CLAIMS

1. A method of generating a thymic cell product comprising:

a) generating one or more population of thymic cells;

b) extracting and sequencing RNA from each of the population of thymic cells;

c) analyzing RNA sequenced in a) to identify sub-populations within each population of thymic cells to generate a test thymic molecular profile for each of the population of thymic cells;

d) comparing each of the test thymic molecular profiles to a reference thymic molecular profile, wherein the reference thymic molecular profile comprises the molecular profile of a single cell atlas of human thymus epithelial cells; and

e) identifying a thymic cell product by selecting a test thymic molecular profile that has a ratio of the proportion of a cell type in the test thymic molecular profile to the proportion of the cell type in the reference thymic molecular profile (Sub-Population Ratio or SPR) or a ratio of the proportion of cortical thymic epithelial cells (cTEC) high to cTEC low within a particular thymic molecular profile (Relative cTEC Ratio or RCTR) of from 0.7 to 1.4.

2. The method of claim 1, wherein the sub-populations within each population of thymic cells comprise one or more of immature thymic epithelial cells (iTECs), cTEC-high cells, cTEC-low cells, Aire+ mTEC-high cells, mTEC-low cells, Corneocyte like mTEC cells, Ciliated cells , Myelin cells, Myoid cells, Neuroendocrine cells and Tuft/lonocyte cells.

3. The method of any one of claims 1-2, wherein the SPR of from 0.7 to 1.4, preferably the SPR is a iTEC SPR, a cTEC-high SPR, a cTEC-low SPR, a Aire+ mTEC-high SPR, a mTEC-low SPR, a Corneocyte like mTEC SPR, a Ciliated SPR, a Myelin SPR, a Myoid SPR, a Neuroendocrine SPR and a Tuft/lonocyte SPR.

4. The method of claim 2, wherein the iTEC SPR, the cTEC-high SPR, the cTEC-low SPR, the Aire+ mTEC-high SPR, the mTEC-low SPR, the Corneocyte like mTEC SPR, the Ciliated SPR, the Myelin SPR, the Myoid SPR, the Neuroendocrine SPR and the Tuft/lonocyte SPR is from 0.7 to 1.4, preferably wherein the SPR is an the iTEC SPR, and wherein the iTEC is 1.

5. The method of claim 1, wherein the RCTR is of from 0.7 to 1.4, preferably the RCTR is 1.

6. The method of claim 1, wherein the one or more populations of thymic cells are prepared by differentiation of stem cells, preferably induced pluripotent stem cells.

7. The method of claim 1, wherein the reference thymus map is prepared from one or more human thymi, preferably wherein the human thymi are selected from fetal human thymi, postnatal human thymi, adolescent thymi, adult human thymi or a combination thereof.

8. The method of claim 2, wherein:

(i) the subpopulation comprises iTEC, and wherein iTEC comprises expression of one or more of IGKC (ENSG00000211592), ANAX2, LIMA1 (ENSG00000050405), EGFR (ENSG00000146648), ASCL1 (ENSG00000139352), HES1 (ENSG00000114315), JUND (ENSG00000130522), FOS (ENSG00000170345), ARID5B (ENSG00000150347), IRF1 (ENSG00000125347), MAFB (ENSG00000204103), IFI16 (ENSG00000163565) , FOXC1 (ENSG00000054598), STAT1 (ENSG00000115415), JUNB (ENSG00000171223), EGFR1, ZFP36 (ENSG00000128016), JUN (ENSG00000177606), FOSB (ENSG00000125740), IER2 (ENSG00000160888), PAX9 (ENSG00000198807), and/or HIF1A (ENSG00000100644); and/or

(ii) the subpopulation comprises cTEC, and wherein cTEC comprises expression of one or more of PSMA3 (ENSG00000100567), FABP5 (ENSG00000164687), APRT (ENSG00000198931), LSM6 (ENSG00000164167), CTSV (ENSG00000136943), SNRPE (ENSG00000182004), ECHS1 (ENSG00000127884), HSPE1 (ENSG00000115541), RAN (ENSG00000132341), TMA7 (ENSG00000232112), TIMM13 (ENSG00000099800), LDHB (ENSG00000111716), ECI1 (ENSG00000167969), GCSH (ENSG00000140905), NOP58 (ENSG00000055044), MRPL11 (ENSG00000174547), STOML2 (ENSG00000165283), ING2 (ENSG00000168556), TOMM7 (ENSG00000196683), MRPS34 (ENSG00000074071), MRPL14 (ENSG00000180992), MRPL57 (ENSG00000173141), IMP3 (ENSG00000177971), MZT2A (ENSG00000173272), and/or XRCC6 (ENSG00000196419); and/or

(iii) the subpopulation comprises corneocyte-like mTEC, and wherein corneocyte-like mTEC comprises expression of one or more of CD24 (ENSG00000272398), ELF3 (ENSG00000163435), CLDN4 (ENSG00000189143), MAL2 (ENSG00000147676), ASAH1 (ENSG00000104763), TMEM123 (ENSG00000152558), TMBIM6 (ENSG00000139644),

LGALS3 (ENSG00000131981-), MYL12B (ENSG00000118680), ACADVL (ENSG00000072778), KRT19 (ENSG00000171345), SAT1 (ENSG00000130066), RAB25 (ENSG00000132698), WFDC2 (ENSG00000101443), VAMP8 (ENSG00000118640), SPINT1 (ENSG00000166145), SERPINB1 (ENSG00000021355), CDH1 (ENSG00000039068), GSN (ENSG00000148180), SDC4 (ENSG00000124145), MGST2 (ENSG00000085871), CAST (ENSG00000153113), B4GALT1 (ENSG00000086062), PERP (ENSG00000112378), and/or DMKN (ENSG00000161249).