7.82	8.29	7.54	7.68	7.56	7.61	7.86	7.59	7.48	7.96	8.18	ANA	ANA	7.31	7.36	8.35	8.15	8.17	8.02	7.98	
41	PB	CTNNAL1-146072	CTNNAL1	146072	7.56	7.42	7.57	8.39	8.36	8.58	9.36	9.13	9.23	7.77	8.36	8.66	8.05	8.28	7.53	8.48	8.43	7.73	9.11	8.31	8.61	ANA	ANA	7.52	8.44	9.24	8.26	8.16	8.15	8.16
41	PB	SNCRAT9-100136	SNCRAT9	100136	7.42	7.41	7.38	7.68	8.17	8.66	8.72	8.19	7.48	8.34	7.82	7.67	7.65	7.65	8.03	8.17	7.48	7.63	7.42	7.62	ANA	ANA	7.43	7.48	8.66	8.63	8.29	7.47	7.48	
41	PB	HRALS2-4250059	HRALS2	4250059	7.36	7.46	7.50	7.55	7.42	7.40	9.12	8.95	8.78	8.12	8.12	7.79	7.50	7.38	7.57	7.61	7.43	7.44	7.58	7.59	7.63	ANA	ANA	7.44	7.46	8.95	8.01	7.44	7.54	7.56
41	PB	RUN2-445054	RUN2	445054	7.31	7.36	7.41	8.26	8.29	8.55	8.57	9.02	9.13	7.65	7.41	7.57	8.57	8.55	8.18	8.15	8.14	8.21	7.51	7.21	7.18	10.70	ANA	ANA	7.36	8.20	8.61	8.17	8.27	7.81
41	B	COR1-439246	COR1	439246	7.56	7.16	7.16	7.16	7.16	7.16	11.52	8.23	8.35	9.15	8.19	7.16	7.17	7.47	7.97	7.46	7.97	7.39	7.32	7.49	ANA	ANA	7.16	7.16	8.57	8.57	7.27	7.29	7.63	7.41
41	B	LTB-420091	LTB	420091	12.27	12.32	8.57	8.57	8.57	8.57	8.70	7.88	8.94	7.59	7.25	7.31	7.39	7.24	7.28	7.25	7.45	7.27	7.29	7.42	7.50	ANA	ANA	7.22	8.68	8.68	7.52	7.52	7.52	7.52
41	B	TCL1A-70110	TCL1A	70110	11.05	10.22	10.90	10.91	10.22	10.59	10.65	8.17	8.95	7.41	7.52	7.51	7.43	7.45	7.44	7.40	7.40	7.46	7.46	7.46	7.29	ANA	ANA	11.02	7.49	8.85	7.54	7.48	7.43	7.45
41	B	BC11A-3170440	BC11A	3170440	12.06	12.03	11.93	9.41	9.56	9.39	8.98	8.69	8.77	7.28	7.39	7.34	7.39	7.23	7.44	7.35	7.79	8.57	9.30	9.35	7.78	ANA	ANA	12.01	8.61	7.33	7.31	7.53	8.50	7.53
41	B	BC11A-698040	BC11A	698040	12.27	12.05	9.61	9.84	9.70	9.05	9.21	9.01	9.27	7.81	7.77	7.67	7.65	7.65	7.81	8.15	9.12	8.92	9.70	9.33	ANA	ANA	12.26	9.72	7.95	7.73	7.65	7.68	9.27	
41	B	LOC42037-306520	LOC42037	306520	11.86	11.39	11.51	10.46	9.26	9.45	9.83	8.76	9.07	7.48	7.27	7.23	7.44	7.37	7.38	7.51	7.37	7.78	7.53	7.44	7.38	ANA	ANA	11.59	9.72	9.22	7.33	7.40	7.42	7.59
41	B	C005-500162	C005	500162	10.32	12.09	11.41	10.38	10.30	10.44	7.73	7.76	8.19	7.41	8.00	7.42	7.14	7.41	7.50	7.59	7.50	8.25	7.70	8.07	8.43	ANA	ANA	11.27	10.37	7.68	7.63	7.27	7.53	9.17
41	B	C04-410437	C04	410437	12.03	11.28	11.84	8.61	8.68	8.62	8.19	8.87	8.28	7.25	7.27	7.27	7.33	7.31	7.22	7.28	7.52	8.91	7.86	7.74	7.28	ANA	ANA	11.71	8.57	8.11	7.26	7.32	7.34	8.34
41	B	IFP9-150072	IFP9	150072	11.84	12.14	12.16	11.08	10.40	8.41	8.50	8.76	8.53	7.67	8.09	8.23	7.28	7.75	8.09	8.17	7.82	7.89	8.33	8.25	ANA	ANA	11.07	10.37	8.01	7.96	7.57	8.01	7.57	
41	B	CXCR5-3990400	CXCR5	3990400	11.35	11.62	11.59	10.59	10.61	10.14	8.29	8.67	8.07	7.41	7.43	7.35	7.38	7.42	7.46	7.84	7.68	7.40	7.31	7.50	ANA	ANA	11.52	10.45	8.68	7.70	7.48	7.65	7.40	
41	B	MSA1-4119021	MSA1	4119021	11.31	11.74	11.58	8.66	8.60	8.38	8.35	8.19	8.48	7.33	7.54	7.40	7.50	7.46	7.55	7.63	7.65	7.47	7.38	7.32	7.60	ANA	ANA	11.74	8.62	8.34	7.43	7.48	7.68	7.44
41	B	MTS1-41170300	MTS1	41170300	11.28	11.38	11.28	9.79	10.13	9.81	9.47	9.01	9.25	7.46	7.45	7.46	7.39	7.32	7.36	7.53	7.68	7.33	7.46	7.36	7.17	ANA	ANA	11.30	9.91	7.17	7.46	7.52	7.56	7.51
41	B	CIOF162-7050719	CIOF162	7050719	11.49	11.66	11.87	8.17	7.96	8.28	7.74	7.68	7.82	7.75	8.01	7.65	7.73	7.68	7.91	7.73	7.78	8.28	8.27	8.42	7.68	ANA	ANA	11.67	10.13	7.74	7.80	7.70	7.81	8.31
41	B	C00N1-346058	C00N1	346058	10.32	10.38	10.37	10.84	10.53	10.75	8.97	8.75	9.77	7.17	7.39	7.35	7.29	7.36	7.38	7.36	7.38	7.28	7.28	7.38	7.20	ANA	ANA	10.36	10.70	9.01	7.54	7.36	7.31	7.36
41	B	BEND5-454398	BEND5	454398	10.24	10.69	10.70	10.51	10.10	10.60	8.18	8.22	8.01	7.37	7.36	7.84	7.51	7.31	7.39	7.43	7.56	8.49	8.83	8.86	8.34	Yes	ANA	10.54	10.73	8.74	7.46	7.51	7.46	8.89
41	B	SPB-4520161	SPB	4520161	11.45	11.23	10.50	10.80	10.71	9.50	8.48	8.89	7.90	7.50	7.40	7.62	7.54	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	ANA	ANA	10.64	10.67	8.78	7.52	7.58	7.83	7.82
41	B	AFB-450733	AFB	450733	11.17	11.21	10.74	9.39	9.50	8.40	7.89	8.01	8.14	7.25	7.34	7.37	7.31	7.23	7.19	7.36	7.35	7.44	7.34	7.32	7.30	ANA	ANA	11.04	8.43	8.01	7.32	7.27	7.30	7.34
41	B	HLA-DQA-025042	HLA-DQA	025042	11.32	11.43	11.32	9.19	9.17	9.51	8.48	8.61	8.84	7.33	7.57	7.37	7.44	7.58	7.53	7.57	7.50	7.51	7.58	7.47	7.39	ANA	ANA	11.35	9.29	8.65	7.49	7.51	7.56	7.49
41	B	C003-4602038	C003	4602038	11.48	10.67	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	9.38	ANA	ANA	11.48	10.67	9.38	9.38	9.38	9.38	9.38
41	B	ILR4-4910009	ILR4	4910009	10.59	11.74	10.79	8.79	9.21	9.05	7.72	8.26	8.47	7.39	7.36	7.46	7.43	7.38	7.36	7.44	7.38	7.36	7.44	7.46	7.46	ANA	ANA	11.17	9.02	8.15	7.41	7.39	7.56	7.56
41	B	ILR4-4910009	ILR4	4910009	10.59	11.74	10.79	8.79	9.21	9.05	7.72	8.26	8.47	7.39	7.36	7.46	7.43	7.38	7.36	7.44	7.38	7.36	7.44	7.46	7.46	ANA	ANA	11.17	9.02	8.15	7.41	7.39	7.56	7.56
41	B	LBH-2810246	LBH	2810246	11.58	11.11	11.35	9.77	9.47	9.18	8.54	8.83	8.46	7.65	7.70	7.52	7.70	7.58	7.58	7.58	7.58	7.58	7.58	7.58	7.58	ANA	ANA	11.35	9.47	8.44	7.63	7.89	7.61	7.66

43	BPBC	GPRI183-400037	GPRI183	400037	9.91	9.79	10.52	9.65	8.95	9.73	10.33	10.67	10.99	10.45	10.47	10.79	10.51	10.92	10.82	10.99	11.07	9.09	7.98	7.90	8.33	ANA	Yes	10.07	9.25	10.53	10.57	10.71	10.93	8.29	
43	BPBC	HS161742-3207003	HS161742	3207003	9.59	9.77	9.86	9.44	9.09	9.32	10.68	10.66	11.10	10.15	9.96	11.09	10.67	10.46	10.43	10.59	10.68	9.65	9.62	9.17	8.97	ANA	Yes	9.74	9.28	10.87	10.40	10.56	10.57	9.35	
43	BPBC	MYAD4-2970730	MYAD4	2970730	9.47	9.77	9.88	9.33	10.05	9.72	8.93	9.31	10.43	9.78	11.33	10.59	10.65	10.65	10.65	10.78	10.69	10.84	9.52	9.17	8.88	ANA	Yes	9.71	9.78	10.87	10.50	10.56	10.57	9.35	
43	BPBC	VAR5-320040	VAR5	320040	9.11	9.18	9.12	10.82	10.79	10.73	10.35	10.59	10.65	10.77	10.93	10.76	10.60	10.89	10.57	10.35	10.35	10.47	10.65	10.44	10.32	ANA	Yes	9.14	10.82	10.53	10.82	10.65	10.56	10.52	
43	BPBC	PCED118-100001	PCED118	100001	9.12	9.65	9.69	9.15	9.41	9.66	9.15	9.41	9.66	9.15	9.41	9.66	9.15	9.41	9.66	9.15	9.41	9.66	9.15	9.41	9.66	ANA	Yes	9.12	9.65	9.69	9.15	9.41	9.66	9.15	
43	BPBC	EIF5-5670468	EIF5	5670468	9.17	9.68	9.23	10.87	9.87	9.14	10.73	10.73	10.80	10.45	9.85	10.76	10.81	10.83	10.47	10.63	10.37	9.84	10.66	8.75	10.42	ANA	Yes	9.16	10.82	10.56	10.82	10.65	10.56	10.52	
43	BPBC	ICSD1-1100069	ICSD1	110069	9.12	9.75	10.09	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	10.06	ANA	Yes	9.14	10.09	10.34	10.09	10.34	10.09	10.34	
43	BPBC	AK2-3270069	AK2	3270069	9.21	9.25	9.20	10.27	10.37	10.42	9.92	9.79	9.48	10.70	10.72	10.32	10.35	10.44	10.81	10.87	10.70	10.40	10.86	10.29	10.40	ANA	Yes	9.22	10.35	10.73	10.58	10.70	10.24	10.24	
43	BPBC	ATF4-7510187	ATF4	7510187	9.14	9.38	9.47	9.99	9.99	9.93	10.30	10.40	10.34	10.66	11.12	10.68	10.79	10.58	10.82	10.61	10.92	10.82	10.80	11.32	ANA	Yes	9.30	9.90	10.35	10.98	10.92	10.57	10.58		
43	BPBC	BOLA2-60148	BOLA2	60148	9.57	9.40	9.81	10.52	10.39	10.45	11.28	10.77	10.99	11.49	11.26	10.91	11.28	10.83	10.81	10.87	10.72	11.29	11.21	11.45	11.15	ANA	Yes	9.29	10.45	10.71	11.22	11.05	10.78	11.27	
43	BPBC	LOC72866-7570156	LOC72866	7570156	8.86	9.11	9.18	10.01	10.65	10.43	10.64	10.39	10.40	10.46	10.83	10.47	10.19	10.32	10.38	10.74	10.60	10.21	10.45	10.32	10.78	ANA	Yes	9.05	10.56	10.48	10.59	10.26	10.57	10.44	
43	BPBC	SHS481-6960072	SHS481	6960072	8.82	9.05	9.33	10.06	10.24	10.23	10.65	10.55	10.63	10.52	10.30	10.79	10.62	10.67	10.43	10.78	10.69	8.89	9.27	10.11	10.18	ANA	Yes	9.10	10.18	10.61	10.54	10.65	10.57	10.61	
43	BPBC	COMMD1-3360093	COMMD1	3360093	9.28	9.19	9.19	9.95	9.93	10.69	10.53	10.47	10.89	11.03	10.88	10.53	10.52	10.62	10.51	10.46	10.40	11.00	10.96	10.80	10.80	ANA	Yes	9.22	9.96	10.56	10.56	10.40	10.53	10.53	
43	BPBC	RABEPK-6600115	RABEPK	6600115	9.36	9.19	9.20	10.11	10.51	9.59	9.77	9.64	10.17	10.71	10.69	10.71	10.69	10.71	10.69	10.71	10.69	10.71	10.69	10.71	10.69	ANA	Yes	9.31	10.24	10.87	10.56	10.47	10.56	10.47	
43	BPBC	PRDX5-520750	PRDX5	520750	9.15	9.21	9.68	9.83	9.53	10.01	11.10	10.51	10.80	10.59	10.86	10.58	10.53	10.65	10.55	10.59	10.49	10.74	10.58	10.62	10.87	ANA	Yes	9.35	9.79	10.81	10.68	10.59	10.51	10.70	
43	BPBC	MPL2-601045	MPL2	601045	9.20	9.29	10.67	10.54	10.10	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	ANA	Yes	9.21	10.68	10.51	10.67	10.50	10.67	10.50	
43	BPBC	PICP-5610630	PICP	5610630	9.52	9.42	9.56	9.83	9.42	9.89	9.98	9.81	9.74	10.78	10.52	10.69	11.05	10.51	11.08	10.69	10.74	10.55	10.25	10.38	10.41	ANA	Yes	9.50	9.79	10.84	10.67	10.78	10.84	10.40	
43	BPBC	ATP5G1-5870446	ATP5G1	5870446	9.06	9.16	9.04	9.76	9.89	10.09	10.30	10.19	10.12	10.75	11.08	10.54	10.46	10.41	10.62	10.26	10.39	10.44	10.77	10.05	10.64	ANA	Yes	9.09	9.91	10.20	10.79	10.44	10.56	10.75	
43	BPBC	EDDM1-2030292	EDDM1	2030292	9.60	10.01	9.74	10.23	10.26	10.98	10.93	11.40	11.35	10.53	10.57	10.95	10.94	11.06	11.01	10.91	10.99	10.94	9.72	9.35	9.67	ANA	Yes	9.78	10.10	11.22	10.62	11.00	10.97	9.70	
43	BPBC	HLA4-2070088	HLA4	2070088	10.64	10.31	9.89	10.18	9.11	9.19	11.11	10.16	10.19	10.11	11.36	10.84	10.67	10.52	10.53	10.19	10.28	9.97	9.84	10.81	8.61	ANA	Yes	10.28	9.61	10.33	10.81	10.19	10.28	9.61	
43	BPBC	PPPPR5-790089	PPPPR5	790089	9.63	9.39	9.62	10.23	10.33	10.18	10.85	10.88	10.78	10.63	10.50	11.36	11.03	10.97	11.00	10.77	10.85	10.07	9.85	9.79	10.20	ANA	Yes	9.55	10.25	10.87	10.83	11.00	10.88	9.98	
43	BPBC	RPS6K2-2030038	RPS6K2	2030038	9.49	9.26	9.59	9.87	9.49	9.54	10.04	9.80	9.72	10.87	10.88	10.89	10.36	10.60	10.66	10.42	10.56	10.99	11.67	10.54	11.03	ANA	Yes	9.45	9.63	9.83	10.88	11.03	10.85	11.03	
43	BPBC	SEC21A-3840100	SEC21A	3840100	9.44	9.41	9.50	9.20	9.40	9.05	10.33	10.36	10.51	10.62	10.10	10.57	10.27	10.49	10.65	10.30	10.34	10.17	10.33	10.06	10.24	ANA	Yes	9.45	9.22	10.40	10.43	10.38	10.43	10.20	
43	BPBC	MPL2-4500131	MPL2	4500131	9.26	9.23	9.27	10.05	10.61	10.72	10.11	10.77	10.79	10.79	10.79	10.79	10.79	10.79	10.79	10.79	10.79	10.79	10.79	10.79	10.79	ANA	Yes	9.29	10.69	10.62	10.66	10.66	10.66	10.62	
43	BPBC	PCDEA-830562	PCDEA	830562	7.98	7.27	7.32	7.95	7.44	7.59	7.41	7.45	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	ANA	Yes	7.92	7.52	7.52	7.52	7.52	7.52	7.52	
43	BPBC	IF27-3990170	IF27	3990170	7.44	7.26	7.29	7.50	7.41	7.36	7.39	7.54	7.42	7.36	7.39	7.54	7.42	7.36	7.39	7.54	7.42	7.36	7.39	7.54	7.42	ANA	Yes	7.33	7.42	7.49	7.53	7.77	7.22	7.27	
43	BPBC	SCOR5B-360086	SCOR5B	360086	7.90	7.46	7.46	7.51	7.48	7.56	7.39	7.62	7.71	7.53	7.93	8.01	9.71	9.69	10.98	9.64	10.47	10.08	9.33	8.94	8.74	9.75	ANA	Yes	7.48	7.51	7.92	10.05	10.14	10.07	9.75
43	BPBC	BRK1-4890098	BRK1	4890098	7.55	7.64	7.57	7.75	7.96	7.70	7.40	7.87	7.81	8.23	8.03	10.12	9.54	10.37	9.24	10.49	10.32	10.66	10.08	10.17	10.31	ANA	Yes	7.55	7.80	7.70	9.86	10.06	10.06	10.53	
43	BPBC	SLC27A1-3460023	SLC27A1	3460023	7.28	7.39	7.31	7.25	7.28	7.43	7.63	7.57	7.65	8.12	8.97	9.31	10.40	9.90	9.62	9.76	9.30	9.34	8.54	8.37	9.79	ANA	Yes	7.32	7.34	7.62	9.80	10.15	9.66	9.80	
43	BPBC	AFSA-4920546	AFSA	4920546	7.84	7.73	7.81	7.75	7.99	7.81	8.34	8.19	8.08	8.19	10.12	9.48	10.49	9.94	9.98	9.66	9.01	7.99	8.48	9.52	9.85	ANA	Yes	7.79	7.68	8.20	10.20	10.22	9.55	8.86	
43	BPBC	TCN2-5670100	TCN2	5670100	7.64	7.64	7.51	7.64	7.42	7.58	7.56	7.50	7.54	8.51	10.06	9.93	9.49	9.94	9.89	9.42	9.90	9.89	9.42	9.90	9.89	ANA	Yes	7.52	7.54	7.57	9.71	9.63	9.55	9.67	
43	BPBC	LOC72785-1300373	LOC72785	1300373	8.03	8.14	7.75	7.78	7.68	7.66	7.76	7.86	7.93	8.30	9.30	9.51	11.09	9.16	8.44	9.20	8.83	11.25	8.10	8.65	8.20	8.99	ANA	Yes	7.89	7.70	8.03	9.97	9.30	9.76	8.48
43	BPBC	MDA-4780005	MDA	4780005	7.61	7.60	7.42	7.55	7.52	7.53	8.10	7.69	7.62	7.53	8.10	7.69	7.62	7.53	8.10	7.69	7.62	7.53	8.10	7.69	7.62	ANA	Yes	7.64	7.63	7.67	7.59	7.69	7.61	7.61	
43	BPBC	MIR593-3390142	MIR593	3390142	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	ANA	Yes	7.59	7.59	7.59	7.59	7.59	7.59	7.59	
43	BPBC	HSTH208E-4200678	HSTH208E	4200678	6.15	7.83	6.36	7.43	7.58	7.65	7.82	7.77	7.66	8.48	9.17	9.19	10.44	9.50	9.52	10.30	10.27	11.33	10.63	10.91	11.09	ANA	Yes	6.12	7.83	6.36	7.43	7.58	7.65	7.82	
43	BPBC	SLC12A2-3310453	SLC12A2	3310453	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	7.81	ANA	Yes	7.81	7.81	7.81	7.81	7.81	7.81	7.81	
43	BPBC	EFCAB4a-10052	EFCAB4a	10052	8.21	7.85	8.31	7.58	7.64	7.56	8.04	8.20	8.49	9.74	10.25	9.90	9.69	10.28	9.68	10.09	10.07	9.58	10.31	9.40	9.97	ANA	Yes	8.18	7.66	7.76	9.77	10.11	10.99	9.88	
43	BPBC	TRH89-3870238	TRH89	387																															

44	PC	MEM140-471014	MEM140	467014	8.18	7.78	8.02	7.76	7.83	7.88	7.98	8.01	8.02	9.01	9.42	9.32	9.01	9.26	9.30	9.43	9.34	9.80	7.91	8.00	9.09	9.74	9.74	7.99	7.83	8.01	9.22	9.14	9.35	8.48	
44	PC	HS17508-176032	HS17508	176032	7.67	7.84	8.25	7.77	7.84	8.01	7.85	7.96	8.21	9.32	9.10	9.31	9.07	9.24	9.33	9.18	9.33	10.17	7.47	8.83	10.01	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	HS17508-176032	HS17508	176032	8.15	8.47	8.15	8.15	7.86	7.77	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.15	10.17	7.47	8.83	10.01	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	PRAP2-727093	PRAP2	727093	7.72	7.95	8.15	8.15	7.86	7.77	7.86	7.86	8.21	9.32	9.10	9.31	9.07	9.24	9.33	9.18	9.33	10.17	7.47	8.83	10.01	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	COLBA2-370168	COLBA2	370168	7.96	7.87	7.96	8.03	8.10	8.06	8.03	7.83	8.19	8.08	9.67	9.24	8.82	9.25	8.86	9.23	9.40	14.88	8.71	8.85	10.41	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	FCBL1-770204	FCBL1	770204	8.12	8.78	8.23	8.07	8.23	8.12	8.23	8.23	8.23	8.23	8.23	8.23	8.23	8.23	8.23	8.23	8.23	10.17	7.47	8.83	10.01	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	ATP13A1-200193	ATP13A1	200193	8.16	8.08	8.26	8.13	8.13	8.26	8.54	8.91	8.97	8.83	9.79	9.55	9.60	9.38	9.52	9.41	9.36	1.16	9.36	9.05	9.43	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	DRP2-1850541	DRP2	1850541	7.83	7.87	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	10.17	7.47	8.83	10.01	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	DAP-2710491	DAP	2710491	8.31	8.24	8.48	8.42	8.30	8.22	8.73	8.81	8.78	9.84	9.85	9.56	9.47	10.00	9.41	9.88	9.54	9.32	9.67	9.67	9.59	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	ANKR40-4500142	ANKR40	4500142	8.50	8.24	7.98	8.04	8.14	8.43	8.28	8.36	8.36	9.30	9.29	9.36	9.35	9.43	9.62	9.40	9.17	9.23	9.23	9.26	9.49	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	OAS1-7040035	OAS1	7040035	9.13	8.19	8.60	8.05	7.98	8.18	8.77	8.46	8.77	9.30	10.10	9.85	9.54	9.39	9.48	9.34	9.36	8.52	7.54	7.88	9.85	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	PIGM-120719	PIGM	120719	8.50	8.22	8.43	8.30	8.43	8.51	8.75	8.63	8.89	9.54	9.72	9.62	9.10	9.80	9.94	9.59	9.62	10.07	9.52	9.59	9.95	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	ZBTB19-2001015	ZBTB19	2001015	7.81	7.84	7.88	7.71	7.76	7.78	8.15	8.15	8.16	8.34	8.19	9.19	9.23	9.21	9.36	9.10	9.04	8.81	8.50	8.89	8.91	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	ZNF14-2510288	ZNF14	2510288	8.11	8.23	8.28	8.19	8.27	7.91	7.97	7.88	8.26	8.21	8.31	9.58	9.45	9.15	9.64	9.30	9.60	9.19	9.49	9.73	9.02	9.47	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11
44	PC	SCDL-4202087	SCDL	4202087	8.15	8.23	8.28	8.15	8.23	8.10	8.03	8.03	8.21	9.13	9.13	9.14	9.44	9.45	9.42	9.34	9.45	9.08	9.55	8.83	9.34	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	TPRRL2-1190739	TPRRL2	1190739	7.92	7.80	8.06	8.51	8.33	8.14	8.33	8.69	8.98	9.21	9.91	9.47	9.01	9.75	9.29	9.27	9.31	9.74	9.63	9.13	10.23	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	DPPT-2104937	DPPT	2104937	8.18	8.49	8.57	8.55	8.51	8.41	8.60	8.45	8.41	9.89	9.53	9.55	9.57	9.57	9.53	9.58	9.63	9.58	9.21	9.57	10.96	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	CTSA-884046	CTSA	884046	8.20	8.28	8.35	8.12	8.27	8.27	8.77	8.67	8.52	9.70	9.28	9.32	9.76	9.34	9.80	9.28	9.75	8.83	8.61	9.39	9.57	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	ANKR40-4500142	ANKR40	4500142	8.15	8.23	8.28	8.15	8.23	8.10	8.03	8.03	8.21	9.13	9.13	9.14	9.44	9.45	9.42	9.34	9.45	9.08	9.55	8.83	9.34	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	DEXA-2470386	DEXA	2470386	8.09	7.85	8.05	8.10	8.14	8.02	7.85	8.23	8.10	9.00	9.03	9.15	9.64	9.49	9.46	9.41	9.25	8.80	7.88	8.36	9.76	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	ANKR40-4500142	ANKR40	4500142	8.15	8.23	8.28	8.15	8.23	8.10	8.03	8.03	8.21	9.13	9.13	9.14	9.44	9.45	9.42	9.34	9.45	9.08	9.55	8.83	9.34	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	PCYOX1-3450725	PCYOX1	3450725	8.46	8.11	8.35	8.04	8.07	8.20	8.50	8.45	8.81	9.34	8.86	9.12	9.60	9.31	9.95	9.85	9.62	9.35	9.42	9.35	9.31	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	BGALT7-520332	BGALT7	520332	8.50	8.49	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50		
44	PC	RTN0-4901129	RTN0	4901129	8.35	8.13	8.37	8.21	8.38	8.28	8.72	8.69	8.66	9.73	9.62	9.57	9.57	9.54	9.57	9.55	9.65	9.46	9.47	9.49	9.47	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	CCDC51-4290259	CCDC51	4290259	7.91	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89	7.89		
44	PC	TPDLS2-4500507	TPDLS2	4500507	8.21	8.25	8.40	8.38	8.30	8.38	8.31	8.27	8.38	9.78	9.61	9.38	9.47	9.47	9.48	9.35	9.53	9.66	9.67	9.14	9.71	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	ARFB-270215	ARFB	270215	7.97	7.94	7.79	8.29	8.32	8.17	8.62	8.74	8.30	9.16	9.36	9.30	9.50	9.25	9.34	9.75	9.24	8.32	8.70	8.65	8.38	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	SLC35A1-3801189	SLC35A1	3801189	8.38	8.03	8.28	8.62	8.64	8.56	8.42	8.51	8.61	9.75	9.89	9.81	9.21	9.56	9.42	9.59	9.40	8.81	9.33	9.08	9.91	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	STY10-4202073	STY10	4202073	8.36	8.54	8.61	8.62	8.76	8.70	8.60	8.51	8.65	9.38	9.03	10.08	9.03	9.81	8.91	9.70	10.07	9.18	9.02	9.56	10.79	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	RTEL1-387703	RTEL1	387703	8.74	8.46	8.71	8.30	8.20	8.23	8.60	8.59	8.62	10.20	9.67	9.32	9.51	9.73	9.26	9.41	9.27	9.28	9.23	9.31	10.24	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	RHBD1-2701032	RHBD1	2701032	8.42	8.07	8.22	8.09	7.99	7.98	8.18	8.42	8.63	9.27	9.02	9.08	9.31	9.05	9.43	9.58	9.18	9.57	8.97	8.96	9.49	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	UBED4-3200562	UBED4	3200562	7.89	7.92	8.06	8.33	8.05	8.44	8.25	8.03	8.06	9.11	9.25	9.28	9.30	9.33	9.32	9.86	9.59	9.24	8.92	9.04	9.02	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	NCHE1-7210277	NCHE1	7210277	8.43	8.29	8.48	8.29	8.48	8.29	8.48	8.29	8.48	8.29	8.48	8.29	8.48	8.29	8.48	8.29	8.48	8.29	8.48	8.29	8.48	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	ARHGF1-3180736	ARHGF1	3180736	8.27	8.42	8.32	8.47	8.44	8.03	8.27	8.35	8.50	9.58	9.25	9.23	9.70	9.29	9.47	9.46	9.30	9.47	9.74	9.74	9.74	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11	
44	PC	HCHD1-3180338	HCHD1	3180338	8.28	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38	8.38		
44	PC	C19ORF65-520204	C19ORF65	520204	8.01	8.38	8.50	8.08	8.28	8.06	7.75	8.01	8.05	9.42	9.25	9.23	9.91	9.02	9.21	8.80	9.01	9.02	8.65	8.88	8.64	9.04	9.74	9.74	7.92	7.87	8.01	9.24	9.16	9.28	9.11
44	PC	LOC10132740	LOC10132740	LOC10132740	8.27	8.50	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25		
44	B	HLA-DRB5	HLA-DRB5	672015	7.98	7.92	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98		
44	B	BACH2	BACH2	724015	1																														

46	BABDPR	HSPD1-460072	HSPD1	696072	10.55	10.28	10.39	13.00	12.89	12.85	11.53	11.97	15.18	10.59	10.09	10.58	10.73	10.94	10.87	11.02	10.54	10.56	10.96	11.11	ANA	ANA	10.40	12.90	11.89	10.42	10.83	10.85	10.79	
46	BABDPR	LOC100120266-10152	LOC100120266	10152	10.47	10.29	10.51	12.72	12.75	12.64	11.37	10.97	11.34	10.27	10.57	10.42	9.89	10.28	9.88	10.71	10.37	9.46	8.90	10.29	9.64	ANA	ANA	10.42	12.90	11.22	10.42	10.07	10.32	8.83
46	BABDPR	LOC10013378-531024	LOC10013378	531024	11.54	11.48	11.79	12.57	12.58	12.76	11.48	11.20	11.72	10.30	10.31	10.45	10.16	10.33	10.63	10.86	11.00	11.23	11.59	11.55	ANA	ANA	11.01	13.21	11.84	11.37	10.81	10.79	11.34	
46	BABDPR	LOC10013378-531024	LOC10013378	531024	12.62	12.74	12.86	12.42	12.23	11.39	11.29	10.84	11.72	10.72	10.66	10.42	10.03	9.62	11.17	10.33	11.22	8.17	8.08	10.10	ANA	ANA	10.75	12.22	11.38	10.69	10.67	10.61	9.39	
46	BABDPR	TFRC-2940435	TFRC	2940435	10.41	9.99	9.95	12.56	12.66	12.37	11.40	11.58	11.35	10.84	9.74	10.44	10.61	10.46	10.34	10.27	10.06	8.99	10.62	10.30	10.73	ANA	ANA	10.12	12.53	11.44	10.41	10.53	10.22	10.64
46	BABDPR	RAMP1-2340703	RAMP1	2340703	10.81	10.78	10.78	12.76	12.75	12.73	11.93	11.61	11.81	10.27	10.43	10.12	10.36	10.42	10.37	10.38	10.37	10.38	10.37	10.38	10.37	ANA	ANA	10.32	12.76	12.32	10.76	10.29	10.36	10.90
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	10.14	11.61	11.81	12.55	12.71	12.23	11.52	11.89	11.84	9.95	10.17	10.45	10.37	10.51	9.96	10.80	10.91	10.60	10.57	10.75	11.12	ANA	ANA	11.52	12.50	11.82	10.19	10.44	10.56	10.90
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	10.78	11.96	12.08	12.45	12.44	11.58	11.58	11.58	11.58	10.27	10.43	10.12	10.36	10.42	10.37	10.51	10.57	10.57	10.57	10.57	10.57	ANA	ANA	11.81	13.02	11.91	10.41	10.46	10.95	11.26
46	BABDPR	LYN-120001	LYN	720551	12.40	12.45	12.25	12.22	12.48	12.08	11.07	11.49	11.48	10.17	10.42	10.29	10.40	10.47	10.40	10.65	10.64	10.01	10.14	9.92	10.19	ANA	ANA	12.57	12.25	11.35	10.30	10.43	10.56	10.06
46	BABDPR	CSP1-110047	CSP1	110047	12.18	11.21	12.07	12.10	12.20	12.35	12.39	11.41	12.71	10.67	10.46	11.03	10.91	10.90	10.49	10.47	9.96	10.93	10.92	10.92	10.92	ANA	ANA	11.82	12.57	11.50	10.91	10.20	10.35	10.68
46	BABDPR	SNMG5-1050475	SNMG5	1050475	11.69	11.84	12.02	12.51	12.89	12.38	11.69	11.68	11.50	10.25	10.49	10.57	10.83	10.99	10.97	11.21	11.69	11.78	11.09	10.31	10.64	ANA	ANA	12.85	12.25	11.36	10.44	10.91	11.29	10.96
46	BABDPR	LOC10013378-531024	LOC10013378	531024	12.07	12.38	12.76	12.41	12.20	12.55	12.32	11.58	11.66	10.84	10.53	10.48	10.37	10.64	10.33	10.83	10.37	11.59	11.83	11.48	11.46	ANA	ANA	11.39	11.82	11.88	10.62	10.80	10.88	11.54
46	BABDPR	C10B7P76-AS1-7100632	C10B7P76-AS1	7100632	11.54	11.48	11.79	12.57	12.58	12.76	11.48	11.20	11.72	10.30	10.31	10.45	10.16	10.33	10.63	10.86	11.00	11.23	11.59	11.55	ANA	ANA	11.60	12.54	11.47	10.33	10.30	10.67	11.34	
46	BABDPR	CTSH-198028	CTSH	198028	10.93	10.26	11.40	11.98	11.33	12.45	11.33	9.66	12.17	11.42	9.85	11.79	11.45	9.77	11.42	11.01	11.70	11.36	11.67	11.48	12.83	ANA	ANA	11.22	11.92	11.12	11.02	10.61	11.08	11.78
46	BABDPR	LOC10013378-531024	LOC10013378	531024	10.01	9.83	10.29	12.15	12.64	12.44	11.37	11.46	11.19	10.58	10.47	10.37	10.67	10.83	10.53	10.62	10.95	10.54	10.52	9.43	ANA	ANA	10.07	12.41	11.34	10.47	10.65	10.68	10.04	
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	10.01	10.38	10.30	10.30
46	BABDPR	LOC10013372-2340703	LOC10013372	2340703	11.03	10.94	10.66	12.19	12.32	12.19	11.48	11.12	10.88	9.85	10.03	10.17	10.39	10.36	10.22	10.46	10.22	10.19	10.32	10.41	10.27	ANA	ANA	10.88	12.30	11.16	1			

48	BPC	CCL1-450554	CCL1	405554	10.04	10.91	10.64	8.98	9.99	9.15	9.85	9.95	9.94	10.09	8.81	9.70	11.15	9.97	9.47	9.43	9.78	11.57	11.59	10.78	11.02	Yes	RNA	10.53	9.04	9.91	9.53	10.06	9.55	11.24
48	BPC	KANSL1-190338	KANSL1	190338	11.03	10.98	10.70	9.26	9.28	9.03	9.49	9.47	9.99	9.82	9.78	9.84	9.98	10.09	10.03	10.03	10.03	10.03	10.53	10.37	10.35	RNA	RNA	10.09	9.19	9.52	9.81	10.03	10.05	10.48
48	BPC	LOC44887	LOC44887	190338	10.45	10.45	10.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	9.45	RNA	RNA	9.45	9.45	9.45	9.45	9.45	9.45	9.45
48	BPC	TMEM156-200064	TMEM156	200064	10.43	10.14	10.14	8.42	8.43	8.01	8.61	8.55	9.19	8.68	8.83	9.36	9.74	10.08	9.93	9.12	9.12	11.03	9.73	10.36	9.98	RNA	RNA	10.22	8.69	9.32	9.29	9.50	9.60	10.40
48	BPC	CCL1-4280524	CCL1	6280524	10.40	10.85	9.97	9.00	8.96	8.90	9.82	9.67	9.35	9.81	8.82	9.03	11.19	9.87	9.37	9.36	9.19	11.07	10.74	10.46	10.83	Yes	RNA	10.21	8.95	9.61	9.05	10.03	9.31	10.78
48	BPC	CAC1-4886156	CAC1	4886156	10.41	10.48	10.25	8.82	8.84	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	9.34	RNA	RNA	9.34	9.34	9.34	9.34	9.34	9.34	9.34
48	BPC	SLC25A47-3406094	SLC25A47	3406094	7.50	7.83	7.80	7.38	7.47	7.60	7.54	6.68	9.74	8.06	13.38	13.24	8.06	13.68	7.88	13.36	13.36	10.90	7.80	7.73	12.17	RNA	RNA	7.64	7.86	8.61	8.06	11.56	10.84	11.50
48	BPC	LOC47134-5600767	LOC47134	5600767	7.34	7.60	7.46	7.37	7.53	7.38	9.28	9.77	9.42	11.49	11.44	11.07	11.71	11.78	10.17	12.11	11.39	12.12	9.90	11.28	11.12	RNA	RNA	7.47	7.42	9.49	11.33	11.75	11.22	11.11
48	BPC	JBP1-4403037	JBP1	4403037	7.65	7.38	7.41	7.57	7.57	8.58	8.58	7.78	9.44	11.10	10.63	11.14	11.14	10.13	10.60	11.10	12.17	11.46	11.84	12.68	RNA	RNA	7.51	7.64	8.58	11.19	10.54	11.29	10.84	
48	BPC	IFIT1-2000148	IFIT1	2000148	8.38	7.64	8.10	7.92	7.74	7.81	7.78	7.71	7.46	11.37	11.41	11.38	11.34	10.85	11.48	11.04	11.10	8.12	7.48	7.47	8.05	RNA	RNA	7.84	7.82	9.46	11.33	11.75	11.22	11.11
48	BPC	LOC200712-280136	LOC200712	280136	7.57	7.47	7.54	7.73	7.50	7.58	8.72	9.08	9.48	11.30	11.19	11.32	11.09	11.45	10.05	11.25	11.07	11.16	9.32	10.68	10.94	RNA	RNA	7.52	7.53	9.09	11.27	11.27	10.99	10.67
48	BPC	LOC1013504-1170369	LOC1013504	1170369	7.44	7.55	7.64	7.53	7.51	7.65	8.61	9.11	9.30	11.01	10.63	11.30	11.38	11.03	10.69	11.67	11.01	10.33	10.96	8.87	9.12	RNA	RNA	7.55	7.56	9.07	11.00	11.20	10.84	10.40
48	BPC	QPRT-4294291	QPRT	4294291	7.34	7.42	7.26	8.12	8.44	8.13	7.66	7.76	8.22	10.73	10.81	11.33	10.66	11.67	11.01	10.33	10.96	8.87	9.19	9.16	9.07	RNA	RNA	7.35	7.33	7.89	10.85	10.66	10.83	10.10
48	BPC	HST1HBD	HST1HBD	200710	8.43	8.29	8.81	7.80	7.74	8.17	8.59	8.64	9.04	11.58	11.38	11.02	11.56	11.58	11.68	11.27	11.11	11.04	9.11	9.86	8.97	RNA	RNA	8.51	7.96	8.57	11.28	11.36	11.56	11.34
48	BPC	SDC1-6595952	SDC1	6595952	7.46	7.69	7.83	7.51	7.62	7.66	7.60	7.73	7.75	10.14	10.62	10.47	9.99	10.46	11.35	10.82	10.80	11.98	12.38	11.76	12.45	Yes	RNA	7.66	7.60	7.70	10.38	10.22	10.99	12.14
48	BPC	LOC1-1030195	LOC1	1030195	7.47	7.55	7.58	7.40	7.45	7.56	8.00	7.80	7.67	10.56	10.50	10.96	10.62	10.51	10.30	10.40	9.80	11.00	10.10	10.29	RNA	RNA	7.53	7.47	7.85	10.10	10.10	10.61	10.17	
48	BPC	PTPA43-8915058	PTPA43	8915058	7.54	7.51	7.43	7.66	8.04	7.66	8.15	8.49	8.35	10.46	10.22	10.79	11.60	11.03	10.60	10.77	10.63	9.52	9.52	9.99	10.31	RNA	RNA	7.50	7.79	8.33	10.36	10.69	10.80	10.11
48	BPC	ITGB4-2145078	ITGB4	2145078	7.65	7.68	7.85	8.71	8.57	8.61	8.62	8.64	8.77	11.12	11.10	10.98	11.14	10.96	10.88	10.87	11.03	8.83	8.84	8.81	9.26	RNA	RNA	7.64	7.65	8.57	10.70	11.07	11.11	10.86
48	BPC	TMEM138-4509598	TMEM138	4509598	8.59	8.62	8.50	8.43	8.29	8.50	8.60	8.40	8.45	11.03	11.45	10.60	11.19	11.72	10.99	11.58	11.06	10.33	9.53	9.54	10.88	RNA	RNA	8.53	8.42	8.42	11.02	11.17	11.24	10.84
48	BPC	HIST2PA3	HIST2PA3	1205952	8.25	8.64	8.54	7.71	7.72	7.87	9.13	8.48	8.70	10.89	11.47	10.45	11.08	10.72	10.44	11.39	10.83	11.29	12.29	12.03	11.57	RNA	RNA	8.48	7.76	8.77	10.94	10.90	11.09	11.79
48	BPC	GAD45A-479255	GAD45A	479255	7.28	7.18	7.27	7.18	7.26	7.28	8.08	8.62	8.18	9.88	9.96	10.41	10.08	10.14	10.48	10.18	10.83	9.87	10.33	8.81	9.26	RNA	RNA	7.38	7.30	8.26	10.08	10.15	10.50	9.49
48	BPC	LOC1013504-5600767	LOC1013504	5600767	7.54	7.60	7.46	7.37	7.53	7.38	9.28	9.77	9.42	11.49	11.44	11.07	11.71	11.78	10.17	12.11	11.39	12.12	9.90	11.28	11.12	RNA	RNA	7.47	7.42	9.49	11.33	11.75	11.22	11.11
48	BPC	IFIT1-2000148	IFIT1	2000148	8.38	7.64	8.10	7.92	7.74	7.81	7.78	7.71	7.46	11.37	11.41	11.38	11.34	10.85	11.48	11.04	11.10	8.12	7.48	7.47	8.05	RNA	RNA	7.84	7.82	9.46	11.33	11.75	11.22	11.11
48	BPC	LOC200712-280136	LOC200712	280136	7.57	7.47	7.54	7.73	7.50	7.58	8.72	9.08	9.48	11.30	11.19	11.32	11.09	11.45	10.05	11.25	11.07	11.16	9.32	10.68	10.94	RNA	RNA	7.52	7.53	9.09	11.27	11.27	10.99	10.67
48	BPC	LOC1013504-1170369	LOC1013504	1170369	7.44	7.55	7.64	7.53	7.51	7.65	8.61	9.11	9.30	11.01	10.63	11.30	11.38	11.03	10.69	11.67	11.01	10.33	10.96	8.87	9.12	RNA	RNA	7.55	7.56	9.07	11.00	11.20	10.84	10.40
48	BPC	QPRT-4294291	QPRT	4294291	7.34	7.42	7.26	8.12	8.44	8.13	7.66	7.76	8.22	10.73	10.81	11.33	10.66	11.67	11.01	10.33	10.96	8.87	9.19	9.16	9.07	RNA	RNA	7.35	7.33	7.89	10.85	10.66	10.83	10.10
48	BPC	HST1HBD	HST1HBD	200710	8.43	8.29	8.81	7.80	7.74	8.17	8.59	8.64	9.04	11.58	11.38	11.02	11.56	11.58	11.68	11.27	11.11	11.04	9.11	9.86	8.97	RNA	RNA	8.51	7.96	8.57	11.28	11.36	11.56	11.34
48	BPC	SDC1-6595952	SDC1	6595952	7.46	7.69	7.83	7.51	7.62	7.66	7.60	7.73	7.75	10.14	10.62	10.47	9.99	10.46	11.35	10.82	10.80	11.98	12.38	11.76	12.45	Yes	RNA	7.66	7.60	7.70	10.38	10.22	10.99	12.14
48	BPC	LOC1-1030195	LOC1	1030195	7.47	7.55	7.58	7.40	7.45	7.56	8.00	7.80	7.67	10.56	10.50	10.96	10.62	10.51	10.30	10.40	9.80	11.00	10.10	10.29	RNA	RNA	7.53	7.47	7.85	10.10	10.10	10.61	10.17	
48	BPC	PTPA43-8915058	PTPA43	8915058	7.54	7.51	7.43	7.66	8.04	7.66	8.15	8.49	8.35	10.46	10.22	10.79	11.60	11.03	10.60	10.77	10.63	9.52	9.52	9.99	10.31	RNA	RNA	7.50	7.79	8.33	10.36	10.69	10.80	10.11
48	BPC	ITGB4-2145078	ITGB4	2145078	7.65	7.68	7.85	8.71	8.57	8.61	8.62	8.64	8.77	11.12	11.10	10.98	11.14	10.96	10.88	10.87	11.03	8.83	8.84	8.81	9.26	RNA	RNA	7.64	7.65	8.57	10.70	11.07	11.11	10.86
48	BPC	TMEM138-4509598	TMEM138	4509598	8.59	8.62	8.50	8.43	8.29	8.50	8.60	8.40	8.45	11.03	11.45	10.60	11.19	11.72	10.99	11.58	11.06	10.33	9.53	9.54	10.88	RNA	RNA	8.53	8.42	8.42	11.02	11.17	11.24	10.84
48	BPC	HIST2PA3	HIST2PA3	1205952	8.25	8.64	8.54	7.71	7.72	7.87	9.13	8.48	8.70	10.89	11.47	10.45	11.08	10.72	10.44	11.39	10.83	11.29	12.29	12.03	11.57	RNA	RNA	8.48	7.76	8.77	10.94	10.90	11.09	11.79
48	BPC	GAD45A-479255	GAD45A	479255	7.28	7.18	7.27	7.18	7.26	7.28	8.08	8.62	8.18	9.88	9.96	10.41	10.08	10.14	10.48	10.18	10.83	9.87	10.33	8.81	9.26	RNA	RNA	7.38	7.30	8.26	10.08	10.15	10.50	9.49
48	BPC	LOC1013504-5600767	LOC1013504	5600767	7.54	7.60	7.46	7.37	7.53	7.38	9.28	9.77	9.42	11.49	11.44	11.07	11.71	11.78	10.17	12.11	11.39	12.12	9.90	11.28	11.12	RNA	RNA	7.47	7.42	9.49	11.33	11.75	11.22	11.11
48	BPC	IFIT1-2000148	IFIT1	2000148	8.38	7.64	8.10	7.92	7.74	7.81	7.78	7.71	7.46	11.37	11.41	11.38	11.34	10.85	11.48	11.04	11.10	8.12	7.48	7.47	8.05	RNA	RNA	7.84	7.82	9.46	11.33	11.75	11.22	11.11
48	BPC	LOC200712-280136	LOC200712	280136	7.57	7.47	7.54	7.73	7.50	7.58	8.72	9.08	9.48	11.30	11.19	11.32	11.09	11.45	10.05	11.25	11.07	11.16	9.32	10.68	10.94	RNA	RNA	7.52	7.53	9.09	11.27	11.27	10.99	10.67
48	BPC	LOC1013504-1170369	LOC1013504	1170369	7.44	7.55	7.64	7.53	7.51	7																								

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