Table S14: GO component analysis of top 100 signals, when compared to all signals, from CEU population using the $T_2$ test statistic.

| Description | $p$-value | Enrichment | Genes |
|---|---|---|---|
| Integral to lumenal side of endoplasmic reticulum membrane | $8.5 \times 10^{-15}$ | 62.8 | *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| ER to Golgi transport vesicle membrane | $5.8 \times 10^{-14}$ | 52.3 | *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| MHC protein complex | $2.1 \times 10^{-13}$ | 46.2 | *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Transport vesicle membrane | $5.5 \times 10^{-13}$ | 31.7 | *CPE*, *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Endocytic vesicle membrane | $9.0 \times 10^{-13}$ | 24.0 | *CUBN*, *DMBT1*, *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| MHC class II protein complex | $8.7 \times 10^{-11}$ | 74.8 | *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Integral to endoplasmic reticulum membrane | $1.3 \times 10^{-9}$ | 18.5 | *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Clathrin-coated endocytic vesicle membrane | $2.1 \times 10^{-9}$ | 47.6 | *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Intrinsic to endoplasmic reticulum membrane | $6.1 \times 10^{-9}$ | 15.6 | *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Trans-Golgi network membrane | $8.1 \times 10^{-9}$ | 38.8 | *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Cytoplasmic vesicle membrane | $9.7 \times 10^{-9}$ | 7.9 | *CPE*, *CUBN*, *DMBT1*, *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1*, *SNX19* |
| Coated vesicle membrane | $1.0 \times 10^{-8}$ | 14.7 | *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Vesicle membrane | $1.6 \times 10^{-8}$ | 7.6 | *CPE*, *CUBN*, *DMBT1*, *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1*, *SNX19* |
| Cytoplasmic vesicle part | $2.0 \times 10^{-7}$ | 6.1 | *CPE*, *CUBN*, *DMBT1*, *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1*, *SNX19* |
| Integral to organelle membrane | $7.5 \times 10^{-7}$ | 8.9 | *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Intrinsic to organelle membrane | $1.9 \times 10^{-6}$ | 8.0 | *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Endosome membrane | $5.0 \times 10^{-6}$ | 6.2 | *CUBN*, *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Lysosomal membrane | $7.4 \times 10^{-6}$ | 9.8 | *CUBN*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Endosomal part | $7.7 \times 10^{-6}$ | 5.9 | *CUBN*, *HLA-A*, *HLA-B*, *HLA-C*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Clathrin-coated vesicle membrane | $9.2 \times 10^{-6}$ | 12.3 | *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Phagocytic vesicle membrane | $2.2 \times 10^{-5}$ | 24.1 | *DMBT1*, *HLA-A*, *HLA-B*, *HLA-C* |
| Vacuolar membrane | $2.2 \times 10^{-5}$ | 8.3 | *CUBN*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |
| Vacuolar part | $5.1 \times 10^{-5}$ | 6.1 | *CUBN*, *GPC5*, *HLA-DPA1*, *HLA-DPB1*, *HLA-DQA1*, *HLA-DQB1*, *HLA-DRA*, *HLA-DRB1* |

GO categories in which false discovery rate is less than 0.01.