

SUPPLEMENTS

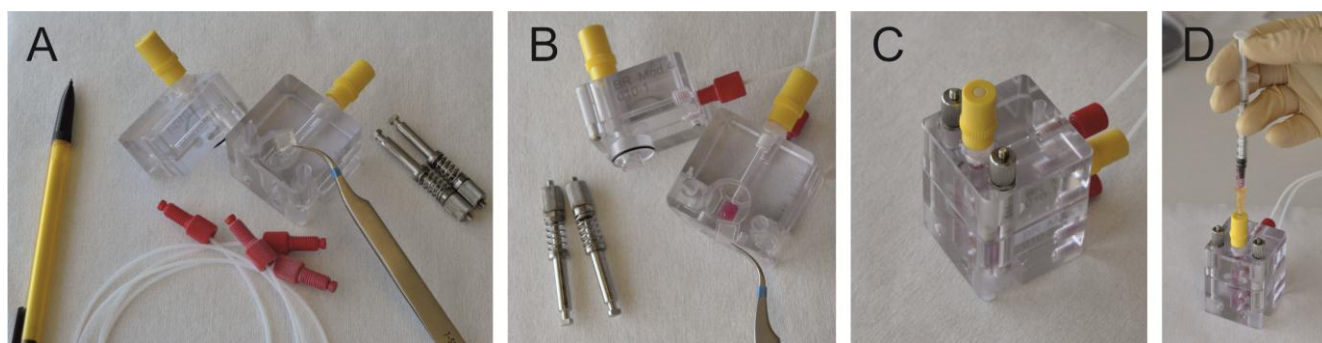


Fig.S1. The easy to handle micro bio reactor consists of 2 modules which need to be assembled and connected to tubings (A). For 3D perfused cell cultivation, the micro bio reactor is filled with cultivation medium and prepared for insertion of MatriGrid (B). The now fully assembled and secured system is ready for incubation (C). A septum allows for easy sample taking for further analysis (D).

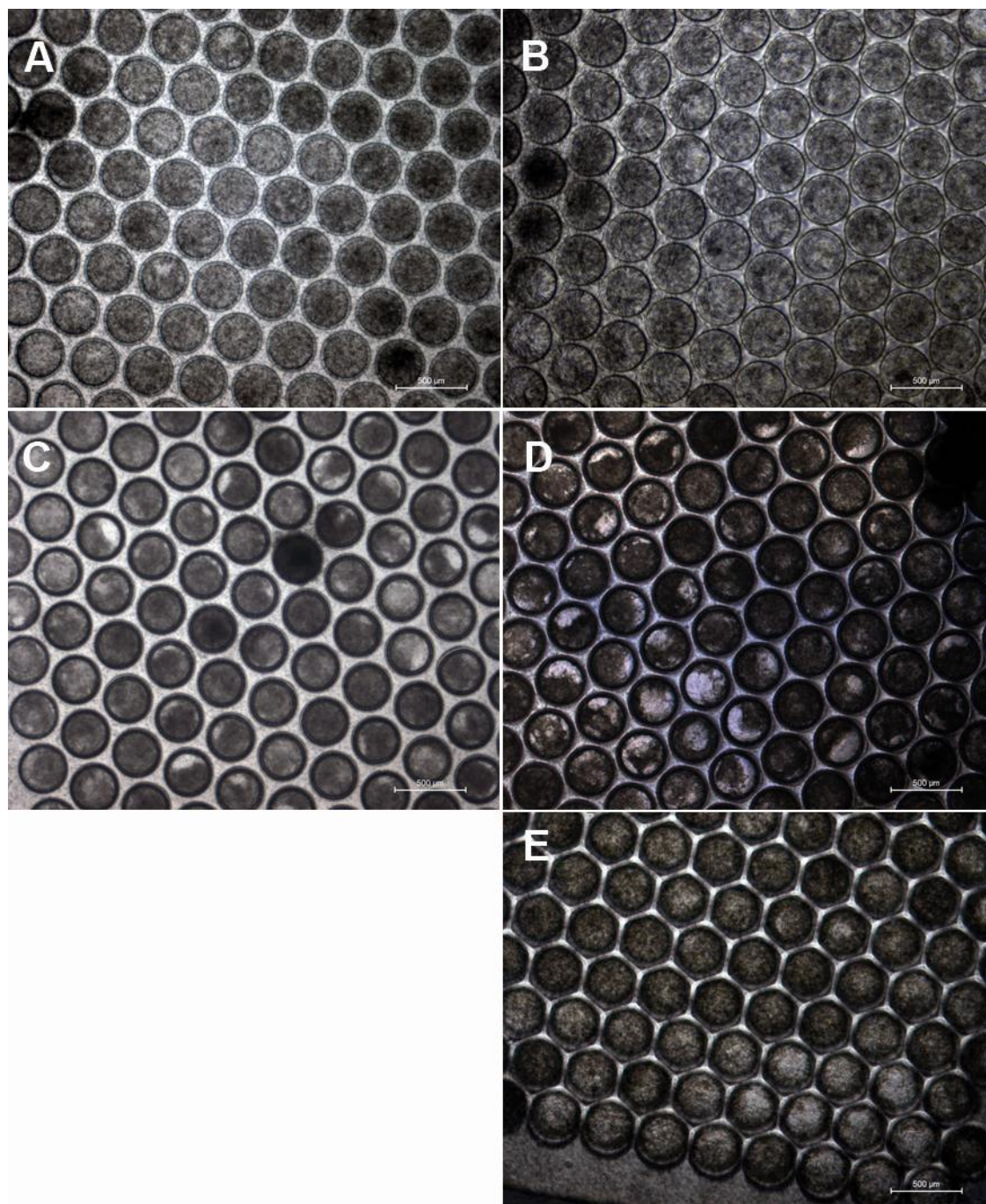


Fig.S2. Documentation of homogeneity of cell seeding after 5 days of cultivation in independent MatriGrids under static (A,C) and perfused conditions (B,D,E). The bar =500μm.

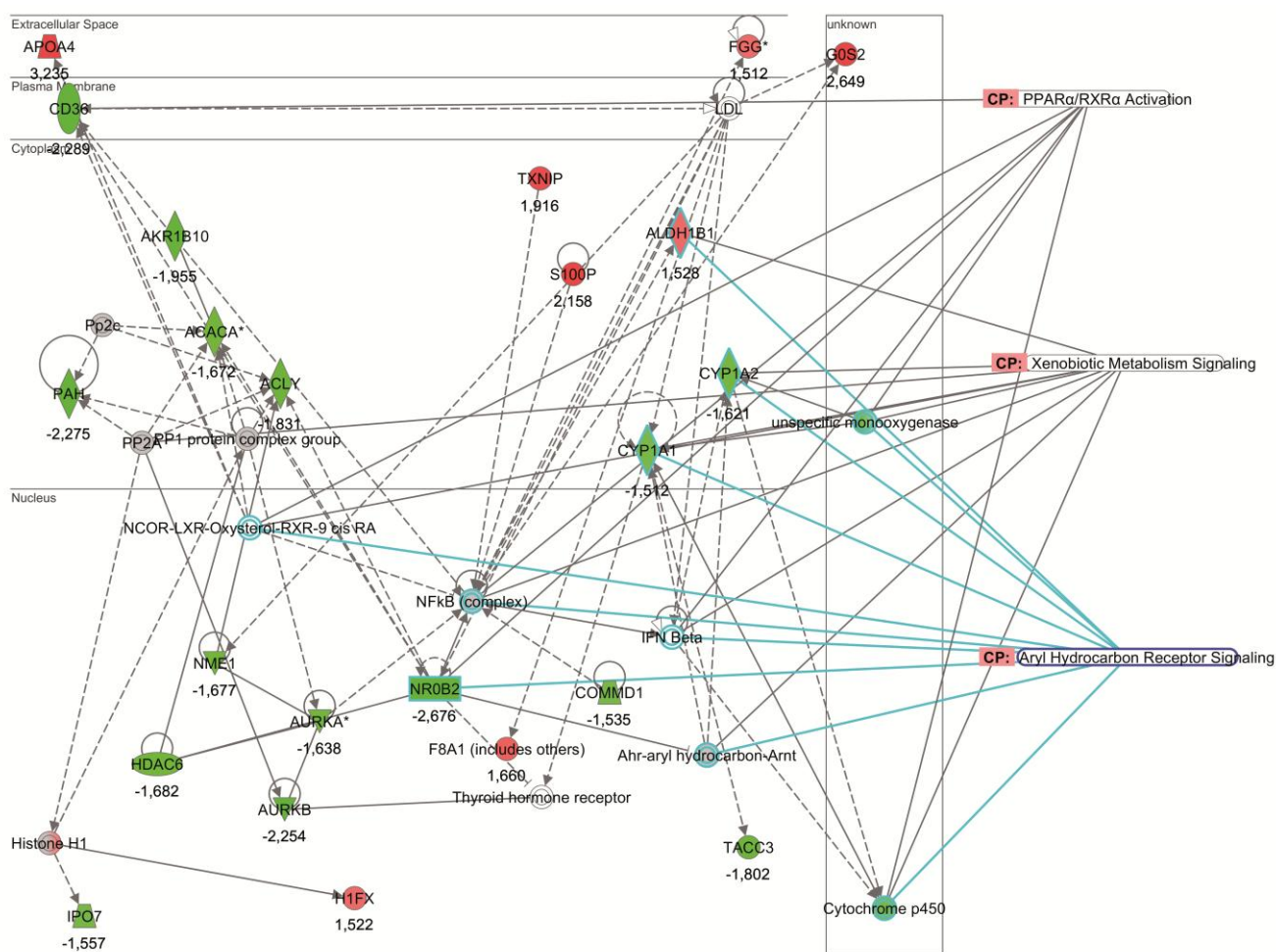


Fig.S3. Gene network “Lipid metabolism, small molecule biochemistry, vitamin and mineral metabolism” for a static 3D cell cultivation of biopsy derived primary hepatocytes of Patient 2. Major enzyme function involved in metabolism is downregulated under static conditions. Up regulated genes appear red while down regulated molecules are toned green. The intensity of the node colour indicates the degree of upregulation. Genes in uncolored nodes were not identified as differentially expressed and were implemented on the basis of evidence stored in IPA knowledge base. The node shapes signify enzymes \diamond , transcription factors \circ , transporters \triangle , growth factors \square , other \circ .

Table S1. Flow resistance of MatriGrids^a before and after cell seeding

MatriGrid, nontreated		Collagen- coated MatriGrid		Collagen- coated MatriGrid 24h after cell seeding	
Flow resistance correlated to a relative pore size [μm]					
Mean	SD	Mean	SD	Mean	SD
2,28	0,10	1,27	0,30	1,49	0,46

^a A number of 6 MatriGrids were analysed per test.

Table S2. Comparison of different bioreactor types

Source	Type of bioreactor	Operating volume	Material	Medium Flow Rate	3D support	Cell type	Cell seeding number	Cultivation period (days)	Citation
Domansky et al.	open well multichamber bioreactor	3ml	Polycarbonate/ Polystyrene	250 $\mu\text{l}/\text{min}$	ECM-coated polymer wafer with 769 μm channels (depth 240 μm , diameter 340mm), backed by porous filter (5 μm Pores)	primary rat hepatocytes	0,4-0,6*10 ⁶	7	12
Vinci et al.	Multichamber modular bioreactor	2-3ml	Silicone	250-500 $\mu\text{l}/\text{min}$	collagen sandwich	primary human hepatocytes		14	28
Hongo et al.	Radial flow bioreactor	5ml			SIRAN, hydroxyapatite, calcine cattle bone calcium powder, polyurethane foam	HepG2 cells		17	38
Prot et al.	Microfluidic biochip	40 μl	PDMS	10 $\mu\text{l}/\text{min}$	Microfluidic biochip	HepG2 cells	0.25*10 ⁶	4	9
Lübberstedt et al.	hollow-fibre membrane bioreactor	0.5ml	Polyurethane	0.5ml/h	hollow fiber membranes surrounding injected cells	primary human hepatocytes	2*10 ⁷	10	4
Schütte et al.	HepaChip	n.a.	cyclic olefin polymers (COP)	3 $\mu\text{l}/\text{min}$	collagen- coated microchannels	Cryopreserved human hepatocytes		1	10
Fernekom et al.	Modular monobioreactor	1.4ml	Polycarbonate	25 $\mu\text{l}/\text{min}$	collagen-coated microporous polycarbonate scaffold (200 μm depth, 300 μm diameter)	primary human hepatocytes	1*10 ⁶	5	