Table S1. Evaluation of the models by comparison to curated tissue-specific enzymes. For each model, the set of genes is compared to the set of genes annotated as existing in the corresponding tissue in BRENDA. The p-values are derived from hypergeometric distribution.

| Model Cell type                      | BRENDA Tissue name | BRENDA EC numbers | BRENDA Ensembl | Model Ensembl | Overlap | p-value |
|--------------------------------------|--------------------|-------------------|----------------|---------------|---------|---------|
| Adrenal gland-cortical cells         | adrenal gland      | 165               | 335            | 1113          | 169     | 9.82e-37|
| Bone marrow-bone marrow poietic cells| bone marrow        | 115               | 375            | 1031          | 168     | 7.23e-33|
| Breast-glandular cells               | breast             | 56                | 259            | 1021          | 79      | 1.17e-06|
| Cerebellum-cells in granular layer   | cerebellum         | 166               | 681            | 855           | 199     | 4.53e-22|
| Cerebral cortex-glial cells          | cerebral cortex    | 122               | 542            | 965           | 180     | 1.85e-20|
| Colon-glandular cells                | colon              | 196               | 590            | 1157          | 269     | 3.30e-45|
| Duodenum-glandular cells             | duodenum           | 67                | 119            | 1202          | 74      | 1.92e-21|
| Epididymis-glandular cells           | epididymis         | 84                | 241            | 1113          | 140     | 2.35e-39|
| Esophagus-squamous epithelial cells  | esophagus          | 39                | 129            | 970           | 79      | 1.11e-28|
| Fallopian tube-glandular cells       | fallopian tube     | 6                 | 13             | 1154          | 10      | 2.58e-05|
| Gall bladder-glandular cells         | gall bladder       | 14                | 40             | 1155          | 18      | 4.52e-04|
| Hippocampus-glial cells              | hippocampus        | 147               | 635            | 962           | 200     | 6.59e-20|
| Kidney-cells in glomeruli            | kidney             | 886               | 1521           | 826           | 491     | 1.53e-95|
| Liver-hepatocytes                    | liver              | 1484              | 1713           | 1154          | 820     | 1.0e-200|
| Lung-macrophages                     | lung               | 560               | 1140           | 1206          | 432     | 5.36e-43|
| Lymph node-lymphoid cells outside centra | lymph node   | 62                | 145            | 933           | 70      | 1.53e-18|
| Ovary-follicle cells                 | ovary              | 298               | 809            | 975           | 280     | 7.31e-36|
| Pancreas-exocrine glandular cells    | pancreas           | 325               | 719            | 1112          | 287     | 1.82e-38|
| Placenta-decidual cells              | placenta           | 347               | 806            | 1111          | 370     | 7.79e-72|
| Prostate-glandular cells             | prostate           | 88                | 230            | 1036          | 103     | 5.25e-20|
| Rectum-glandular cells               | rectum             | 18                | 38             | 1207          | 31      | 9.68e-15|
| Salivary gland-glandular cells       | salivary gland     | 75                | 273            | 986           | 74      | 5.26e-05|
| Seminal vesicle-glandular cells      | seminal vesicle    | 30                | 48             | 1172          | 26      | 5.67e-07|
| Skeletal muscle-myocytes             | skeletal muscle    | 327               | 940            | 1041          | 357     | 2.16e-51|
| Skin-adnexal cells                   | skin               | 186               | 410            | 1181          | 246     | 4.07e-69|
| Small intestine-glandular cells      | small intestine    | 260               | 557            | 1109          | 279     | 2.81e-62|
| Smooth muscle-smooth muscle cells    | smooth muscle      | 52                | 183            | 996           | 79      | 1.72e-15|
| Spleen-cells in red pulp             | spleen             | 471               | 941            | 1044          | 387     | 5.65e-68|
| Stomach 1-glandular cells            | stomach            | 203               | 519            | 1077          | 220     | 1.11e-35|
| Testis-cells in seminiferus ducts    | testis             | 445               | 1060           | 1045          | 414     | 1.50e-65|
| Thyroid gland-glandular cells        | thyroid gland      | 84                | 326            | 1178          | 128     | 5.49e-14|
| Tonsil-lymphoid cells outside centra | tonsil             | 17                | 79             | 977           | 54      | 4.03e-23|
| Urinary bladder-urothelial cells     | urinary bladder    | 20                | 29             | 1203          | 21      | 9.48e-09|