Supporting Information

Development of a biomimetic liver tumor-on-a-chip model based on decellularized liver matrix for toxicity testing

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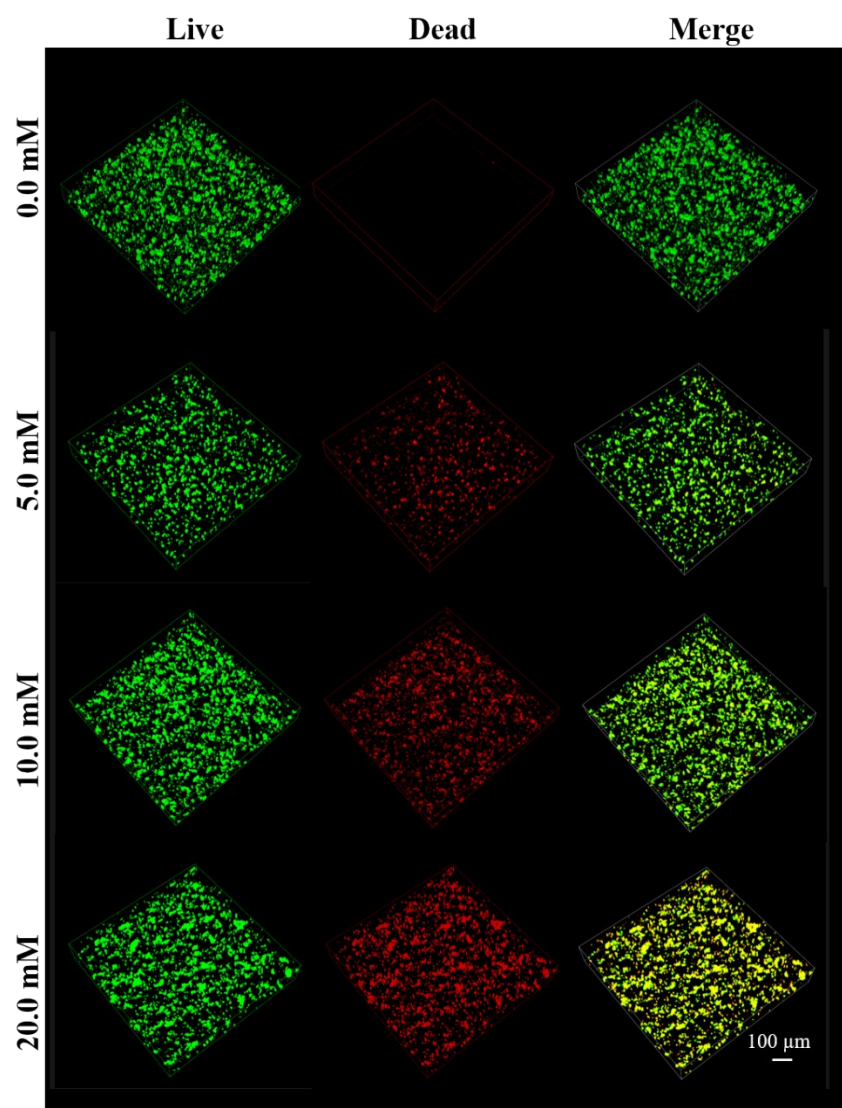
Fig. S1 Live/dead staining of HepG2 cells in the 2:3 DLM-GelMA hydrogels after adding 0.0, 5.0, 10.0, and 20.0 mM of acetaminophen after 24h. Live cells were stained in green, and dead cells are stained in red. The yellow color represented the overlaid images of live and dead cells.
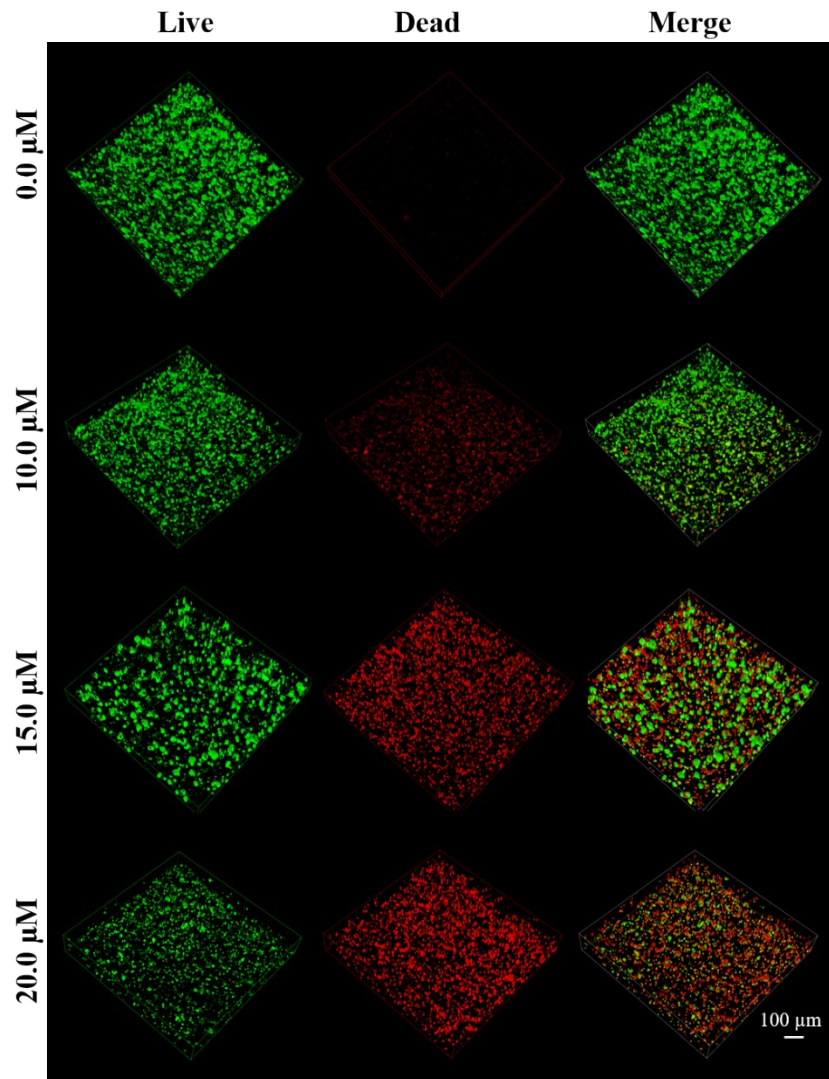
Fig. S2 Live/dead staining of HepG2 cells in the 2:3 DLM-GelMA hydrogels after adding 0.0, 10.0, 15.0, and 20.0 µM of sorafenib after 24h. Live cells were stained in green, and dead cells are stained in red. The yellow color represented the overlaid images of live and dead cells.
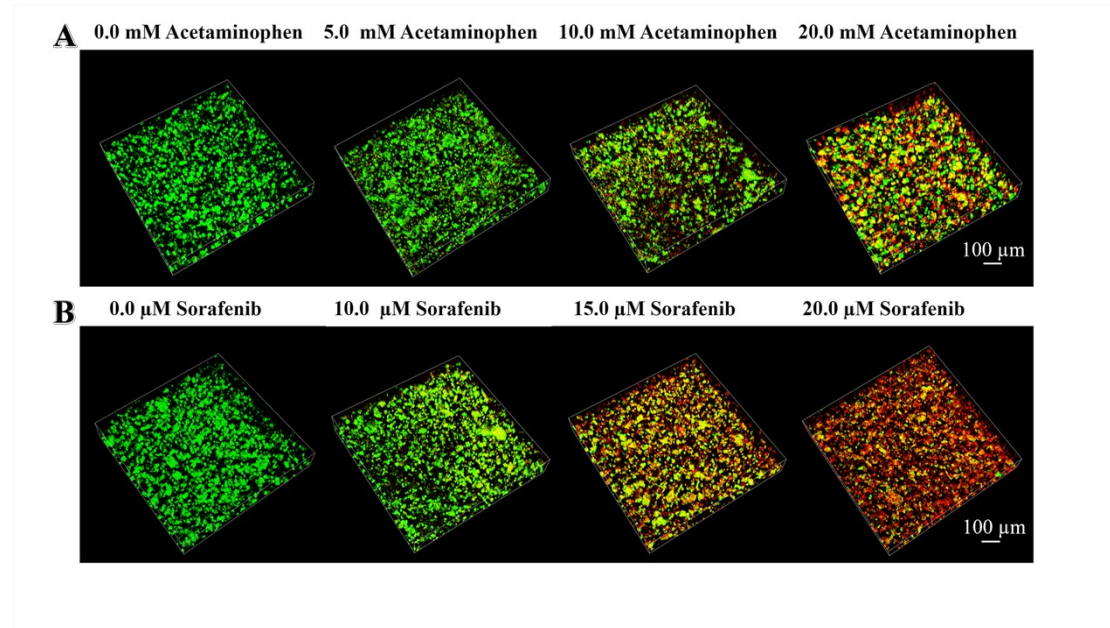
Fig. S3 Evaluation of acetaminophen/sorafenib induced toxicity using the tumor-on-a-chip platform with embedded 3D HepG2-laden GelMA. (A) Live/dead staining showing acetaminophen (0.0, 5.0, 10.0 and 20.0 mM) treatment of HepG2 embedded in GelMA for 24 h. Scale bar: 100 µm. (B) Live/dead staining showing sorafenib (0.0, 10.0, 15.0 and 20.0 µM) treatment of HepG2 embedded in GelMA only for 24 h. Scale bar: 100 µm.

Table S1. Calculation of collagen concentration in native liver, DLM solution and DLM-UV light.

	Native liver		DLM solution		DLM-UV light	
Sample Volume (µL)	400		400		400	
HYP (µg)	3.480	± 0.586	8.018	± 2.819	8.213	± 1.317
Collagen (µg)	25.058	± 4.22	57.731	± 20.297	59.135	± 9.486
Dry weight (mg)	3		0.4		0.4	
Dry Weight Collagen (µg/mg)	8.35	± 2.44	144.33	± 87.89	147.84	± 41.07
Total Collagen in the sample (µg)	25.1		57.7		59.1	
Concentration of Collagen in live tissues (µg/µL)	0.06275		0.14433		0.14784	
Concentration of Collagen from DLM in Chip (µg/µL)	N/A		N/A		0.0591	

Table S2. Preparation of different volume ratios of DLM-GelMA

DLM-GelMA	DLM (µL)	10 wt% GelMA (µL)	PI (g)
GelMA only	0	1,000	0.01
1:9 DLM-GelMA	100	900	0.01
1:4 DLM-GelMA	200	800	0.01
3:7 DLM-GelMA	300	700	0.01
2:3 DLM-GelMA	400	600	0.01
1: 1 DLM-GelMA	500	500	0.01

Abbreviations: PI = photoinitiator

Table S3. Dimensions of liver tumor-on-a-chip

Dimensions	Top Layer	Bottom Layer
Width of chamber (w)	5 mm	5 mm
Length of chamber (l)	15 mm	15 mm
Height of chamber (h)	0.5 mm	1 mm
Volume	45 mm^3	60 mm^3
Diameter of microchannel	1.5 mm	1.5 mm
Inner diameter of tubes	0.5 mm	0.5 mm
Outer diameter of tubes and of device inlets/outlets	2 mm	2 mm

Table S4. Quantification of collagen, glycosaminoglycans (GAG), HGF and bFGF in the DLM solution before and after UV light exposure and in the native liver.

Parameter	Native liver	DLM solution	DLM-UV light
Collagen (µg/mg dry weight)	8.35 ± 1.41	144.33 ± 50.74	147.84 ± 23.71
GAG (µg/mg dry weight)	195.23 ± 5.33	499.16 ± 14.02	479.42 ± 28.77
HGF (pg/mg dry weight)	6.70 ± 0.08	4.27 ± 0.05	4.37 ± 0.04
bFGF (pg/mg dry weight)	5.29 ± 0.09	4.58 ± 0.11	4.07 ± 0.02

Abbreviations: GAG = glycosaminoglycan; HGF = hepatocyte growth factor; bFGF = basic fibroblast growth factor

Table S5. Measurement of Young's modulus and pore size for different volume ratios of DLM-GelMA

	Young's modulus (kPa)	Pore size (µm)
GelMA only	19.56 ± 1.30	41.28 ± 1.79
1:9 DLM-GelMA	21.78 ± 0.45	56.74 ± 5.91
1:4 DLM-GelMA	19.41 ± 0.73	72.07 ± 4.81
3:7 DLM-GelMA	19.47 ± 1.45	89.87 ± 6.27
2:3 DLM-GelMA	16.91 ± 0.54	100.34 ± 8.56
1:1 DLM-GelMA	19.14 ± 0.70	101.54 ± 5.97