WHAT IS CLAIMED IS:

1. An in vitro human liver organoid comprising hepatocytes, cholangiocytes and at least two cell types selected from the group consisting of liver specific endothelial cells (LSEC), stellate cells, hepatic myofibroblast and hepatoblasts,

wherein the hepatocytes

a) express albumin (ALB);

b) express the hepatocyte markers HNF4a (NCBI: 3172), FAH (NCBI: 2184), TAT (NCBI: 6898), GCK (NCBI: 2645), TTR (NCBI: 7276), MET (NCBI: 4233), GLUl/MGAM (NCBI: 8972), FAHD2A (NCBI: 51011), HNF1B (NCBI: 6928), HNF1A (NCBI: 6927), CYP3A4 (NCBI: 1576), CYP2C9 (NCBI: 1559), CYP2C19 (NCBI: 1557), CYP1A2 (NCBI: 1544), CYP2E1 (NCBI: 1571), CYP2D6 (NCBI: 1565), CYP3A7 (NCBI: 1551), CYP1A1 (NCBI: 1543), CYP3A5 (NCBI: 1577), CYP27A1 (NCBI: 1593), MRP2 (NCBI:1244), NTCP (NCBI: 6554), OATP1B3 (NCBI: 28234), UGT2B7 (NCBI: 7364), UGT2B15 (NCBI: 7366), UGT1A1 (NCBI: 54658), CEBP (NCBI: 1050), KRT8 (NCBI: 3856), NOTCH2 (NCBI: 4853) and CYP2B6 (NCBI: 1555); and

c) do not express the cholangiocyte marker Cytokeratin 7 (CK7);

wherein the organoids are capable of performing liver functions and exhibit a spatially organized structure comprising a core of hepatocytes and peripheral bile duct-like structures formed by cholangiocytes around the core of hepatocytes, and

the hepatocytes are connected by a network of bile canaliculi to the cholangiocyte bile duct-like structures.

2. The liver organoid of claim 1, wherein the cholangiocytes express CK7 but do not express albumin (ALB).

3. The liver organoid of claim 2, wherein the cholangiocytes further express a marker selected from CFTR (NCBI: 1080), CK19 (NCBI: 3880), HNF1B (NCBI: 6928) or SOX9 (NCBI: 6662).

4. The liver organoid of claim 1, wherein the hepatoblasts express at least one marker selected from the group consisting of SOX9 (NCBI: 6662), CK19 (NCBI: 3880), CK18 (NCBI: 3875), HNF4a (NCBI: 3172), PROX1 (NCBI: 5629), ONECUT1 (NCBI: 3175), AFP (NCBI: 174), and ALB (NCBI: 213).

5. The liver organoid of claim 1, wherein the liver specific endothelial cells (LSEC) express at least one marker selected from the group consisting of CD45, CD80, CD86, CD11c, VAP1, STAB1 and CD31, wherein the CD31 expression is mainly in the cytoplasm and not on the cell surface.

6. The liver organoid of claim 1, wherein the stellate cells express at least one marker selected from the group consisting of GFAP, VIM, LHX2, LRAT, PDGFRb, HAND2, ICAM-1, VCAM-1, and N-CAM-1.

7. The liver organoid of claim 1, wherein the hepatic myofibroblast express a marker selected from the group consisting of COL1A1 and α-SMA.

8. The liver organoid of claim 1, wherein the liver organoid comprises parenchymal and non-parenchymal cell types that originate from the same primary stem cells.

9. The liver organoid of claim 1, wherein the cells are cultured in suspension without the use of extracellular matrices.

10. The liver organoid of claim 1, wherein the liver functions are selected from the group consisting of liver specific metabolic activities, albumin secretion, glycogen storage, low density lipo-protein uptake, bile acid production, drug metabolism, and cytochrome enzymatic activities.

11. The liver organoid of claim 1, wherein the spatially organized structure comprises endogenous extracellular matrix adhesion molecules.

12. The liver organoid of claim 1, wherein the spatially organized structure comprises liver parenchymal cells in both the interior and exterior of the organoid.