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Supplementary Materials for

Promotion of uterine reconstruction by a tissue-engineered uterus with biomimetic structure and extracellular matrix microenvironment

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Method

The preparation of small intestinal submucosa (SIS)

In brief, the procedure involved mechanical disassociation, degrease, enzyme digestion, detergent treatment, lyophilization and sterilization. The porcine small intestinal was cut in length of approximately 10 cm each and washed with a saline solution. Firstly, SIS was obtained by mechanical removal of the tunica serosa and tunica muscularis, then cleaned by washing continuously with a saline solution. Secondly, the submucous membrane was submerged in a solution containing methanol and chloroform (1:1, V/V) in a fume cupboard for 12 h and rinsed with the deionized water to remove the organic solvents. Thirdly, the membrane was incubated in the 0.05% trypsin/0.05% ethylenediamine tetraacetic acid at 37 °C for 12 h and rinsed with a saline solution continuously to remove the trypsin. Subsequently, the membrane was further treated with 0.5% sodium dodecylsulphate (SDS) in 0.9% sodium chloride by continuously shaking on a shaker for 4 h. Then, the detergent was removed by thoroughly rinsing with a saline solution. Finally, the submucous membrane was soaked into 0.1% peroxyacetic acid and 20% ethanol for 30 min and rinsed with saline solution. All the samples were frozen-dried under 70 °C with a lyophilizer (CHRIST, GAMMA 2-16 LSC, Germany).

The preparation of PU/SIS composites

Berifly, PU prepolymer was synthesized through a bulk polymerization procedure. IPDI (21.48 g, 96.67 mmol), PTMG 1000 (33.33 g, 33.33 mmol), and 0.2 mL of stannous octoate were mixed together and stirred at a temperature of 74 °C for 3 h, after which the solution temperature was reduced to 54 °C. Subsequently, DMBA (4.94 g, 33.33 mmol) reagent was added to the resulting mixture, and the reaction was extended for three additional hours. Then, the obtained prepolymer was ionized with 7 mL of triethylamine (TEA) for 20 min, added dropwise into a solvent mixture containing 50 mL of acetone and 200 mL of distilled water, and stirred at a rate of 1300 rpm for 2 h. Finally, acetone and redundant TEA species were removed under a reduced pressure of 1.01 kPa via rotary evaporation and dialysis.The obtained SIS powder was then dispersed in the PU emulsion at a mass fraction of 42.9%, and stirred at room temperature for 2.5 h. The produced PU/SIS aqueous suspension were freeze-dried at a temperature of 70 °C for 24 h. The obtained PU/SIS foams were allowed to react with an EDC/NHS solution mixture in phosphate buffer solution (PBS, pH = 7.4) for 36 h. After washing the foams with saturated NaCl solution and distilled water, they were freeze-dried again and sterilized using ethylene oxide (EO) gas.

In vitro adhesion tests

For the overlapping shear test, lap shear joints between the PU/SIS and SIS ($L \times W = 5$ mm × 10 mm) were prepared (Fig. S1). The samples were clamped to a tensile machine (AG-10TA, Shimadzu) with a shearing velocity of 20 mm/min. The adhesive sheer strength was calculated with the following equation (3):

$$Adhesive\ sheer\ strength = \frac{Maximun\ Force}{Junction\ contact\ area} \quad (3)$$

Hemocompatibility assay

Hemolysis test was carried out according to the ISO standard 10993:2018. Briefly, fresh venous blood samples from healthy adult New Zealand white rabbits were diluted to remove the debris and lysed red blood cells. The precipitation was then diluted with PBS to obtain a red blood cells (RBCs) suspension. The SPS and ECM-SPS samples were added into the RBCs suspension (300 μL) and incubated at 37℃ for 60 min. Normal saline and distilled water were used as the positive and negative controls, respectively. After incubation, the samples were centrifuged, and the supernatant was measured under a wavelength of 545 nm.

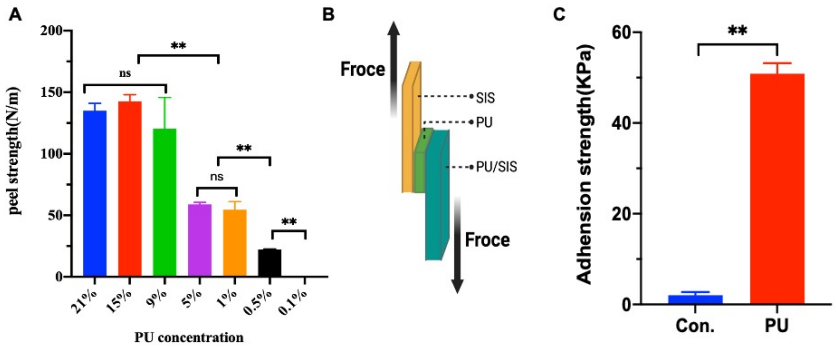

Fig. S1. (A) Peel strength of the PU emulsion of various concentrations on the SPS. (B) Schematic of the overlapping shear test. (C) The average adhesion shear strength of the bi-layered SPS composites.

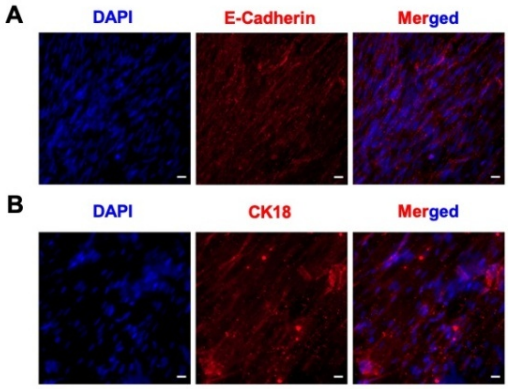

Fig. S2. Immunofluorescence staining of specific markers CK18 and E-Cadherin on the ECs cultured with the SIS for 7 days.

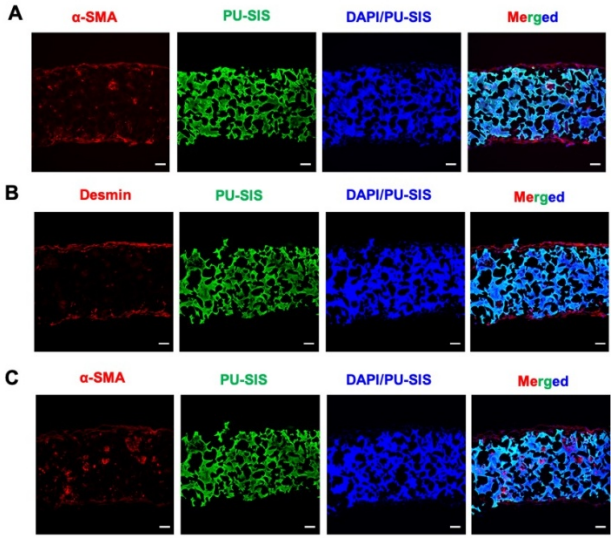

Fig. S3. Immunofluorescence staining of specific markers α-SMA, desmin, and myosin on the SMCs cultured with the PU/SIS for 14 days.

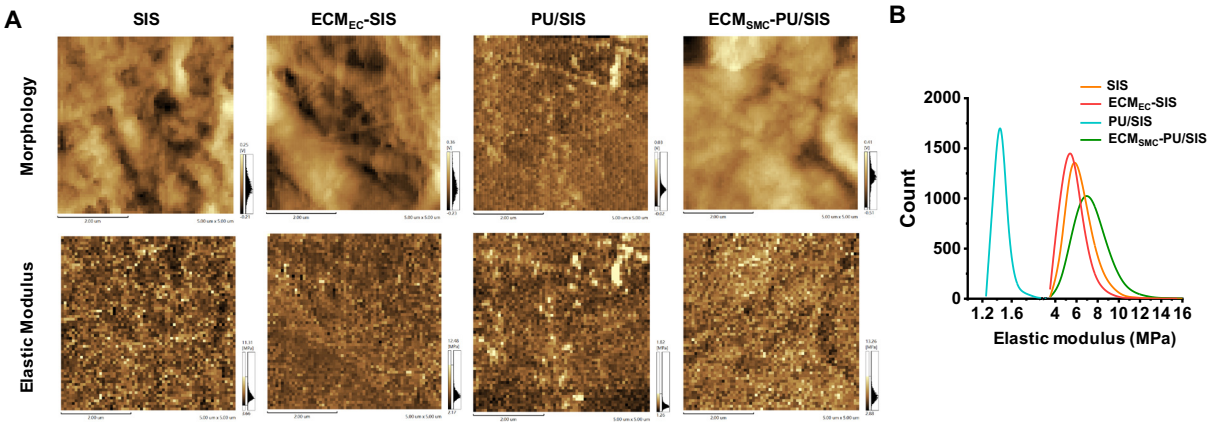

Fig. S4. (A) Representative maps of topography and elastic modulus obtained with standard AFM probe. (B) The distribution of elastic modulus in the ECM_{EC}-SIS and ECM_{SMC}-PU/SIS scaffolds detected by atomic force microscope.

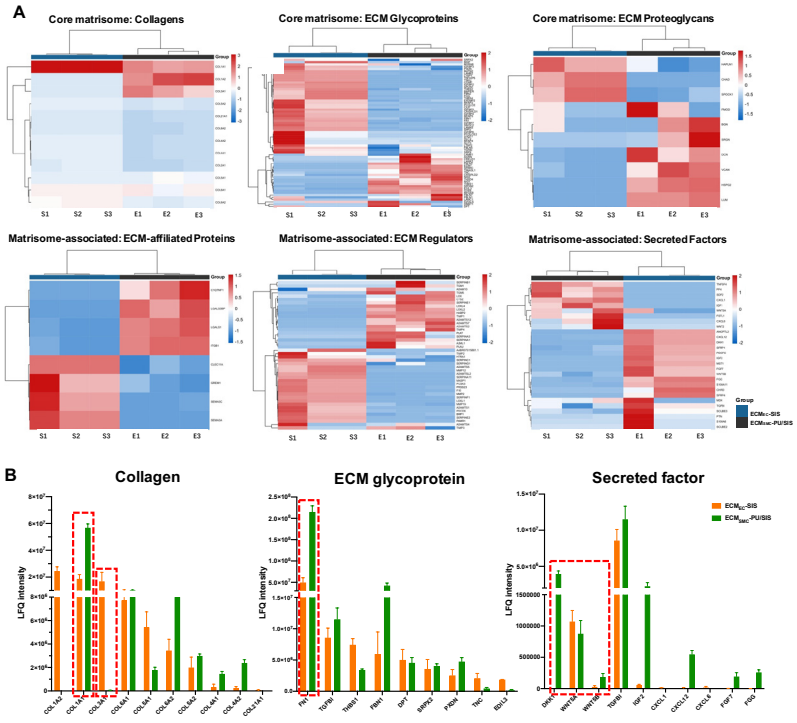

Fig. S5. (A) Matrisome protein relative quantitative comparison between the ECM_{EC}-SIS and ECM_{SMC}-PU/SIS. Results showed the fold-change (FC) in protein detection levels normalized to the mean of all samples in log2 scale. (B) 5 Comparison of matrisome proteins derived from the ECM_{EC}-SIS and ECM_{SMC}-PU/SIS.

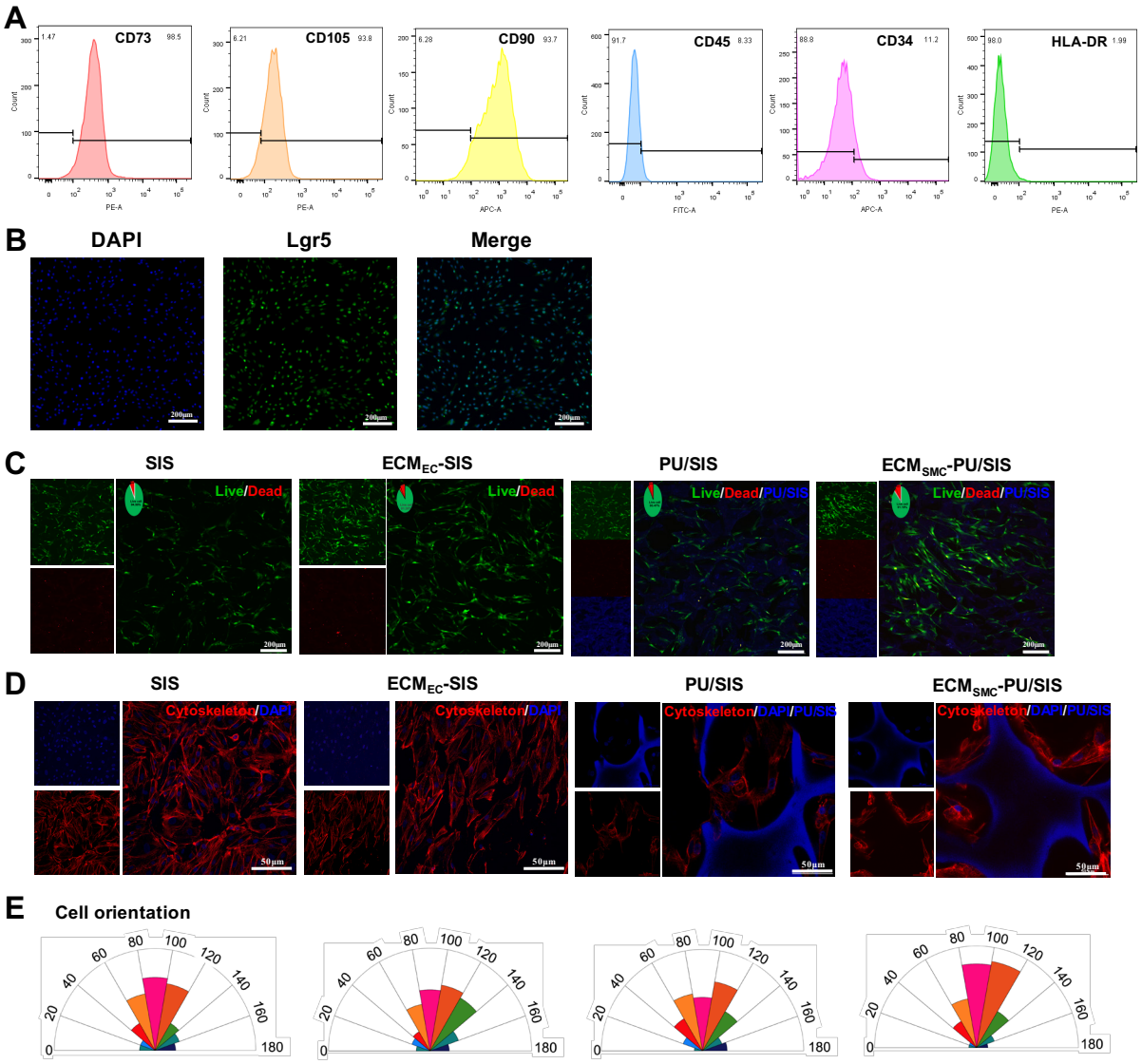

Fig. S6. (A) Flow cytometry analysis of the MSCs. (B) Flow cytometry analysis of the MSCs. (B) Expression of Lgr5 in the MSCs as observed by immunofluorescence staining (scale bar = 200 μm). (C) Calcein-AM/PI staining of the live/dead cells on the ECM_{EC}-SIS and ECM_{SMC}-PU/SIS after 3 days of culture (green: viable cells; red: dead cells). Inside the white frame is the proportion of the live/dead cells. The pie chart represented the proportion of live and dead cells. (D) Rhodamine phalloidin/DAPI staining revealed cytoskeletal morphology of the MSCs on the ECM_{EC}-SIS and ECM_{SMC}-PU/SIS. (E) The orientation of the MSCs on the ECM_{EC}-SIS and ECM_{SMC}-PU/SIS were indicated by the angles between the cell long axis and horizontal line. The number on the axis represented the angle. The sector size in the pie chart represents the distribution of cell angles.

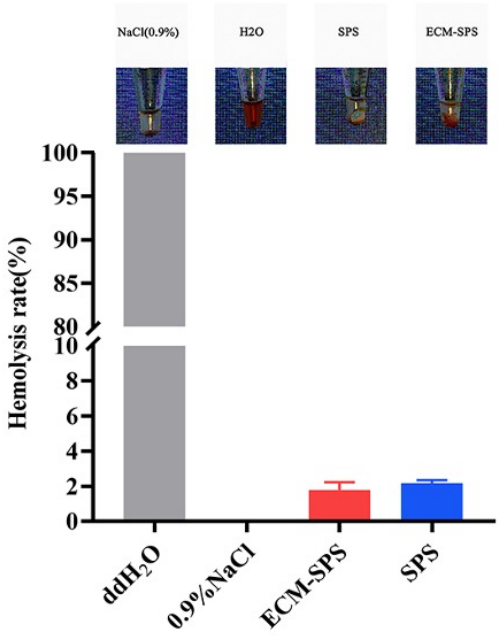

Fig. S7. Hemocompatibility of the SPS and ECM-SPS as determined by a hemolysis test.

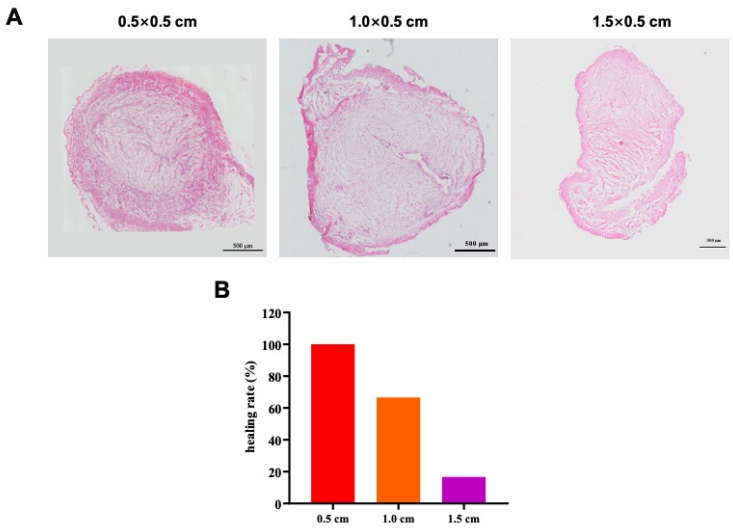

Fig. S8. (A) Cross-sections of H&E stained reconstructed uterine segments; (B) Statistical analysis of the self-healing rate.

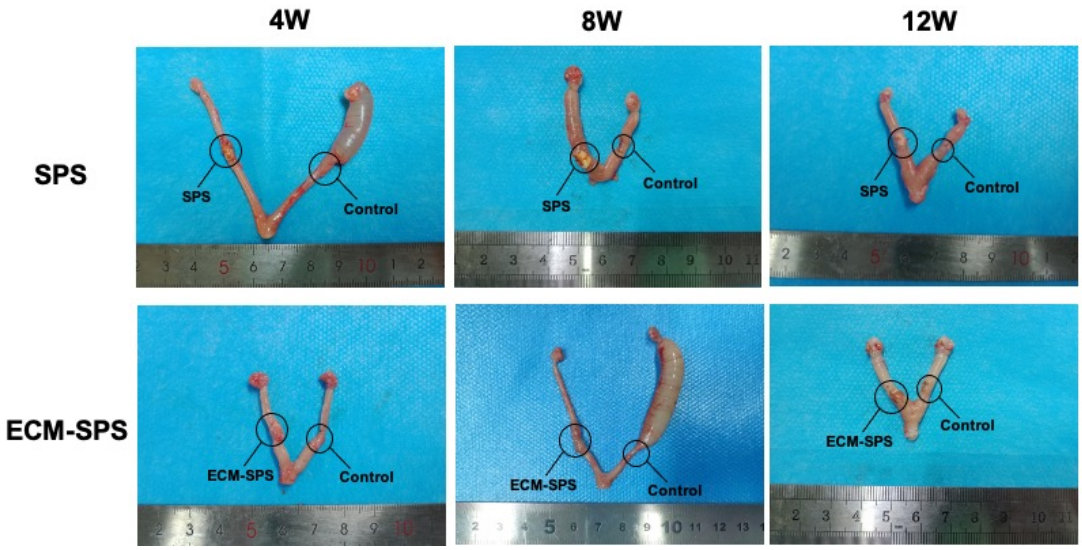

Fig. S9. Gross view of the regenerated uterine horns.

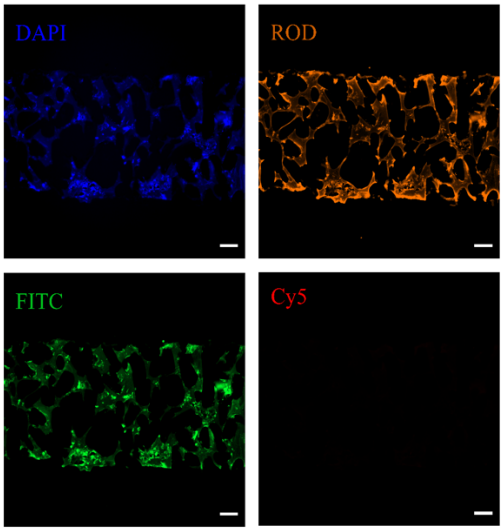

Fig. S10. Autofluorescence intensity of PU/SIS under various excitation conditions (bar=50μm).

Table S1 Sequences of PCR primers

Primers	Sequence (5' to 3')
CK18-F	AAATCCGGGAGCACTTGGAG
CK18-R	CAATCTGCAGAACGATGCGG
E-Cadherin-F	GCTGGACCGAGAGAGTTTCC
E-Cadherin-R	CAAAATCCAAGCCCGTGGTG
α-SMA-F	CACGATGTACCCTGGGATCG
α-SMA-R	GCCGATCCACACCGAGTATT
Myosin-F	AGCACCGTGTCTTATGGTGA
Myosin-R	ATTTGCCGAATCGGGAGGAG
GAPDH-F	GTCAAGGCTGAGAACGGGAA
GAPDH-R	AAATGAGCCCCAGCCTTCTC

Data S1 The original data of Figs.3C &3D

Group	ECM_{EC}-SIS(%)	ECM_{SMC}-PU/SIS(%)
Core Matrisome: Collagens	3.83	3.83
Core Matrisome: Proteoglycans	2.13	2.13
Core Matrisome: ECM glycoproteins	20.43	20.43
Matrisome-associated: ECM regulators	11.49	11.49
Matrisome-associated: Secrete factors	7.23	7.23
Matrisome-associated: ECM affiliated proteins	2.13	2.13
Other	52.77	52.77

Data S2 The original data of Figs.3E & S5

	Protein	E_1	E_2	E_3	S_1	S_2	S_3
Collagens	COL1A1	17711000	16105000	22213000	60113000	55087000	40422000
	COL1A2	27678000	24495000	21417000	0	0	0
	COL21A1	95019	675	57735	0	0	0
	COL3A1	17959000	9581300	22955000	0	0	0
	COL4A1	620010	185480	160220	1694800	1328300	1454900
	COL4A2	366050	250890	125730	2709000	2228500	2425800
	COL5A1	6902000	4367400	5014600	2058900	1643800	1731300
	COL5A2	3018900	1387400	1579300	3181000	2889100	2864500
	COL6A1	5508800	6804300	10866000	10259000	10389000	10506000
	COL6A2	2730100	3074800	4534900	8796500	9180600	8868300
	COL2A1	0	0	0	889430	1275700	1424800
	COL8A2	0	0	0	14193	0	11249
ECM glycoproteins	BMPER	0	0	0	58810	85845	100530
	CILP	0	0	0	29810	14013	22463
	COMP	0	0	0	97529	115190	126720
	CRISPLD1	0	0	0	685800	423980	533360
	CRISPLD2	382110	409530	467200	308200	257070	261190
	DPT	6846300	4656800	3536300	5522300	4055000	4124100
	EDIL3	1846400	1863700	1897600	313390	71552	180770
	EFEMP2	57004	200990	302380	1709700	966170	1295400
	FBLN1	402120	515160	982460	272720	154630	154570
	FBLN5	150500	200070	212960	254570	221750	262240
	FBN1	10011000	3565000	4285000	49261000	38954000	52322000
	FBN2	0	0	0	632430	936850	1220900
	FGG	920.54	1478.2	2021.3	211280	282400	263670
	FN1	48146000	39446000	61399000	231480000	206640000	222620000
	IGFALS	404040	88423	100340	162070	262990	160700
	IGFBP2	0	0	0	2373300	2511100	3209000
	IGFBP3	572070	506430	302000	1087700	873810	975710
	IGFBP4	0	0	0	3749700	2530000	2438200
	IGFBP5	59393	302340	253880	1319600	1033900	804220
	IGFBP6	0	0	0	1025900	166220	952460
	IGFBP7	123860	558830	634710	6646600	5016400	5385400
	LAMA5	10864	18679	13921	191330	153350	295460
	LAMB1	216190	792260	498530	332430	522050	46550
	LAMB2	18425	8505.6	19535	388660	374240	461140
	LAMC1	920780	1013600	1967600	1492500	865740	1061600
	MATN2	0	0	0	221680	203360	272560
	MFAP2	108240	72042	74715	861040	511000	765920
	MFAP4	21702	14307	14622	137300	20810	58998
	MFAP5	0	0	0	671960	436600	566060
	MXRA8	22289	0	15872	28843	19478	28730
	PCOLCE	94718	373860	305920	7175300	3661900	5232100
	PCOLCE2	0	0	0	8617.6	1529.9	0
	PXDN	3239400	2903000	1480400	5478700	4388400	5323700
	SLIT2	0	0	0	3421500	2074600	3332400
	SLIT3	0	0	0	4326	0	29036
	SPON1	0	0	0	61163	66635	48300
	SPP2	17750	4098.8	2227.6	495750	411030	423840
	SRPX	343450	1011800	1195000	2998700	1516100	2041200
	SRPX2	1965000	3801100	4956100	4447400	3843400	3812800
	SVEP1	0	0	0	184120	31528	135440
	TGFBI	6866200	8985300	9857200	13607000	10460000	9488500
	THBS1	8261300	6358500	7688500	3598300	3317500	4845200
	THBS2	485690	989190	644770	2285000	2785100	2326500
	THBS4	0	0	0	723210	1002200	1086900
	TNC	1214600	2571700	2492100	636800	364680	153990
	TNFAIP6	0	0	0	863950	835760	735060
	TSKU	0	0	0	250870	244710	213790
	AGRN	20533	108540	26252	0	0	0
	CRELD1	3038.6	37407	18671	0	0	0
	DMBT1	5585.1	4157.9	0	0	0	0
	ECM1	78411	121340	111870	0	0	0
	FBLN2	0	0	0	0	0	0
	FBLN7	0	2099	5417.6	0	0	0
	GAS6	15358	13005	15955	0	0	0
	LAMA2	2298.4	13716	5364.7	0	0	0
	LTBP1	30473	38751	60317	3118500	3020700	2915600
	LTBP2	0	15500	8631.4	28206	14103	83603
	MFGE8	537380	420010	498170	0	0	0
	MGP	3027.1	13078	2193.9	0	1358800	0
	NID1	1633800	871360	1644000	0	0	0
	NID2	127370	316580	449830	0	0	0
	SMOC2	0	0	6555.2	541030	386810	593300
	SPARC	710500	1087000	1026000	0	0	0
	SPON2	0	0	0	0	0	0
	THSD4	547110	361290	853650	0	0	0
	TINAGL1	488810	1428600	1147000	13888	0	0

Proteoglycans	BGN	1416100	2564700	3057300	2104500	1426100	1420700
	CHAD	6407.9	11096	8573.1	544030	677220	791770
	DCN	2717700	1379300	1989000	128230	57409	38961
	FMOD	680670	572690	467970	559370	492030	407210
	HAPLN1	37046	16944	20172	59849	50428	78927
	HSPG2	3756400	4844200	5007000	0	0	0
	SPOCK1	25917	53081	236810	778150	1106000	490230
	SRGN	0	0	0	0	0	0
	VCAN	677800	1301200	1141000	181880	71495	160510
	LUM	7498500	7401500	8164500	369090	358000	357790
CM affiliated protei	C1QTNF1	32068	19654	41440	0	0	0
	CLEC11A	132970	119360	127070	172990	173450	31465
	GREM1	795850	1385500	460670	6055100	3721800	5427400
	LGALS1	6195500	5893900	6646100	1381300	1125400	1301300
	LGALS3BP	0	0	0	0	0	0
	SEMA3C	247300	334290	496920	12019000	7833300	10556000
	SEMA3A	0	0	0	789620	614920	778250
	ITGB1	241450	224900	239420	77104	58607	97910
ECM regulators	A2ML1	17926	6480	5821.1	0	0	0
	ADAMTS1	50068	86005	57251	7035800	3983900	5184400
	ADAMTS12	0	0	0	0	0	0
	ADAMTS2	54264	38767	59431	0	0	26334
	ADAMTS4	87304	151220	109080	256780	63950	98794
	ADAMTS5	3041.9	3733.5	3420	39077	53262	84947
	ADAMTS7	6465.6	7118.8	11496	0	0	0
	BMP1	53188	203030	275190	2569600	1788200	2247200
	CTSZ	30835	85778	71812	0	0	0
	HABP2	19260	20929	19817	0	0	0
	LOX	5601900	9095100	8406000	5384200	4233800	5544800
	LOXL2	4559000	5945700	4904100	1131700	1007300	964900
	LOXL4	50123	57626	33771	0	0	0
	MASP1	0	5961.7	3713.5	5923500	4862000	8957500
	MMP2	4230800	4823000	6241200	25871000	24411000	24688000
	PLAT	1140300	1100000	180360	0	0	0
	PLAU	87874	28123	36887	0	0	0
	PRSS23	40805	33407	55346	2342500	1877900	2362900
	SERPINA1	54662	39970	24934	0	0	0
	SERPINA3	1975.9	2077.8	0	0	0	0
	SERPINB1	0	0	0	0	0	0
	SERPINE1	4388700	7079900	5238300	2449800	2064500	2457100
	SERPINE2	221220	312590	167100	6188000	4560300	5020100
	SERPINF1	6551.3	0	13328	1817900	1759400	850140
	SERPING1	19281	55883	35529	80404	85675	76591
	TGM1	0	24168	9212.1	0	0	0
	TGM5	6848.5	0	5429.2	0	0	0
	TIMP1	1537400	1409600	1289500	0	0	0
	TIMP2	479260	624370	930160	2270600	1151000	1298200
	TIMP3	1400300	1474200	813630	1455000	1065500	1189400
	TIMP4	221.18	98.469	295.09	0	0	0
	AABR07015881.1	0	0	0	5412.2	18842	17031
	ADAM10	74849	63243	44799	9915.7	52694	0
	ADAMTSL2	0	0	0	7297.1	8332.8	6804.7
	F10	0	0	0	193040	148690	103260
	HTRA1	2356400	2044800	1710300	3464000	2581700	2665700
	LOXL1	0	0	0	383930	352500	364920
	MMP12	0	0	0	667400	891740	881080
	MMP19	121510	84917	80629	378630	286380	345260
	PAMR1	0	0	0	271060	180130	108610
	PCSK5	0	0	0	180380	151110	100790
	PDCD6	38931	24251	25225	550970	329960	530020
	SERPINA11	0	0	0	66570	71265	101490
	SERPINC1	47165	0	5656.9	66040	59521	76654
Secrete factors	CXCL1	12190	13912	9684.6	0	0	0
	CXCL12	0	18571	7951	617410	512830	528080
	CXCL6	14184	36004	0	0	0	0
	FGF7	0	3724	478.49	263340	157520	161270
	FGG	920.54	1478.2	2021.3	211280	282400	263670
	FSTL1	0	0	0	0	0	0
	IGF1	4227.7	2692.9	2103.9	0	0	0
	IGF2	46719	67554	60990	2822500	1958700	2035000
	MDK	121660	207470	127780	443500	5022.2	316700
	PDGFC	24810	44843	28656	318530	240550	377530
	PF4	2314	0	3956.5	0	0	0
	PTN	12775	75182	26302	1507100	156240	1450300
	S100A11	447530	380890	486860	4399400	5605300	4995400
	SCUBE3	18792	10794	29342	102830	43724	49931
	SDF2	0	0	0	0	0	0
	SFRP1	139250	324810	113860	1729500	1357600	1223000
	TGFBI	6866200	8985300	9857200	13607000	10460000	9488500
	TNFSF4	7528.3	6054.9	9911	0	0	0
	WNT2	0	0	0	0	0	0
	WNT5A	893490	1247500	1071500	1119500	755380	600870
	WNT5B	6071	30906	45945	249650	153290	171720
	ANGPTL2	0	0	0	1815600	1482000	1478800
	CHRD	0	0	0	9459.7	30795	5358.3
	DKK1	0	0	0	4424100	3700400	5006800
	MST1	0	0	0	538320	391660	398420
	S100A6	0	0	0	1536100	14418	1947.9
	SCUBE2	0	0	0	11275	0	10261
	SFRP4	0	0	0	10224	21435	14039

Other	AABR07049085.1	0	0	0	0	8375.2	7872.3
	AABR07073181.1	0	0	0	3585100	3314500	3688800
	AC115277.1	0	0	0	166760	220650	0
	ALB	0	0	0	110900	77118	571710
	AMH	0	0	0	22054	27266	27920
	ANDPRO	0	0	0	0	1334.2	2773.4
	APOM	252430	55127	363760	449100	1160700	1381100
	ARPC1B	177480	291170	299360	216120	277360	287590
	BET1	48338	10116	29332	545060	134510	315080
	C1GALT1C1	0	0	0	56598	35826	54309
	C1QTNF3	0	0	0	53306	107450	52270
	C1R	40342	68193	39688	138450	179630	143120
	C6	4471	0	2111.4	223020	204020	229990
	C7	0	0	0	20988	586550	608980
	C8B	0	0	0	880280	526710	698500
	CCN1	1211900	1304500	1684600	8006500	5069200	7024000
	CCN2	145180	203040	165110	3037100	2592500	4453900
	CD44	186690	245420	179820	82718	137740	90887
	CDC42	351640	349190	349190	746570	839910	902410
	CLEC11A	132970	119360	127070	172990	173450	31465
	CNBP	25067	71955	66154	220620	411310	196570
	CNMD	0	0	0	65473	53562	71540
	COMT	298570	414960	400220	323160	258300	293830
	COPS3	68373	70435	67535	50453	38264	0
	COX6B1	17458	26947	150570	147580	187810	195740
	CYTL1	0	0	0	63168	59823	75200
	DNAJB9	0	0	0	191020	113650	236480
	DNAJC19	0	0	0	134660	5166.4	144220
	DPM3	0	0	0	0	45350	44852
	DSC1	125740	118620	118900	9875.7	23379	55302
	DUSP3	57473	97306	43960	169400	249370	290010
	DYNLT1	23260	29089	35767	97862	137770	102130
	EGFR	0	0	0	19977	13663	13983
	ENPP2	0	0	0	425730	201100	422910
	ERGIC1	92838	23261	58617	65464	69774	67054
	ESD	37572	34786	32607	106200	15243	13565
	ETFBKMT	0	0	0	270580	119810	0
	F11	0	0	0	457650	333490	351430
	FAM115C	0	0	0	1003500	48153	1030300
	FHL1	31242	44516	64013	1138900	661330	861020
	FKBP11	138850	15094	36328	34356	44775	37541
	FMOD	680670	572690	467970	559370	492030	407210
	FRZB	0	0	0	21091	0	14543
	FSCN1	143450	189960	191620	305070	240690	187250
	FST	0	0	0	54006	58615	28421
	GNB1	405970	122720	317490	538600	603190	499220
	GNB2	34702	58098	28967	12646	265290	19819
	GNPNAT1	0	0	0	198560	233940	233770
	GPX3	5176.7	90326	21376	1596900	1643100	1568200
	GPX4	140660	118980	174860	169850	213050	273310
	GPX7	8767.8	8533.7	11671	38095	34898	35903
	HBA-A1	0	0	0	213980	211950	407410
	HBB	103020	133680	131100	143800	23865	13321
	HBE1	35520	41196	22463	601180	354970	531950
	HGF	0	0	0	4370700	1272200	1515400
	IGF2	46719	67554	60990	2822500	1958700	2035000
	ISLR	0	0	0	25957	44850	38669
	LANCL1	28372	49825	32708	10409	65852	48098
	LECT2	0	0	0	212360	216530	205420
	LIMS1	283740	201930	226610	301960	220010	245120
	LMAN2	105950	70186	55914	41740	27217	40672
	LMCD1	56638	128410	96668	36470	85930	18803
	LOC100909840	0	0	0	120140	72164	70388
	LOC103694877	0	0	0	605110	815180	796540
	LOC108348085	0	0	0	87326	55521	0
	LOC305806	0	0	0	32630	31617	34045
	LPL	0	42567	0	29972	14002	10743
	LRRC57	0	0	0	159410	65105	70037
	LSM12	42121	25198	41359	106890	78196	69611
	LTBP1	30473	38751	60317	3118500	3020700	2915600
	LTBP2	0	15500	8631.4	28206	14103	83603
	LTBP3	0	0	0	9688	67612	73869
	LTBP4	0	0	0	53423	58232	69361
	MANF	8505	58803	41041	259580	243420	195250
	METAP1	8615	2492.2	39800	245910	224560	249670
	NEWGENE_621351	0	0	0	52440000	61142000	52069000
	OLFML2A	0	0	0	106590	105540	253160
	ORMDL1	53144	20945	18316	169770	74283	79673

other	PAM	0	0	0	108920	394930	335490
	PBLD1	0	0	0	35140	27026	25136
	PDGFRL	7046.9	6558	8334	151570	148610	94722
	PIGR	0	0	0	60159	31382	14181
	PRNP	0	0	0	136500	117260	593270
	PSMB2	54502	153900	179490	2979.9	39718	42679
	PSME1	53647	116070	33905	121390	286570	131420
	PTP4A2	16091	111560	71798	306300	172020	367560
	QPCT	2599.1	11160	7491	99906	59450	90516
	QSOX1	312220	270070	181850	6686700	4559000	6154700
	RAB29	0	0	0	59923	77769	78368
	RAB5B	77374	22656	71015	78536	80795	101510
	RAB5C	853610	903860	1037800	1461600	1067200	1188300
	RAC1	0	175330	52683	2844800	2354800	2661700
	RACK1	620680	634670	761070	965950	918270	729420
	RAE1	0	0	0	69425	81739	82879
	RBM12	0	0	0	1463400	1289200	1389600
	RBX1	32283	24217	23017	0	31167	24929
	RHOG	47368	32232	60101	751310	812540	873230
	RNASE4	1719.4	1345.3	1754.4	937880	374940	703380
	RPN2	1734700	988030	1300400	46440	106330	79675
	RT1-A1	0	0	0	136450	161070	157530
	S GENE NAME	0	0	0	0	0	0
	SCPEP1	105560	107700	39155	12966	81259	48008
	SEC13	267500	275720	239520	114160	118290	121910
	SPCS3	101490	49435	61874	159320	215900	213630
	SSR4	102640	146060	104850	45380	192480	85489
	STC1	14663	31077	14895	1570400	1661500	1055000
	TBL2	48654	38809	100060	147860	67625	143330
	TF	1746.9	5303.1	8578.2	522030	602120	487390
	TIAL1	24730	5308.1	3720	151520	92016	106750
	TIE1	0	0	0	145760	138590	118130
	TMED10	630300	368510	470470	244770	156250	279220
	TMED2	391530	184870	126650	51960	89315	76333
	TMED7	208000	113780	81580	64974	205690	61894
	TMED9	72631	30272	39704	112250	124490	71569
	TMEM214	44370	4919.7	5057.2	19977	31988	20813
	TNFRSF11B	25394	0	11172	230530	154230	180980
	TXNDC5	100440	207290	150660	73888	94040	70383
	UBE2D2	0	0	0	273110	382260	278490
	VDAC2	510170	435400	585290	650820	831910	696240
	VPS25	7381.9	13758	11338	16477	82105	14873
	WDFY1	13162	17945	50408	60214	57705	59371
	WDR1	1344700	1206600	1533700	4747400	6740200	4681200
	WDR45B	13147	14780	18709	106840	67426	96853
	YKT6	56178	74897	45926	19003	46336	0
	ABHD14B	20045	19266	13447	441340	350240	402780
	AIMP2	149130	129150	245580	0	0	0
	ALPI	3493.8	3226.7	2602.7	0	0	0
	ANOS1	0	15825	15858	0	0	0
	APOA1	29207	6632.5	13112	0	0	0
	APOC3	19970	0	1712.4	0	0	0
	APOE	68393	9378.9	4011.2	0	0	0
	ARMC10	13608	6851.6	4264.5	0	0	0
	ATP1B3	0	43579	56669	0	0	0
	ATP5MF	39809	27780	41509	0	0	0
	AZGP1	63387	53197	49242	0	0	0
	B2M	31765	65453	48252	0	0	0
	BCAS2	15983	14991	11219	0	0	0
	BDNF	0	0	0	0	0	0
	BID	2590.2	9529.1	5069.9	0	0	0
	BSG	128040	78708	87137	0	0	0
	C1orf53	0	0	0	0	0	0
	C1S	0	0	0	0	0	0
	C2	168030	0	76475	0	0	0
	C5orf51	16948	18374	4714.2	0	0	0
	CCL20	1184.7	924.43	593.72	0	0	0
	CD59	24532	22146	19637	0	0	0
	CDA	0	0	0	0	0	0
	CEP250	0	340740	676140	0	0	0
	CHI3L1	0	0	0	0	0	0
	CIAO1	30128	33115	38822	0	0	0
	CISD1	0	0	0	0	0	0
	CNPY2	51189	519650	149500	0	0	0
	COMMD10	0	43245	32132	0	0	0
	COMMD3	16988	15998	42617	0	0	0
	COMMD6	0	0	0	0	0	0
	COMMD9	0	0	0	0	0	0

other	CPSF4	10056	12789	14335	0	0	0
	CRTAP	306210	287420	258250	0	0	0
	CUTA	33488	38341	29211	0	0	0
	DCD	0	0	0	0	0	0
	DEFA3	2942.5	458.44	2293.2	0	0	0
	DKK3	3753.2	17034	2049.2	0	0	0
	DNAJC5	0	0	0	0	0	0
	DNASE1L1	1885.7	989.14	14208	0	0	0
	DNASE2B	17485	53751	23104	0	0	0
	DSC3	8204.3	11617	7164.1	0	0	0
	DYNLT3	55380	80587	46211	0	0	0
	ECRG4	11428	11426	3243.3	0	0	0
	EEF1E1	64838	91529	125690	0	0	0
	EIF3I	272450	242180	147990	0	32097	20790
	EIF6	37868	83534	117360	0	0	0
	EMC10	0	0	0	0	0	0
	EMC8	0	0	0	0	0	0
	EPDR1	0	0	0	0	0	0
	ERP44	233890	252280	235800	194310	542300	128920
	ETHE1	37879	61063	33666	0	0	0
	F3	5363.3	5047.2	4434	0	0	0
	FBLIM1	29430	12913	5298.2	0	0	0
	FHL2	472070	673440	597180	0	20960	0
	GET4	15208	7052.9	8025.1	0	0	0
	GLRX	79989	94029	67667	0	0	0
	GPLD1	2133.1	35883	8273.4	0	0	0
	GPNMB	29240	141310	116090	0	0	0
	GPX1	586360	596090	362120	129460	182700	113590
	GPX8	56808	36444	39066	0	0	0
	GRN	11273	19403	12875	0	0	0
	GSTP1	605420	709210	696130	0	0	0
	GYG1	45881	31177	24678	0	0	0
	HBA1	104000	71440	25159	0	0	0
	HIKESHI	13159	4210	4772.4	0	0	0
	HLA-A	429020	625350	417950	0	0	0
	HLA-B	175380	194630	152320	0	0	0
	HLA-C	190160	362480	280880	0	0	0
	HLA-E	0	0	0	0	0	0
	HLA-H	51550	36902	22774	0	0	0
	ICAM1	205220	111550	140960	0	0	0
	IFI30	0	0	0	0	0	0
	IGF2R	22509	24347	20113	0	0	0
	IGHA1	33411	45811	8260.4	0	0	0
	IGHA2	0	0	0	0	0	0
	IGHG1	119700	108050	85765	0	0	0
	IGIP	0	0	0	0	0	0
	IGKC	16336	47490	35106	0	0	0
	IGLC3	27941	17700	18099	0	0	0
	IKBKG	1305.3	1522	13113	0	0	0
	ITGB1	241450	224900	239420	77104	58607	97910
	ITGB3	18213	20507	99954	0	0	0
	ITGB5	0	0	0	0	0	0
	ITPA	39464	216440	166190	0	0	0
	LAMP1	11859	13705	9422.1	0	0	0
	LAMP2	277610	491610	361910	0	0	0
	LAMTOR2	19176	31023	0	0	0	0
	LDLR	56375	35215	32200	0	0	0
	LGMN	0	0	0	0	0	0
	LRP1	114080	141600	91693	0	0	0
	LRP10	24203	38181	11495	0	0	0
	LRP2	0	0	0	0	0	0
	LRSAM1	6240.4	5839.4	6374.3	0	0	0
	LTF	0	0	0	0	0	0
	LYZ	4812.2	0	1333.5	0	0	0
	MESD	0	0	0	0	0	0
	MIF	61853	183020	165490	0	0	0
	MMS19	26181	18056	17092	0	0	0
	MPZL1	21719	15860	11707	0	0	0
	MRC2	0	0	0	0	0	0
	MYCBP	15064	29497	13943	0	0	0
	NIT1	19956	29437	47895	0	0	0
	NUCB1	64385	139600	63533	0	0	0
	NUP43	43495	45561	46816	0	0	0
	OAF	34308	22396	7442.6	0	0	0
	PDCD6	38931	24251	25225	550970	329960	530020
	PFN1	232890	219690	174720	17382	22031	16485
	PFN2	142920	192640	160020	0	0	0
	PHF5A	5716.1	5666.5	7995.1	0	0	0
	PHPT1	43540	78604	98622	0	0	0
	PIP	14685	7592.8	10109	0	0	0
	PIP4P1	0	2824.2	7396.5	0	0	0
	PLAA	99979	113310	53890	0	0	0

other	PRDX3	220640	127830	254940	32906	34303	0
	PSAP	906570	464020	1030700	6996.1	0	0
	PSMB8	0	0	0	0	0	0
	PTRH2	0	0	0	0	0	0
	PTTG1IP	3428	2187.7	2570	0	0	0
	RAB5A	53614	51841	40570	0	0	0
	RAC2	207820	109340	93166	0	0	0
	RARRES1	50895	109660	164200	0	0	0
	RARRES2	100730	305300	159460	0	0	0
	RBCK1	9573.9	9269.5	9636.6	0	0	0
	RDH11	31942	29198	6124.5	0	0	0
	RETN	9556.8	12254	5849.7	0	0	0
	RHOQ	5541.1	5533.3	6106	0	0	0
	RNASE7	18231	25168	13337	0	0	0
	RNF114	413.29	3833.6	3762.3	0	0	0
	SAA1	4811.6	3886.6	0	0	0	0
	SAA2	660.23	1319.4	756.13	0	0	0
	SCGB3A2	21159	4805.4	3201.2	0	0	0
	SEH1L	0	0	0	0	0	0
	SELENOF	7208.9	24881	39248	0	0	0
	SELENOM	0	0	0	0	0	0
	SIGMAR1	29991	30029	24372	0	0	0
	SLC3A1	0	0	0	0	0	0
	SNRNP40	0	0	0	0	0	0
	SOD3	13192	17178	9286.2	0	0	0
	SPP2	17750	4098.8	2227.6	495750	411030	423840
	SPRYD7	0	0	0	0	0	0
	SRM	98170	138320	102240	455210	355850	488900
	SRPRB	93735	87824	75153	0	0	0
	SRPX	343450	1011800	1195000	2998700	1516100	2041200
	SRPX2	1965000	3801100	4956100	4447400	3843400	3812800
	STC2	10328	14421	13586	0	0	0
	SUSD2	8963.6	2526.5	2735.4	0	0	0
	TBL1XR1	0	0	0	0	0	0
	TEX30	23465	12794	2405	0	0	0
	TFPI	0	31633	43830	0	0	0
	TFPI2	1234000	1001800	475740	0	0	0
	THY1	56535	28932	12175	0	0	0
	TMED3	21066	17753	19231	0	0	0
	TNPO3	14770	16600	11763	0	0	0
	TOMM22	86208	47928	93854	0	10983	0
	TOMM40	0	0	0	0	0	0
	TRIM25	35454	19157	18015	39068	39173	71328
	TRIP6	140930	36090	115490	0	0	0
	TRMT112	0	0	0	0	0	0
	TXN2	8422.3	10815	8403.2	0	0	0
	UBE2L6	0	0	0	0	0	0
	VASN	0	0	0	0	0	0
	WDR18	0	0	0	0	0	0
	WDR5	15325	19872	27719	0	0	0
	WDR77	24144	30179	22910	0	0	0
	WFDC11	1544500	280500	2477900	0	0	0