

Supplementary Figures

A Customized 3D Extracellular Matrix Niche Incorporating Type IV Collagen Enhances Stable Proliferation and Preserves Phenotype in Primary Mouse Hepatocytes

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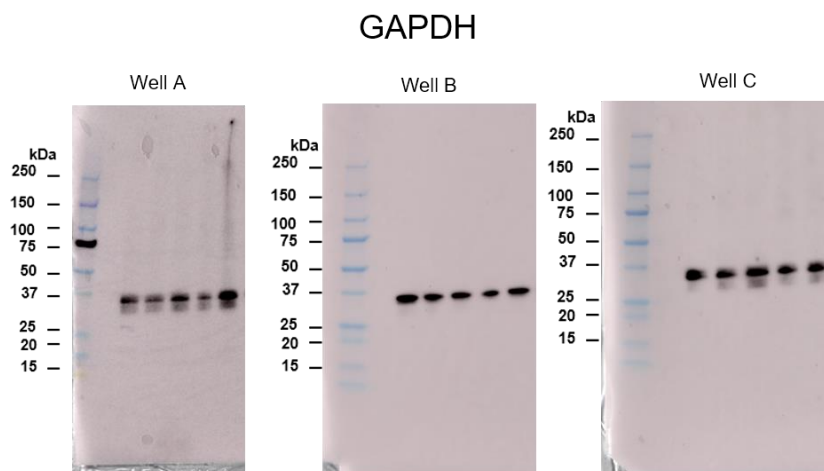
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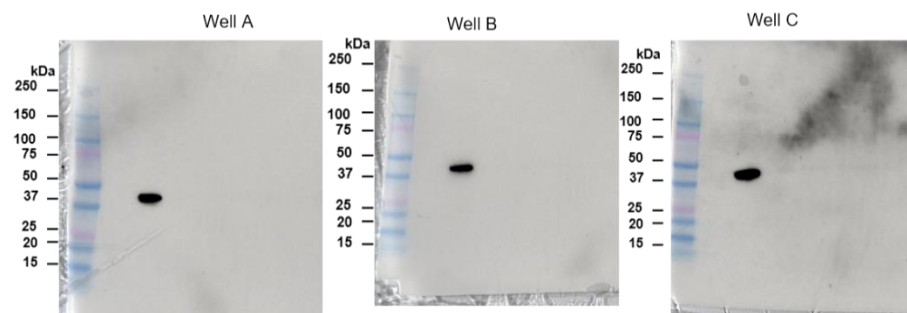
The Supplementary Figs consist of Supplementary Fig. S1, Supplementary Fig. S2, Supplementary Fig. S3, Supplementary Fig. S4, and Supplementary Fig. S5.

Supplementary Fig. S1: Raw uncropped western blot images and quantitative densitometric analysis.

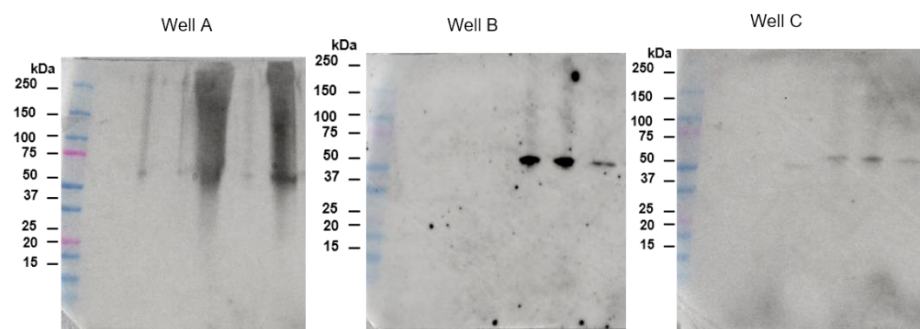
A. WB data



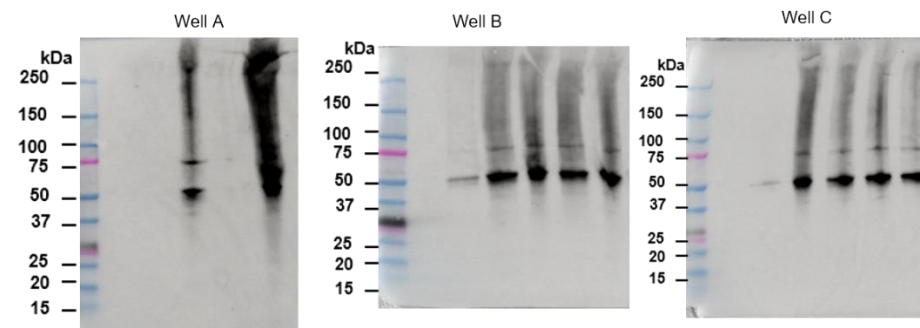
CK19



Albumin



Cyp3a



B. Quantitative analysis data of WB

CK19

1. CK19 Band Intensities			
Condition	well A	well B	well C
MG	13,049.368	12,919.225	16,198.983
MM-511	131.263	35.895	614.184
Col I/IV gel	101.314	88.849	44.352
Col I gel	32.713	16.761	173.678
MM-111	48.375	36.606	69.192
2. GAPDH Band Intensities			
Condition	well A	well B	well C
MG	7139.79	14163.083	12073.184
MM-511	5382.355	10691.669	8816.648
Col I/IV gel	8312.598	10317.134	9636.619
Col I gel	7958.598	8955.841	9438.719
MM-111	10218.326	11642.669	11685.083

CK19 Expression Analysis			
<i>Normalized to GAPDH & Statistical Comparison against MG Control Group</i>			
Substrate	Mean (CK19/GAPDH)	SD	Student's t-test
MG	1.3605	0.4580	-
MM-511	0.0325	0.0339	0.00745
Col I/IV gel	0.0085	0.0038	0.00692
Col I gel	0.0081	0.0090	0.00692
MM-111	0.0046	0.0014	0.00685

Albumin

1. Albumin (ALB) Raw Data			
Condition	well A	well B	well C
MG	141.14	51.78	356.46
MM-511	214.14	53.36	1,128.21
Col I/IV gel	6,282.49	9,574.03	3,433.43
Col I gel	171.02	9,064.60	5,558.43
MM-111	3,639.13	4,386.70	2,429.41
2. GAPDH Raw Data			
Condition	well A	well B	well C
MG	7,139.79	14,163.08	12,073.18
MM-511	5,382.36	10,691.67	8,816.65
Col I/IV gel	8,312.60	10,317.13	9,636.62
Col I gel	7,958.60	8,955.84	9,438.72
MM-111	10,218.33	11,642.67	11,685.08

ALB Expression Analysis				
<i>Normalized by GAPDH & Compared to Control (MG)</i>				
Condition	Mean	SD	p-value (Student)	p-value (Welch)
MG	0.0176	0.0131	Control	Control
MM-511	0.0576	0.0634	0.3454	0.3896
Col I/IV gel	0.6800	0.2933	0.0174	0.0593
Col I gel	0.5408	0.4971	0.1425	0.2098
MM-111	0.3136	0.0921	0.0053	0.0288

Cyp3a

1. GAPDH Band Intensities				
Substrate	well A	well B	well C	
MG	7,139.790	14,163.083	12,073.184	
MM-511	5,382.355	10,691.669	8,816.648	
Col I/IV gel	8,312.598	10,317.134	9,636.619	
Col I gel	7,958.598	8,955.841	9,438.719	
MM-111	10,218.326	11,642.669	11,685.083	
2. Cyp3a Band Intensities				
Substrate	well A	well B	well C	
MG	33.071	218.435	1,010.163	
MM-511	232.728	4,373.355	6,777.855	
Col I/IV gel	6,238.598	6,564.355	5,240.276	
Col I gel	62.899	5,484.406	4,626.698	
MM-111	1,844.719	4,716.335	4,471.719	

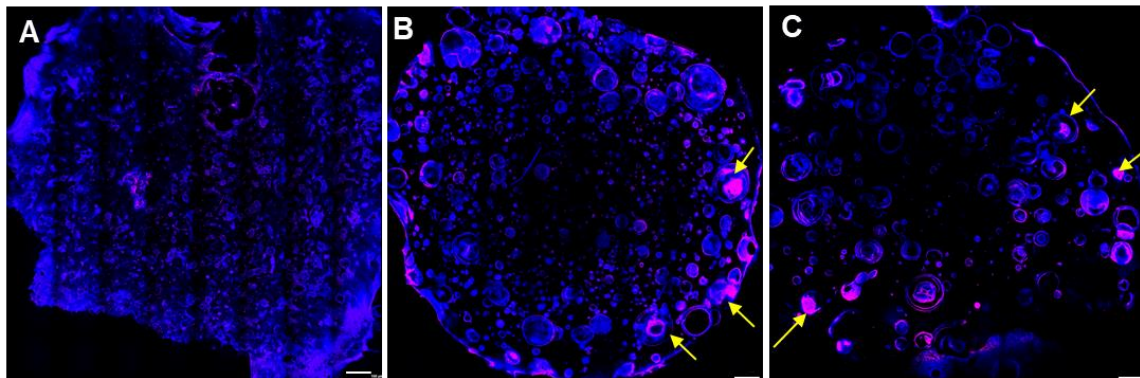
Cyp3a Expression Analysis				
<i>Normalized to GAPDH & Statistical Comparison against MG Control Group</i>				
Substrate	Mean (Cyp3a/GAPDH)	SD	p-value (Student's t-test)	Significance vs MG
MG	0.0346	0.0429	-	-
MM-511	0.4070	0.3628	0.1522	n.s.
Col I/IV gel	0.6435	0.1035	0.0007	***
Col I gel	0.3702	0.3196	0.1458	n.s.
MM-111	0.3228	0.1237	0.0189	*

(A) Raw western blot data: Full-length, uncropped western blot membrane images for GAPDH, CK19, Albumin, and Cyp3a. To ensure experimental transparency and reproducibility, the complete blots from three independent biological replicates (designated as Well A, Well B, and Well C) harvested at Day 36 (Passage 4, 8 days post-seeding) are displayed. Molecular weight markers (kDa) are indicated on the left of each membrane.

(B) Quantitative analysis data of WB: Comprehensive raw data sheets and statistical evaluation tables for CK19, Albumin (ALB), and Cyp3a protein expression levels

corresponding to the densitometric quantification in Fig. 2b. The individual band intensities for each biological replicate (Wells A, B, and C) and their respective GAPDH loading controls are provided. The summary tables present the calculated means, standard deviations (SD), and exact p-values determined by Student's t-test for statistical comparisons against the conventional Matrigel (MG) benchmark control group (n = 3 independent biological replicates). Substrate abbreviations are consistent with those defined in the main text (MG: Matrigel; MM-511: MatriMix with Laminin 511 E8; Col I/IV gel: PSC Col IV-enriched collagen gel; Col I gel: type I collagen gel; MM-111: MatriMix with Laminin 111 E8; MM-111/IV: MatriMix with Laminin 111 E8 and PSC Col IV).

Supplementary Fig. S2: Spatial distribution of Cyp3a-positive spheroids in Matrigel and laminin-functionalized MatriMix substrates.



Large-scale tiling images (8x8 fields, maximum projection) of whole gel sections at Day 26, serving as the baseline comparison for Main Figure 3A. (A) Matrigel (MG) control: Spheroids within the MG matrix exhibits minimal or sparse Cyp3a expression (red) throughout the scaffold. (B) MM-511 and (C) MM-111: In these laminin-functionalized MatriMix variants, Cyp3a-positive functional spheroids (red) are strictly restricted to the outermost periphery/edge of the gel sections (indicated by yellow arrowheads), while the vast internal mass of the gels contains predominantly Cyp3a-negative clusters (blue, DAPI). Nuclei were counterstained with DAPI (blue). Scale bars: 500 μ m.

Supplementary Fig. S3: Quantitative analysis of Cyp3a-positive spheroids.

A.

Spheroid Count for Individual Wells (A, B, C)						
Size Range	Col IV - Well A	Col IV - Well B	Col IV - Well C	Col I - Well A	Col I - Well B	Col I - Well C
$2 \times 10^2 < X \leq 1 \times 10^3$	106	102	106	55	52	49
$1 \times 10^3 < X \leq 5 \times 10^3$	503	489	490	191	175	183
$5 \times 10^3 < X \leq 1 \times 10^4$	181	173	165	111	102	105
$1 \times 10^4 < X \leq 5 \times 10^4$	193	190	180	167	163	161
$5 \times 10^4 < X \leq 1 \times 10^5$	41	39	38	41	39	40
$1 \times 10^5 < X \leq 5 \times 10^5$	24	21	18	25	24	23
Total (Overall)	1048	1014	997	590	555	561

Quantitative Analysis of Spheroid Counts per Well (Quantitative Volume Effect)						
Note: Values represent the mean number of spheroids (objects) across replicates (n=3 wells) per size category, demonstrating the quantitative survival/expansion advantage.						
Spheroid Size Range [μm^2]	Col I/IV Gel (PSC Col IV) Mean Count (Objects)	Col I/IV Gel Standard Deviation (SD)	Col I Gel Mean Count (Objects)	Col I Gel Standard Deviation (SD)	p-value (Unpaired t-test)	Statistical Significance ($\alpha = 0.05$)
$2 \times 10^2 < X \leq 1 \times 10^3$	104.7	2.3	52.0	3.0	0.000018	Highly Significant (****)
$1 \times 10^3 < X \leq 5 \times 10^3$	494.0	7.8	183.0	8.0	0.000001	Highly Significant (****)
$5 \times 10^3 < X \leq 1 \times 10^4$	173.0	8.0	106.0	4.6	0.0002	Highly Significant (****)
$1 \times 10^4 < X \leq 5 \times 10^4$	187.7	6.8	163.7	3.1	0.0051	Significant (**)
$5 \times 10^4 < X \leq 1 \times 10^5$	39.3	1.5	40.0	1.0	0.5614	Not Significant
$1 \times 10^5 < X \leq 5 \times 10^5$	21.0	3.0	24.0	1.0	0.1757	Not Significant
Total (Overall)	1019.7	26.0	568.7	18.7	0.000017	Highly Significant (****)

B.

Mean Red / Mean Blue Normalized Ratio for Individual Wells (A, B, C)						
Size Range	Col IV - Well A	Col IV - Well B	Col IV - Well C	Col I - Well A	Col I - Well B	Col I - Well C
$2 \times 10^2 < X \leq 1 \times 10^3$	0.334	0.327	0.302	0.186	0.181	0.236
$1 \times 10^3 < X \leq 5 \times 10^3$	0.312	0.265	0.253	0.186	0.149	0.195
$5 \times 10^3 < X \leq 1 \times 10^4$	0.275	0.314	0.360	0.186	0.165	0.152
$1 \times 10^4 < X \leq 5 \times 10^4$	0.258	0.236	0.245	0.183	0.185	0.189
$5 \times 10^4 < X \leq 1 \times 10^5$	0.248	0.366	0.408	0.154	0.200	0.141
$1 \times 10^5 < X \leq 5 \times 10^5$	0.232	0.213	0.232	0.201	0.277	0.289
Total (Overall)	0.290	0.277	0.280	0.184	0.174	0.186

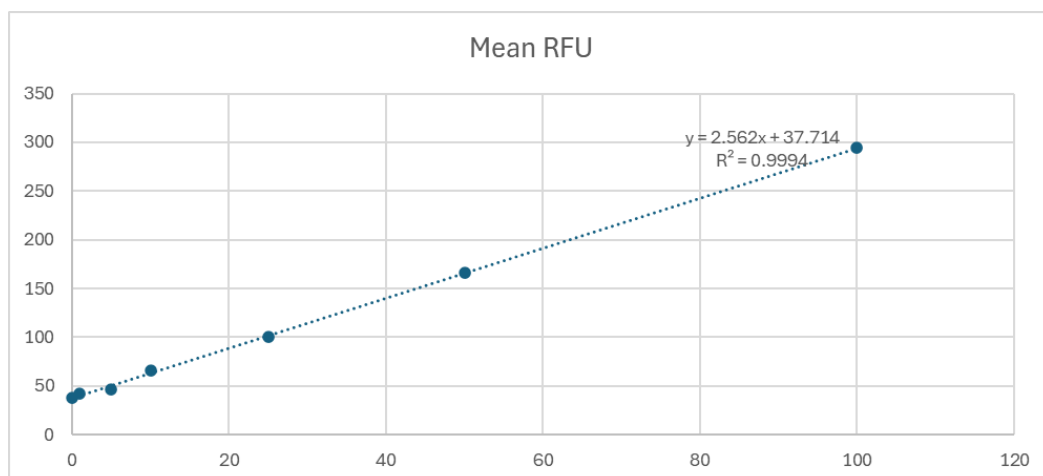
Quantitative Analysis of Cyp3a Functional Maturation (Mean Red / Mean Blue Normalized Method)						
Note: Values represent the mean of (Mean Red / Mean Blue) ratio across replicates (n=3 wells) calculated as group aggregates, neutralizing any cell density noise.						
Spheroid Size Range [μm^2]	Col I/IV Gel Mean Ratio (Cyp3a/DAPI)	Col I/IV Gel Standard Deviation (SD)	Col I Gel Mean Ratio (Cyp3a/DAPI)	Col I Gel Standard Deviation (SD)	p-value (Unpaired t-test)	Statistical Significance ($\alpha = 0.05$)
$2 \times 10^2 < X \leq 1 \times 10^3$	0.321	0.017	0.201	0.031	0.0041	Significant (**)
$1 \times 10^3 < X \leq 5 \times 10^3$	0.277	0.031	0.177	0.024	0.0119	Significant (*)
$5 \times 10^3 < X \leq 1 \times 10^4$	0.316	0.043	0.168	0.017	0.0050	Significant (**)
$1 \times 10^4 < X \leq 5 \times 10^4$	0.247	0.011	0.186	0.003	0.0008	Highly Significant (****)
$5 \times 10^4 < X \leq 1 \times 10^5$	0.341	0.083	0.165	0.031	0.0267	Significant (*)
$1 \times 10^5 < X \leq 5 \times 10^5$	0.225	0.011	0.256	0.047	0.3448	Not Significant
Total (Overall)	0.282	0.007	0.181	0.006	0.000044	Highly Significant (****)

(A) Individual well data (Wells A, B, and C) representing the cumulative Cyp3a fluorescence intensity (Mean Red) across specified spheroid size ranges for the Col I gel and Col I/IV gel cultures. **(B)** Comprehensive statistical summary including the mean values, standard deviations (SD), and *P*-values determined by unpaired Student's *t*-test for each size category. The comprehensive single-ROI raw data sheets are available in Supplementary Table S1.

Supplementary Fig. S4: Raw Data and Calculation for PDT

Supplementary Fig. S4-1

A

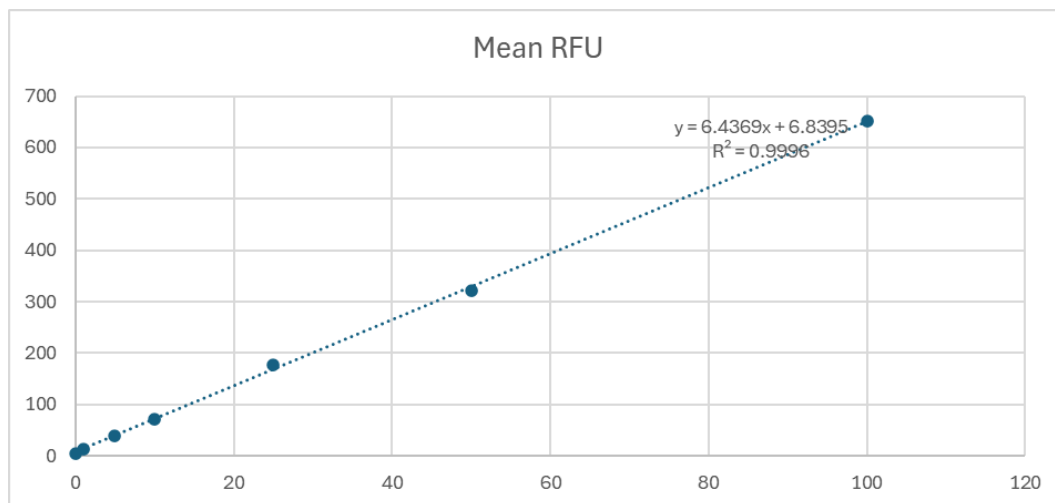


B

Day 7 DNA measurement data (The samples were diluted 50 times and measured.)								
intensity		MG	Col I	Col I/IV	MM-511	MM-111	MM-111/IV	day0
	A	108	61	121.3	112	104.2	150	44.5
	B	100.46	67	124.6	104.1	107.11	152.2	45.1
	C	111.1	68.4	128.2	114.4	103.4	148.7	47.2
	AVERAGE	106.52	65.46666667	124.7	110.1666667	104.9033333	150.3	45.6
A	y-37.714	70.286	23.286	83.586	74.286	66.486	112.286	6.786
	conc (ng/ml)	27.43403591	9.088992974	32.62529274	28.99531616	25.95081967	43.82747853	2.648712
	50 x conc (ng/ml)	1371.701795	454.4496487	1631.264637	1449.765808	1297.540984	2191.373927	132.4356
	Ln(DNA)	7.223807434	6.119087124	7.397110844	7.279157311	7.168226201	7.69228399	4.886096
	Ln(DNAI)-Ln(DNAII)	2.337710966	1.232990655	2.511014376	2.393060842	2.282129733	2.806187522	
	PDT	49.79229755	94.40460842	46.35576806	48.64063543	51.00498816	41.47976538	
B	y-37.714	62.746	29.286	86.886	66.386	69.396	114.486	7.386
	conc (ng/ml)	24.49102264	11.43091335	33.91334895	25.91178767	27.08665105	44.68618267	2.882904
	50 x conc (ng/ml)	1224.551132	571.5456674	1695.667447	1295.589383	1354.332553	2234.309133	144.1452
	Ln(DNA)	7.110329633	6.348344388	7.435831717	7.166720993	7.211064031	7.711687347	4.970821
	Ln(DNAI)-Ln(DNAII)	2.139508515	1.37752327	2.465010598	2.195899874	2.240242913	2.740866228	
	PDT	54.40501835	84.49948002	47.22089231	53.00788135	51.95865116	42.46832581	
C	y-37.714	73.386	30.686	90.486	76.686	65.686	110.986	9.486
	conc (ng/ml)	28.6440281	11.97736144	35.31850117	29.93208431	25.63856362	43.32006245	3.702576
	50 x conc (ng/ml)	1432.201405	598.8680718	1765.925059	1496.604215	1281.928181	2166.003123	185.1288
	Ln(DNA)	7.266967984	6.395041326	7.476429945	7.310953964	7.156120615	7.680638869	5.221052
	Ln(DNAI)-Ln(DNAII)	2.045916154	1.173989497	2.255378115	2.089902135	1.935068786	2.45958704	
	PDT	56.89382713	99.14909826	51.60997139	55.69638791	60.15290044	47.32501762	

Supplementary Fig. S4-2

A

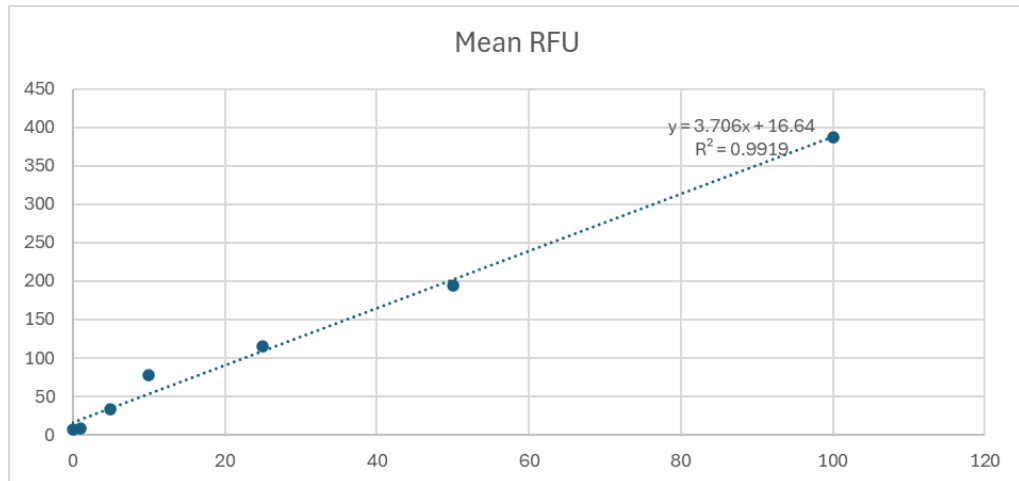


B

Day14 DNA measurement data (The samples were diluted 50 times and measured.)													
intensity		MG	Col I	Col I/IV	MM-511	MM-111	MM-111/IV	day7-1	day7-2	day7-3	day7-4	day7-5	day7-6
	A	387	312	1781	1210	1214	2682	96	37	108	101	90.4	144
	B	320	328	1688	1174	1193	2871	87	38.1	115	102	84.8	150
	C	345	282	1724	1248	1225	2960	92	36.4	113	105	83.5	149
	AVERAGE	350.6666667	307.3333333	1731	1210.666667	1210.666667	2837.666667	91.66667	37.16667	112	102.6667	86.23333	147.6667
A	y-6.8395	380.1605	305.1605	1774.1605	1203.1605	1207.1605	2675.1605	89.1605	30.1605	101.1605	94.1605	83.5605	137.1605
	conc (ng/ml)	59.05956283	47.40799142	275.6234367	186.9161398	187.5375569	415.5976479	13.85147	4.685563	15.71572	14.62824	12.98148	21.30847
	50 x conc (ng/ml)	2952.978142	2370.399571	13781.17184	9345.806988	9376.877845	20779.8824	692.5733	234.2781	785.7859	731.4119	649.0741	1065.424
	Ln(DNA)	7.99056948	7.770813815	9.53105858	9.142683071	9.146002134	9.941740605	6.540414	5.456509	6.666684	6.594977	6.475547	6.971128
	Ln(DNA) ₀ Ln(DNA) ₅₀	1.450155416	2.314304746	2.864374268	2.54770635	2.670455266	2.970612885						
	PDT	80.26725877	50.29588267	40.63714763	45.68815397	43.58807334	39.18383328						
B	y-6.8395	313.1605	321.1605	1681.1605	1167.1605	1186.1605	2864.1605	80.1605	31.2605	108.1605	95.1605	77.9605	143.1605
	conc (ng/ml)	48.65082571	49.89365999	261.1754882	181.3233855	184.2751169	444.9596079	12.45328	4.856453	16.8032	14.78359	12.1115	22.2406
	50 x conc (ng/ml)	2432.541285	2494.683	13058.77441	9066.169274	9213.755845	22247.98039	622.6639	242.8226	840.1599	739.1796	605.5749	1112.03
	Ln(DNA)	7.796691786	7.821916946	9.477215555	9.112305103	9.128452847	10.01000651	6.434007	5.492331	6.733592	6.605541	6.406178	7.013942
	Ln(DNA) ₀ Ln(DNA) ₅₀	1.362684964	2.329585678	2.743623373	2.506764215	2.722274611	2.996064189						
	PDT	85.41959667	49.96596651	42.4256482	46.43436319	42.75836079	38.85097003						
C	y-6.8395	338.1605	275.1605	1717.1605	1241.1605	1218.1605	2953.1605	85.1605	29.5605	106.1605	98.1605	76.6605	142.1605
	conc (ng/ml)	52.53468284	42.74736286	266.7682425	192.8196026	189.246454	458.7861393	13.23005	4.59235	16.49249	15.24965	11.90954	22.08524
	50 x conc (ng/ml)	2626.734142	2137.368143	13338.41212	9640.98013	9462.322702	22939.30696	661.5024	229.6175	824.6244	762.4827	595.4769	1104.262
	Ln(DNA)	7.873496583	7.667330511	9.498403281	9.173778056	9.155073161	10.04060718	6.494514	5.436415	6.714928	6.63658	6.389363	7.006933
	Ln(DNA) ₀ Ln(DNA) ₅₀	1.378982924	2.230915553	2.783475234	2.537198214	2.765710631	3.033674531						
	PDT	84.41003729	52.17588798	41.8182273	45.8773774	42.08683248	38.36931049						

Supplementary Fig. S4-3

A



B

Day 21 DNA measurement data (The samples were diluted 50 times and measured.)													
intensity		MG	Col I	Col I/IV	MM-511	MM-111	MM-111/IV	day14-1	day14-2	day14-3	day14-4	day14-5	day14-6
	A	340	404	4302	1247	2574	6989	136	103	498	347	365	809
	B	384	391	4150	1550	2667	7168	153	104	453	320	348	788
	C	374	414	4035	1068	2510	7221	141	100	476	361	381	794
	AVERAGE	366	403	4162.333333	1288.333333	2583.666667	7126	143.3333	102.3333	475.6667	342.6667	364.6667	797
A	y-16.64	323.36	387.36	4285.36	1230.36	2557.36	6972.36	119.36	86.36	481.36	330.36	348.36	792.36
	conc (ng/ml)	87.25310308	104.5223961	1156.330275	331.9913654	690.0593632	1881.37075	32.20723	23.30275	129.8867	89.14193	93.99892	213.8046
	50 x conc (ng/ml)	4362.655154	5226.119806	57816.51376	16599.56827	34502.96816	94068.53751	1610.362	1165.138	6494.334	4457.097	4699.946	10690.23
	Ln(DNA)	8.380836131	8.561424371	10.96502972	9.717131966	10.44880063	11.45177892	7.384214	7.060594	8.778685	8.402253	8.455306	9.277086
	Ln(DNA) Ln(DNA6)	0.996622117	1.500829888	2.186344411	1.31487912	1.993494328	2.174693206						
	PDT	116.7945182	77.55709089	53.2395534	88.52524789	58.38993289	53.52479129						
B	y-16.64	367.36	374.36	4133.36	1533.36	2650.36	7151.36	136.36	87.36	436.36	303.36	331.36	771.36
	conc (ng/ml)	99.12574204	101.014571	1115.315704	413.7506746	715.1538046	1929.670804	36.79439	23.57258	117.7442	81.85645	89.41176	208.1382
	50 x conc (ng/ml)	4956.287102	5050.728548	55765.78521	20687.53373	35757.69023	96483.54021	1839.719	1178.629	5887.21	4092.822	4470.588	10406.91
	Ln(DNA)	8.508412171	8.527287779	10.92891579	9.937286563	10.48452064	11.4771277	7.517368	7.072107	8.680537	8.31699	8.405275	9.250225
	Ln(DNA) Ln(DNA6)	0.991043846	1.455180389	2.248378324	1.620296466	2.079245361	2.226902637						
	PDT	117.4519174	79.99008292	51.77064677	71.83870511	55.98184908	52.26990982						
C	y-16.64	357.36	397.36	4018.36	1051.36	2493.36	7204.36	124.36	83.36	459.36	344.36	364.36	777.36
	conc (ng/ml)	96.427415	107.2207232	1084.284943	283.6913114	672.7900702	1943.971937	33.5564	22.49325	123.9504	92.91959	98.31624	209.7572
	50 x conc (ng/ml)	4821.37075	5361.036158	54214.24717	14184.56557	33639.50351	97198.59687	1677.82	1124.663	6197.518	4645.979	4915.812	10487.86
	Ln(DNA)	8.480813555	8.586912548	10.90069902	9.559909721	10.42345635	11.48451155	7.42525	7.025238	8.731904	8.443757	8.500212	9.257973
	Ln(DNA) Ln(DNA6)	1.055563092	1.561674093	2.168794922	1.116152221	1.923244088	2.226538114						
	PDT	110.2728969	74.53539797	53.67035805	104.2868506	60.52273903	52.27846731						

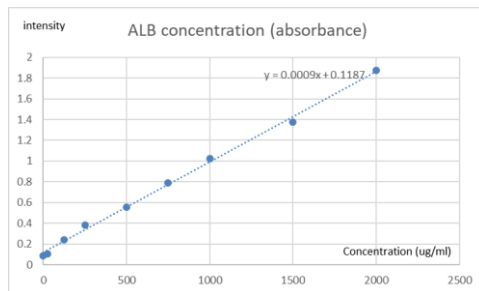
The total DNA content (ng/well) and the calculated PDT (hours) for each substrate at the indicated time points (Day 0, 7, 14, 21) and intervals (Day 0-7, Day 7-14, Day 14-21) are provided. Data is derived from N=3 replicates for each condition. The standard curve and linear regression equations used for DNA concentration calculation are also included. Supplementary Fig. S4-1 A: protein standard curve (day 7). Supplementary Fig. S4-1 B: Raw data of samples (day 7). Supplementary Fig. S4-2 A: protein standard curve (day 14). Supplementary Fig. S4-2 B: Raw data of samples (day 14). Supplementary Fig. S4-3 A: protein standard curve (day 20). Supplementary Fig. S4-3 B: Raw data of samples (day 20).

Supplementary Fig. S5: Raw Data and Calculation for measurement of ALB

Secretion Rate

Supplementary Fig. S5-1

A

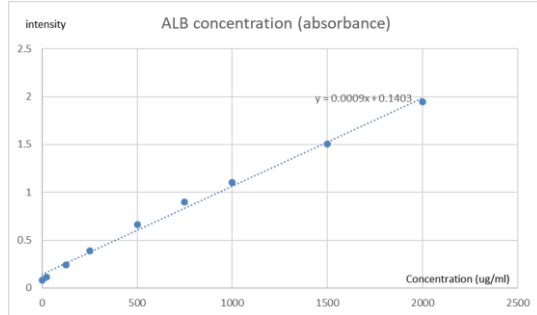


B

Day 20 ALB measurement data (total protein and secretion rate)							
intensity		MG	Col I	Col I/IV	MM-511	MM-111	MM-111/IV
	A	1.354	1.042	0.833	1.036	2.379	1.628
	B	1.212	1.022	0.981	1.063	2.293	1.79
	C	1.488	1.44	1.031	1.184	2.299	1.656
	AVERAGE	1.351333333	1.168	0.948333333	1.094333333	2.323666667	1.691333333
A	y-0.1187	1.2353	0.9233	0.7143	0.9173	2.2603	1.5093
	5 x conc (ug/ml)	6862.777778	5129.444444	3968.333333	5096.111111	12557.22222	8385
	Total amount of protein (mg)	0.068627778	0.051294444	0.039683333	0.050961111	0.125572222	0.08385
	C(Alb) (ng/ml) x Med volume (ml) / 24 (hr)	48.80434783	56.41304348	119.1847826	53.9673913	62.39130435	125.7065217
	Secretion Rate (ng/hr/mg)	711.1456819	1099.788566	3003.396454	1058.991653	496.8559387	1499.183324
B	y-0.1187	1.0933	0.9033	0.8623	0.9443	2.1743	1.6713
	5 x conc (ug/ml)	6073.888889	5018.333333	4790.555556	5246.111111	12079.44444	9285
	Total amount of protein (mg)	0.060738889	0.050183333	0.047905556	0.052461111	0.120794444	0.09285
	C(Alb) (ng/ml) x Med volume (ml) / 24 (hr)	15.38043478	36.57608696	105.0543478	70.81521739	94.72826087	99.89130435
	Secretion Rate (ng/hr/mg)	253.2221953	728.8492917	2192.947073	1349.861181	784.2104105	1075.835265
C	y-0.1187	1.3693	1.3213	0.9123	1.0653	2.1803	1.5373
	5 x conc (ug/ml)	7607.222222	7340.555556	5068.333333	5918.333333	12112.77778	8540.555556
	Total amount of protein (mg)	0.076072222	0.073405556	0.050683333	0.059183333	0.121127778	0.085405556
	C(Alb) (ng/ml) x Med volume (ml) / 24 (hr)	26.25	42.01086957	88.20652174	42.82608696	82.5	102.3369565
	Secretion Rate (ng/hr/mg)	345.0668225	572.3118536	1740.34571	723.6173521	681.0989313	1198.247068
Day 20 ALB measurement data (The samples were diluted 100 times and measured.)							
intensity		MG	Col I	Col IV	MM-511	MM-111	MM-111/IV
	A	0.401	0.429	0.66	0.42	0.451	0.684
	B	0.278	0.356	0.608	0.482	0.57	0.589
	C	0.318	0.376	0.546	0.379	0.525	0.598
	AVERAGE	0.332333333	0.387	0.604666667	0.427	0.515333333	0.623666667
A	y-0.2214	0.1796	0.2076	0.4386	0.1986	0.2296	0.4626
	conc (ng/ml)	78.08695652	90.26086957	190.6956522	86.34782609	99.82608696	201.1304348
	100 x conc (ng/ml)	7808.695652	9026.086957	19069.56522	8634.782609	9982.608696	20113.04348
B	y-0.2214	0.0566	0.1346	0.3866	0.2606	0.3486	0.3676
	conc (ng/ml)	24.60869565	58.52173913	168.0869565	113.3043478	151.5652174	159.826087
	100 x conc (ng/ml)	2460.869565	5852.173913	16808.69565	11330.43478	15156.52174	15982.6087
C	y-0.2214	0.0966	0.1546	0.3246	0.1576	0.3036	0.3766
	conc (ng/ml)	42	67.2173913	141.1304348	68.52173913	132	163.7391304
	100 x conc (ng/ml)	4200	6721.73913	14113.04348	6852.173913	13200	16373.91304

Supplementary Fig. S5-2

A



B

Day 40 ALB measurement data (total protein and secretion rate)							
intensity		MG	Col I	Col I/IV	MM-511	MM-111	MM-111/IV
	A	2.036	1.637	1.755	1.428	1.637	1.96
	B	2.421	1.774	1.438	1.976	1.822	1.946
	C	1.903	1.428	1.476	1.464	1.482	1.786
	AVERAGE	2.12	1.613	1.556333333	1.622666667	1.647	1.897333333
A	y=0.1413	1.8947	1.4957	1.6137	1.2867	1.4957	1.8187
	2.5 x conc (ug/ml)	5263.055556	4154.722222	4482.5	3574.166667	4154.722222	5051.944444
	Total amount of protein (mg)	0.052630556	0.041547222	0.044825	0.035741667	0.041547222	0.050519444
	C(Alb) (ng/ml) x Med volume (ml) / 24 (hr)	21.22282609	26.11413043	80.73369565	31.00543478	35.35326087	76.92934783
	Secretion Rate (ng/hr/mg)	403.2415365	628.5409478	1801.08635	867.4871005	850.9175579	1522.767098
B	y=0.1413	2.2797	1.6327	1.2967	1.8347	1.6807	1.8047
	2.5 x conc (ug/ml)	6332.5	4535.277778	3601.944444	5096.388889	4668.611111	5013.055556
	Total amount of protein (mg)	0.063325	0.045352778	0.036019444	0.050963889	0.046686111	0.050130556
	C(Alb) (ng/ml) x Med volume (ml) / 24 (hr)	23.94021739	25.8423913	79.10326087	32.36413043	33.99456522	77.47282609
	Secretion Rate (ng/hr/mg)	378.0531763	569.8083463	2196.126622	635.0404402	728.1515725	1545.421255
C	y=0.1413	1.7617	1.2867	1.3347	1.3227	1.3407	1.6447
	2.5 x conc (ug/ml)	4893.611111	3574.166667	3707.5	3674.166667	3724.166667	4568.611111
	Total amount of protein (mg)	0.048936111	0.035741667	0.037075	0.036741667	0.037241667	0.045686111
	C(Alb) (ng/ml) x Med volume (ml) / 24 (hr)	4.375	28.55978261	76.11413043	35.89673913	31.27717391	75.02717391
	Secretion Rate (ng/hr/mg)	89.40228189	799.0612994	2052.97722	977.0035599	839.84356	1642.231569
Day 40 ALB measurement data (The samples were diluted 100 times and measured.)							
intensity		MG	Col I	Col IV	MM-111	MM-511	MM-111/IV
	A	0.344	0.362	0.563	0.38	0.396	0.549
	B	0.354	0.361	0.557	0.385	0.391	0.551
	C	0.282	0.371	0.546	0.398	0.381	0.542
	AVERAGE	0.326666667	0.364666667	0.555333333	0.387666667	0.389333333	0.547333333
A	y=0.2659	0.0781	0.0961	0.2971	0.1141	0.1301	0.2831
	conc (ng/ml)	33.95652174	41.7826087	129.173913	49.60869565	56.56521739	123.0869565
	100 x conc (ng/ml)	3395.652174	4178.26087	12917.3913	4960.869565	5656.521739	12308.69565
B	y=0.2659	0.0881	0.0951	0.2911	0.1191	0.1251	0.2851
	conc (ng/ml)	38.30434783	41.34782609	126.5652174	51.7826087	54.39130435	123.9565217
	100 x conc (ng/ml)	3830.434783	4134.782609	12656.52174	5178.26087	5439.130435	12395.65217
C	y=0.2659	0.0161	0.1051	0.2801	0.1321	0.1151	0.2761
	conc (ng/ml)	7	45.69565217	121.7826087	57.43478261	50.04347826	120.0434783
	100 x conc (ng/ml)	700	4569.565217	12178.26087	5743.478261	5004.347826	12004.34783

Data is derived from N=3 replicates for each condition. The standard curve and linear regression equations used for ALB concentration calculation are also included.

Supplementary Fig. S5-1 A: Day 20 albumin quantification standard curve.

Supplementary Fig. S5-1 B: Raw data of samples (day 20). Supplementary Fig. S5-2 A: Day 40 albumin quantification standard curve. Supplementary Fig. S5-2 B: Raw data of samples (day 40).