

## REFERENCES

- Aly, A.S. (1998) Self dissolving chitosan. I. Preparation and characterization and evaluation for drug delivery system. Angew Macromolecule Chemistry, 259, 33-38.
- Bergshoef, MM., Vancso, GJ. (1999) Transparent nanocomposites with ultrathin, electrospun Nylon-4, 6 fiber reinforcement. Advance Material, 11, 1362-1365.
- Bhattarai, N., Edmondson, D., Veiseh, O., Matsen, F.A., Zhang, M. (2005) Electrospun chitosan-based nanofibers and their cellular compatibility. Biomaterials, 26, 6176-6184.
- Boland, ED., Wnek, GE., Simpson, DG., Palowski, KJ., Bowlin, GL. (2001) Tailoring tissue engineering scaffolds using electrostatic processing techniques: a study of poly(glycolic acid) electrospinning. Journal of Macromolecular Science and Purification Application Chemistry A38, 1231-1243.
- Bourbigot, S., Flambard, X., Revel, B. (2002). Characterisation of poly(p-phenylenebenzobisoxazole) fibres by solid state NMR. European Polymer Journal, 38, 1645-1651.
- Broda, J. (2003) Morphology of the noncoloured and coloured polypropylene fibers. Polymer, 40, 1619-1629.
- Buchko, C.J., Chen, L.C., Shen, Y., Martin, D.C. (1999) Processing and microstructural characterization of porous biocompatible protein polymer thin films. Polymer, 40, 7397-7407.
- Byung, Moo, Min., Sung, Won, Lee., Jung, nam, Lim., young, you., Taek, Seung, Lee., Pil, Hyun, Kang., Won, Ho, Park. (2004) Chitin and chitosan nanofibers:electrospinning of chitin and deacetylation Of chitin nanofibers. Polymer, 45, 7137-7142.
- Demir, MM, Yilgor, I., Yilgor, E., Erman, B. (2002) Electrospinning of polyurethane fibers. Polymer, 43, 3303-3309.
- Doshi, J., Reneker, DH. (1995) Electrospinning process and applications of electrospun fibers. Journal of Electrostatics, 35, 151-160.

- Grählert, W., Leupolt, B., Hopfe, V. (1999) Optical modeling vs. FTIR reflectance microscopy: characterization of laser treated ceramic fibres. Vibrational Spectroscopy, 19, 353-359.
- Gupta, K.C, and Jabrail, Fawzi Habeeb. (2006) Glutaraldehyde and glyoxal cross-linked chitosan microspheres for controlled delivery of centchroman. Carbohydrate Reserch, 346, 744-756.
- Heath, D. Dennis., Pruitt, A. Millagros., Brenner, E. Dean., Begum, N. Aynun., Frautschy, A. Sally., Rock, L. Cheryl. (2005) Tetrahydrocurcumin in plasma and urine: Quantitation by high performance liquid chromatography. Journal of Chormatography B, 824, 206-212.
- Huang, Z.-M., Zhang, Y. Z., Kotakic, M., Ramakrishna, S. (2003) A review on polymer nanofibers by electrospinning and their applications in nanocomposites. Composites Science and Technology, 63, 2223-2253.
- Kawaguchi, H., (2000) Functional polymer microspheres. Progress in Polymer Science, 25(8), 1171-1210.
- Li, W.J., Laurencin, C.T., Caterson, E.J., Tuan, R.S., Ko, F.K. (2002) Electrospun nanofibrous structure: A novel scaffold for tissue engineering. Journal of Biomedical Materials Research, 60(4), 613-621.
- Lu, J.Y., Normal, C., Abboud K.A., Ison, A., (2001) Crysta Engineering of an inclusion coordination polymer with cationic pocket-like structure and its property to form metal-organic nanofibers. Inorg, Chem, Commom, 4459-61.
- Majeed, M., Badmaev, V, Uma, S., Rajenderan, JR. (1995) Curcuminiods antioxidant Phytonutrients. Nutri-Science Publishers, Neu Jersey, 1, 24-33.
- Ohkawa, K., Cha. D. H., Nishida, A., Yamamoto, H. (2004) Electrospinning of chitosan . Macromolecular Rapid Commuacation, 25, 1600-1605.
- Osawa, T., Sugiyama, Y., Inayoshi, M., Kawakishi, S. (1995) Antioxidative activity of tetrahydrocurcumin. Bio-Sci Biotechno Biochem, 59, 1609-1612.
- Pari, L., Amali, Rosalin. D., (2005) Protective role of tetrahydrocurcumin (THC) an active principle of turmeric on chloroquine induced hepatotoxicity in rats. J Pharmaceut Sci, 8(1), 115-123.

- Porsopone, V., Supaphpl, P., Rangkupan, R., Tantayanon S. (2005) Electrospinning of Methacrylate-based copolymer: effects of solution concentration and applied electrical potential on morphological Appearance of as-spun fibers. Polymer Engineering and Science, 1073-1080.
- Porsopone, V., Supaphpl, P., Rangkupan, R., Tantayanon S. (2006) Electrospun methacrylate-based copolymer/indomethacin fibers and their release characteristics of indomethacin. Journal of Polymer Research.
- Reneker, DH., Yarin, AL., Fong, H., Koombhongse, S. (2000) Bending instability of electrically charged liquid jets of polymer solutions in electrospinning. Journal of Apply Physic, 87, 4531-4547.
- Shin, Y.M., Hohman, M.M., Brenner, M. P., & Rutlidge, G.C. (2001) Experimental characterisation of electrospinning: the electrically forced jet and instabilities. Polymer, 42(25), 9955-9967.
- Sangsanoh, P., Supaphol, P. (2006) Stability Improvement of Electrospun Chitosan Nanofibrous Membrances in Neutral or Weak Basic Aqueous Solution. Biomacromolecules, 7, 2710-2714.
- Scobbie, E, Groves, J. A. (1995) An investigation of the composition of the vapour evolved from aqueous glutaraldehyde solutions. Ann, Occup, Hyg, 39: 63-78.
- Suwantong, O., Waleetorncheepsawat, S., Sanchavanakit, N., Pavasant, P., Cheepsunthorn, P., Bunaprasert, T., Supaphol, P. (2006) In vitro biocompatibility of electrospun poly(3-hydroxyvalerate) and poly(3-hydroxyvalerate-co-3-hydroxyvalerate) fiber mats. International Journal of Biological Macromolecules, Biomac, 1-7.
- Xinying, Geng., Oh, Hyeong, Kwon, Jang. (2005) Electrospinning of chitosan dissolved in concentrated acetic acid solution. Biomaterials, 26, 5427-5432.

## APPENDICES

### Appendix A Average Fiber Diameter of the Electrospun Chitosan/THC Fibers , and Average Bump Size of the Chitosan Films

**Table A1** Average fiber diameter of chitosan produced from 6.9 wt % chitosan and 20 wt% THC concentration in TFA: DCM 70:30(v/v) by using applied voltage 25 kV, and 15cm collecting distance

Point	Fiber diameter ( $\mu\text{m}$ )				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	0.272	0.302	0.282	0.315	0.305
2	0.285	0.312	0.332	0.311	0.324
3	0.332	0.290	0.321	0.323	0.341
4	0.305	0.304	0.295	0.302	0.274
5	0.248	0.293	0.327	0.298	0.266
6	0.276	0.316	0.333	0.312	0.316
7	0.274	0.301	0.317	0.302	0.301
8	0.282	0.298	0.299	0.306	0.318
9	0.297	0.265	0.301	0.294	0.273
10	0.296	0.329	0.311	0.297	0.265
11	0.303	0.312	0.319	0.274	0.301
12	0.292	0.295	0.326	0.283	0.314
13	0.248	0.273	0.295	0.292	0.269
14	0.308	0.269	0.337	0.325	0.295
15	0.254	0.306	0.302	0.330	0.259
16	0.295	0.297	0.306	0.262	0.311
17	0.300	0.292	0.312	0.281	0.283
18	0.275	0.249	0.288	0.276	0.337
19	0.281	0.327	0.293	0.288	0.304

20	0.252	0.279	0.301	0.291	0.319
21	0.325	0.231	0.325	0.269	0.322
22	0.290	0.304	0.312	0.316	0.327
23	0.304	0.263	0.293	0.257	0.335
24	0.261	0.281	0.344	0.286	0.313
25	0.326	0.315	0.283	0.313	0.328
26	0.315	0.264	0.326	0.326	0.307
27	0.304	0.303	0.294	0.247	0.319
28	0.291	0.284	0.362	0.283	0.288
29	0.313	0.272	0.285	0.305	0.285
30	0.272	0.283	0.313	0.314	0.326
31	0.279	0.306	0.299	0.265	0.328
32	0.286	0.318	0.304	0.330	0.294
33	0.307	0.297	0.295	0.269	0.327
34	0.277	0.324	0.329	0.303	0.311
35	0.304	0.283	0.336	0.276	0.312
36	0.295	0.319	0.297	0.274	0.289
37	0.314	0.311	0.284	0.289	0.295
38	0.297	0.332	0.325	0.273	0.286
39	0.324	0.298	0.338	0.304	0.321
40	0.249	0.294	0.308	0.263	0.314
41	0.282	0.306	0.327	0.297	0.308
42	0.267	0.324	0.340	0.304	0.296
43	0.281	0.304	0.298	0.251	0.289
44	0.323	0.311	0.318	0.306	0.315
45	0.300	0.296	0.343	0.329	0.327
46	0.292	0.307	0.297	0.239	0.267
47	0.281	0.297	0.323	0.284	0.328
48	0.289	0.315	0.324	0.319	0.289
49	0.294	0.297	0.298	0.301	0.336

50	0.300	0.322	0.334	0.306	0.326
Average fiber diameter	0.290	0.297	0.313	0.293	0.306
SD	0.021	0.027	0.019	0.024	0.022

Sample	Fiber diameter (m)
1	0.290
2	0.297
3	0.313
4	0.293
5	0.306
Average fiber diameter	0.300
SD	0.010

**Table A2** Average bump size of chitosan films produced from 4wt % chitosan and 20 wt% THC concentration in TFA: DCM 70:30(v/v)

Point	Bump sizes ( $\mu\text{m}$ )				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1	4.76	3.89	4.75	4.08	3.99
2	5.03	4.28	4.45	5.75	5.57
3	5.56	5.12	3.48	4.10	4.96
4	4.41	5.33	8.97	5.84	6.12
5	4.45	6.23	5.93	3.56	4.13
6	2.60	3.40	0.15	4.79	4.16
7	6.05	7.30	4.43	4.04	7.44
8	5.32	5.44	5.00	5.83	7.08
9	2.86	3.91	5.59	4.74	6.47
10	2.66	7.08	4.83	4.15	3.89
11	4.10	3.80	4.87	5.67	4.13
12	4.74	5.15	5.04	2.89	3.76
13	2.42	4.46	3.75	2.53	3.07
14	6.10	4.65	6.73	5.96	5.00
15	5.22	5.14	5.25	5.81	7.08
16	5.67	6.24	6.51	3.03	5.45
17	6.15	5.84	4.83	3.66	3.73
18	3.80	4.12	6.07	4.56	5.44
19	5.40	4.36	4.49	3.80	5.86
20	4.33	5.56	4.56	5.84	5.80
21	4.95	6.15	3.07	5.73	5.02
22	4.62	5.32	5.44	6.27	6.72
23	5.81	3.46	5.86	2.59	4.89
24	3.54	5.56	6.12	3.04	3.57
25	3.95	5.79	4.36	3.67	8.50

26	5.10	3.35	3.86	6.43	6.77
27	4.75	5.32	4.83	4.42	3.94
28	3.76	4.48	6.06	4.60	5.14
29	4.96	5.04	4.79	4.08	5.82
30	4.22	4.31	4.18	4.86	3.94
31	4.43	3.96	3.76	4.95	4.45
32	3.88	4.16	2.41	5.96	4.18
33	4.09	4.20	3.96	6.73	5.33
34	3.67	4.59	4.97	2.89	3.46
35	5.07	6.20	2.28	4.95	3.30
36	3.29	2.79	4.07	3.96	6.96
37	3.94	4.65	5.95	5.61	4.29
38	3.16	4.97	4.53	4.42	5.45
39	4.79	4.65	4.79	3.96	5.62
40	5.54	4.12	7.32	6.06	3.86
41	4.83	8.09	5.76	3.86	5.76
42	4.66	5.00	5.45	5.36	4.55
43	4.31	3.76	0.94	3.42	7.92
44	8.09	5.88	3.42	6.59	3.90
45	5.00	3.57	5.01	3.46	7.19
46	4.59	2.79	5.87	4.13	4.30
47	3.73	5.07	6.11	5.57	3.79
48	5.04	5.47	6.34	5.38	3.51
49	3.96	7.36	5.74	6.03	6.54
50	4.13	7.68	4.69	5.83	3.27
Average bump size	4.55	4.98	4.83	4.71	5.10
SD	1.04	1.22	1.49	1.15	1.37



Sample	Bump sizes ( $\mu\text{m}$ )
1	4.55
2	4.98
3	4.83
4	4.71
5	5.10
Average bump sizes	4.83
SD	0.22

## Appendix B Weight Loss, and Degree of Swelling

**Table B1** The weight loss of as-spun chitosan/THC fibers in acetate buffer (pH 5.5)

Week	Weight of dried sample prior immersion					Weight of dried sample after immersion					%weight loss	SD
	Sample1	Sample2	Sample3	Average	SD	Sample1	Sample2	Sample3	Average	SD		
1	5.87	6.12	6.26	6.08	0.20	5.10	5.15	5.33	5.19	0.10	14.61	1.38
2	6.34	6.19	6.23	6.25	0.08	4.23	4.44	4.19	4.29	0.11	31.43	2.75
3	6.34	6.17	6.33	6.28	0.10	4.31	4.31	4.25	4.29	0.03	31.67	1.39
4	6.39	6.32	6.18	6.30	0.11	3.95	3.96	4.04	3.98	0.04	36.72	1.86
5	6.46	6.49	6.38	6.44	0.06	3.67	3.52	3.27	3.49	0.16	45.9	2.78
6	6.32	6.47	6.58	6.46	0.13	3.50	3.49	3.23	3.41	0.12	47.2	3.3
7	6.46	6.34	6.53	6.44	0.10	3.32	3.05	3.23	3.20	0.11	50.35	1.65
8	6.45	6.39	6.57	6.47	0.09	3.29	3.37	3.30	3.32	0.04	48.68	1.28
9	6.34	6.42	6.36	6.37	0.04	3.33	3.47	3.12	3.31	0.14	48.12	2.56

**Table B2** The weight loss of as-spun chitosan/THC films in acetate buffer (pH 5.5)

Week	Weight of dried sample prior immersion					Weight of dried sample after immersion					%weight loss	SD
	Sample1	Sample2	Sample3	Average	SD	Sample1	Sample2	Sample3	Average	SD		
1	6.37	6.12	6.04	6.18	0.17	5.20	5.11	5.22	5.18	0.05	7.83	1.17
2	6.26	6.09	6.41	6.25	0.16	5.13	5.12	5.13	5.13	0.00	11.27	3.14
3	6.13	6.25	6.29	6.22	0.08	5.06	5.12	5.03	5.06	0.04	17.87	1.84
4	6.21	6.27	6.35	6.28	0.07	4.98	4.93	5.02	4.98	0.04	20.22	2.18
5	6.32	6.51	6.44	6.42	0.10	4.87	4.90	4.86	4.87	0.02	26.93	1.71
6	6.13	6.38	6.29	6.27	0.13	4.41	4.93	4.76	4.70	0.27	25.04	2.74
7	6.31	6.45	6.43	6.40	0.08	4.47	4.51	4.68	4.55	0.11	28.82	1.46
8	6.38	6.42	6.29	6.36	0.07	4.62	4.6	4.40	4.54	0.12	28.66	1.26
9	6.31	6.12	6.47	6.30	0.18	4.5	4.48	4.61	4.53	0.07	28.08	1.11

**Table B3** The degree of swelling of as-spun chitosan/THC fibers in acetate buffer (pH 5.5)

Time (min)	Weight of sample in swollen state					Weight of dried sample after immersion					%Swelling	SD
	Sample1	Sample2	Sample3	Average	SD	Sample1	Sample2	Sample3	Average	SD		
20	10.61	10.53	10.26	10.47	0.18	3.66	3.70	3.52	3.63	0.09	188.65	3.60
40	10.97	11.21	10.72	10.97	0.25	3.68	3.69	3.28	3.55	0.23	209.57	15.21
60	10.85	11.17	10.35	10.79	0.41	3.36	3.53	3.35	3.41	0.10	216.10	6.99
80	11.78	10.64	11.7	11.37	0.64	3.65	3.54	3.58	3.59	0.06	216.71	14.13
100	11.10	11.23	11.98	11.44	0.48	3.57	3.62	3.71	3.63	0.07	214.69	7.13
120	10.35	10.83	10.26	10.48	0.31	3.26	3.39	3.24	3.30	0.08	217.87	1.44

**Table B4** The degree of swelling of as-spun chitosan/THC films in acetate buffer (pH 5.5)

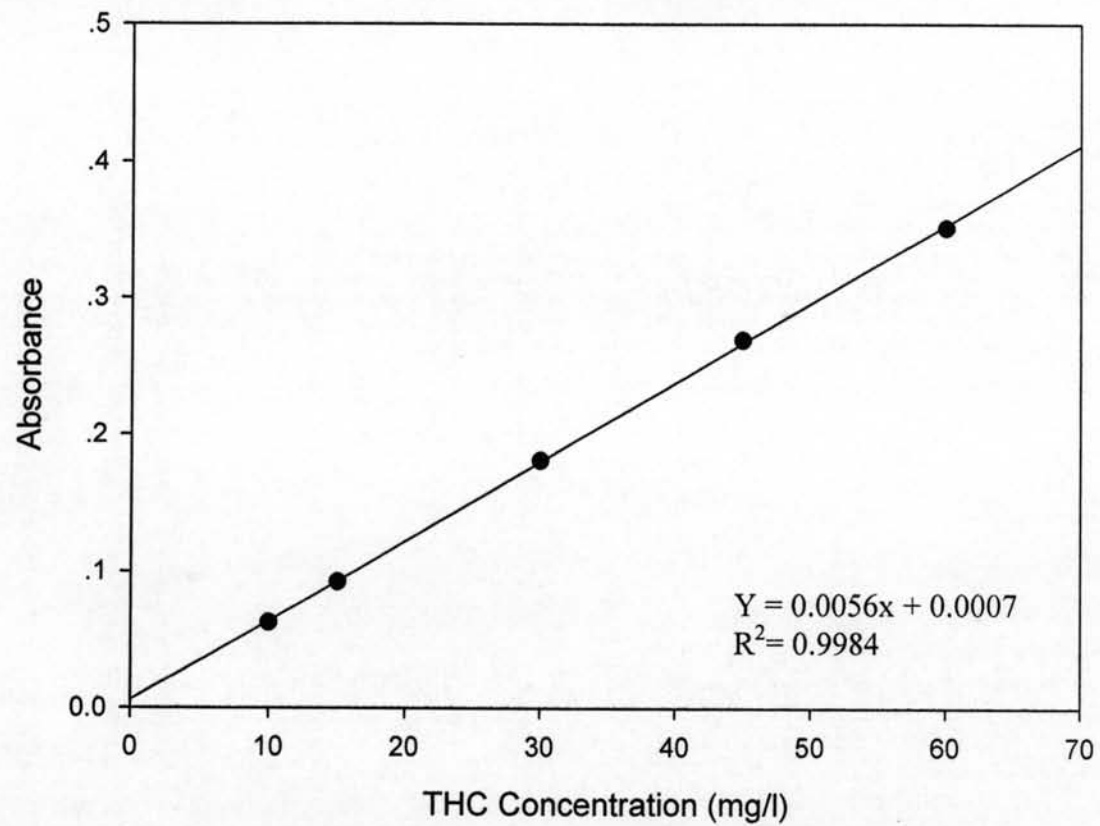
Time (min)	Weight of sample in swollen state					Weight of dried sample after immersion					%Swelling	SD
	Sample1	Sample2	Sample3	Average	SD	Sample1	Sample2	Sample3	Average	SD		
20	7.53	7.91	8.11	7.85	0.29	3.13	3.5	3.58	3.40	0.24	131.04	8.26
40	7.95	8.36	8.43	8.25	0.26	3.15	3.23	3.22	3.20	0.04	157.67	4.82
60	9.17	9.24	9.03	9.15	0.11	3.36	3.55	3.31	3.41	0.13	168.53	7.26
80	7.99	7.67	8.32	7.99	0.33	3.12	2.88	3.05	3.02	0.12	165.06	8.42
100	7.43	7.92	7.79	7.71	0.25	2.76	3.02	2.9	2.89	0.13	166.69	3.86
120	8.75	7.94	8.86	8.52	0.50	3.24	3.05	3.21	3.17	0.10	168.80	7.92

**Appendix C The THC Concentration for Determining Standard Curve, Standard Curve, Accumulative Released of THC from Both the Electrospun Chitosan/THC Fiber Mats and Chitosan/THC Films Base On Total Immersion and Transdermal Diffusion Through Pig Skin Method, The Measurement Properties of UV-2501, and The Data Spectrum of THC**

**Table C1** The THC concentration for determining standard curve

Sample ID	Type	Concentration(mg/l)	Wavelength at 280 nm
std1	Std-Repeat	10	0.0579
std1	Std-Repeat	10	0.0545
std1	Std-Repeat	10	0.0510
std1-Average	Average	10	0.0545
std2	Std-Repeat	15	0.0749
std2	Std-Repeat	15	0.0736
std2	Std-Repeat	15	0.0753
std2- Average	Average	15	0.0746
std3	Std-Repeat	30	0.1749
std3	Std-Repeat	30	0.1758
std3	Std-Repeat	30	0.1762
std3- Average	Average	30	0.1756
std4	Std-Repeat	45	0.2555
std4	Std-Repeat	45	0.2450
std4	Std-Repeat	45	0.2479

Sample ID	Type	Concentration(mg/l)	Wavelength at 280 nm
std4- Average	Average	45	0.2495
std5	Std-Repeat	60	0.3390
std5	Std-Repeat	60	0.3342
std5	Std-Repeat	60	0.3370
std5- Average	Average	60	0.3367



**Figure C1** Standard curve of THC.

**Table C2** Accumulative released of THC from the electrospun chitosan/THC fiber mats based on total immersion method

Release time (min)	Concentration (mg/l)					(% Drug release)				
	Sample1	Sample2	Sample3	Average	SD	Sample1	Sample2	Sample3	Average	SD
5.00	8.15	10.19	9.34	9.23	1.02	5.83	7.12	6.32	6.43	0.65
10.00	11.71	13.07	14.42	13.07	1.36	8.37	9.13	9.76	9.10	0.69
15.00	16.29	16.63	17.31	16.74	0.52	11.65	11.62	11.71	11.66	0.04
25.00	25.44	24.42	26.80	25.55	1.19	18.19	17.07	18.13	17.80	0.63
45.00	32.56	33.24	34.09	33.29	0.76	23.28	23.23	23.06	23.19	0.12
60.00	37.48	40.86	38.49	38.94	1.74	26.80	28.56	26.04	27.12	1.29
90.00	51.54	53.41	59.85	54.93	4.36	36.86	37.33	40.49	38.26	1.97
120.00	76.12	78.66	79.68	78.15	1.83	54.43	54.98	53.90	54.43	0.54
150.00	89.68	86.63	90.19	88.83	1.92	64.13	60.55	61.01	61.87	1.94
210.00	101.37	101.54	103.07	101.99	0.93	72.49	70.97	69.73	71.04	1.38
300.00	115.61	116.46	118.32	116.80	1.39	82.67	81.40	80.05	81.35	1.31
360.00	116.46	119.34	119.68	118.49	1.77	83.28	83.41	80.97	82.53	1.38
420.00	120.36	117.31	118.32	118.66	1.55	86.06	81.99	80.05	82.65	3.07
480.00	116.97	117.31	120.02	118.10	1.67	83.64	81.99	81.19	82.25	1.25
540.00	116.29	117.64	117.98	117.31	0.90	83.15	82.23	79.82	81.70	1.72
600.00	115.27	116.63	118.66	116.85	1.71	82.43	81.52	80.28	81.39	1.08



**Table C3** Accumulative released of THC from the chitosan/THC films based on total immersion method

Release time (min)	Concentration (mg/l)					(%) Drug release				
	Sample1	Sample2	Sample3	Average	SD	Sample1	Sample2	Sample3	Average	SD
5	227.48	231.03	234.93	231.15	3.73	30.43	29.76	29.15	29.78	0.64
10	271.03	298.66	301.54	290.41	16.84	36.25	38.47	37.42	37.38	1.11
15	304.09	312.73	316.46	311.09	6.35	40.67	40.28	39.27	40.08	0.72
25	376.12	371.37	367.31	371.60	4.41	50.31	47.84	45.58	47.91	2.37
45	370.36	381.20	385.10	378.89	7.64	49.54	49.10	47.79	48.81	0.91
60	384.59	390.19	395.78	390.19	5.59	51.44	50.26	49.11	50.27	1.16
90	389.34	396.97	399.85	395.38	5.43	52.08	51.13	49.62	50.94	1.24
120	401.88	403.07	406.97	403.97	2.66	53.75	51.92	50.50	52.06	1.63
150	400.86	405.78	415.27	407.31	7.32	53.62	52.27	51.53	52.47	1.06
210	418.15	433.92	439.17	430.41	10.94	55.93	55.89	54.50	55.44	0.82
300	432.39	441.37	442.39	438.72	5.50	57.84	56.85	54.90	56.53	1.50
360	466.12	472.73	477.48	472.11	5.70	62.35	60.89	59.25	60.83	1.55
420	476.29	483.58	495.78	485.21	9.85	63.71	62.29	61.52	62.51	1.11
480	490.19	496.63	500.19	495.67	5.07	65.57	63.97	62.07	63.87	1.75
540	497.14	500.86	501.03	499.68	2.20	66.50	64.52	62.17	64.40	2.16
600	486.29	506.46	508.49	500.41	12.27	65.04	65.24	63.10	64.46	1.18

**Table C4** Accumulative released of THC from the electrospun chitosan/THC fiber mats based on transdermal diffusion through pig skin method

Release time (min)	Concentration (mg/l)					(% Drug release)				
	Sample1	Sample2	Sample3	Average	SD	Sample1	Sample2	Sample3	Average	SD
5.00	3.07	5.10	5.61	4.59	1.35	2.15	3.54	3.78	3.16	0.88
10.00	4.42	5.95	6.46	5.61	1.06	3.10	4.13	4.35	3.86	0.66
15.00	5.95	7.14	7.98	7.02	1.02	4.17	4.95	5.37	4.83	0.61
25.00	6.63	8.49	9.85	8.32	1.62	4.65	5.89	6.63	5.72	1.00
45.00	7.98	11.54	11.71	10.41	2.11	5.60	8.01	7.88	7.16	1.35
60.00	10.69	13.07	13.58	12.45	1.54	7.51	9.07	9.14	8.57	0.92
90.00	12.05	14.42	15.10	13.86	1.60	8.46	10.01	10.16	9.54	0.94
120.00	13.92	15.78	16.46	15.38	1.32	9.77	10.95	11.08	10.60	0.72
150.00	15.27	17.81	20.53	17.87	2.63	10.72	12.36	13.81	12.30	1.55
210.00	18.49	19.17	22.73	20.13	2.28	12.98	13.30	15.30	13.86	1.26
300.00	18.15	20.53	21.88	20.19	1.89	12.74	14.24	14.73	13.90	1.04
360.00	22.39	23.41	25.78	23.86	1.74	15.71	16.24	17.35	16.43	0.83
420.00	24.59	25.10	26.63	25.44	1.06	17.26	17.42	17.92	17.53	0.34
480.00	25.44	27.98	28.83	27.42	1.76	17.85	19.42	19.40	18.89	0.90
540.00	25.78	28.32	30.36	28.15	2.29	18.09	19.65	20.43	19.39	1.19
600.00	23.92	27.14	29.85	26.97	2.97	16.78	18.83	20.09	18.57	1.67

**Table C5** Accumulative released of THC from the chitosan/THC films based on transdermal diffusion through pig skin method

Release time (min)	Concentration (mg/l)					(% Drug release)				
	Sample1	Sample2	Sample3	Average	SD	Sample1	Sample2	Sample3	Average	SD
5.00	0.69	1.71	2.22	1.54	0.78	0.09	0.22	0.28	0.20	0.10
10.00	2.73	2.56	3.07	2.79	0.26	0.37	0.34	0.39	0.36	0.03
15.00	5.44	6.29	7.31	6.34	0.93	0.73	0.83	0.93	0.83	0.10
25.00	4.76	6.12	6.63	5.84	0.96	0.64	0.80	0.84	0.76	0.11
45.00	6.97	7.64	9.17	7.93	1.13	0.93	1.00	1.16	1.03	0.12
60.00	7.31	8.66	9.34	8.44	1.04	0.98	1.14	1.18	1.10	0.11
90.00	9.68	10.19	11.03	10.30	0.68	1.30	1.34	1.40	1.34	0.05
120.00	10.69	11.37	12.05	11.37	0.68	1.43	1.49	1.53	1.48	0.05
150.00	12.73	13.41	13.92	13.35	0.60	1.70	1.76	1.77	1.74	0.03
210.00	13.24	14.08	14.76	14.03	0.76	1.77	1.85	1.87	1.83	0.05
300.00	12.90	13.75	15.27	13.97	1.20	1.73	1.81	1.94	1.82	0.11
360.00	15.61	16.80	17.31	16.57	0.87	2.09	2.21	2.20	2.16	0.06
420.00	15.10	17.98	18.66	17.25	1.89	2.02	2.36	2.37	2.25	0.20
480.00	15.78	18.49	19.00	17.76	1.73	2.11	2.43	2.41	2.32	0.18
540.00	15.95	18.83	19.68	18.15	1.95	2.13	2.47	2.50	2.37	0.20
600.00	16.12	18.32	19.51	17.98	1.72	2.16	2.41	2.48	2.35	0.17

**Table C6** The measurement properties of UV-2501

<b>Measurement Properties</b>	
Wavelength Range (nm.):	250.00 to 350.00
Scan Speed:	Medium
Sampling Interval:	1
Auto Sampling Interval:	Disabled
Scan Mode:	Single
<b>Additional Information:</b>	
<b>Instrument Properties</b>	
Instrument Type:	UV-2501
Measuring Mode:	Absorbance
Slit Width:	1.0 nm
Light Source Change Wavelength:	360.0 nm
S/R Exchange:	Normal
<b>Attachment Properties</b>	
Attachment:	None

**Table C7** The data spectrum of THC

No.	Wavelehgth (nm)	Absorbance	No.	Wavelehgth (nm)	Absorbance
1	346	-0.091	26	346	-0.148
2	343	-0.091	27	343	-0.146
3	341	-0.089	28	341	-0.146
4	337	-0.086	29	337	-0.15
5	334	-0.085	30	335	-0.149
6	330	-0.089	31	333	-0.146
7	328	-0.09	32	331	-0.149
8	325	-0.087	33	329	-0.147
9	322	-0.083	34	325	-0.143
10	319	-0.08	35	322	-0.142
11	314	-0.067	36	315	-0.137
12	280	0.509	37	281	0.147
13	347	-0.094	38	279	0.146
14	345	-0.093	39	347	-0.15
15	342	-0.093	40	344	-0.152
16	339	-0.095	41	339	-0.151
17	336	-0.089	42	336	-0.155
18	332	-0.09	43	334	-0.151
19	329	-0.091	44	332	-0.151
20	327	-0.093	45	330	-0.15
21	323	-0.089	46	327	-0.148
22	321	-0.086	47	320	-0.145
23	318	-0.083	48	318	-0.145
24	313	-0.068	49	314	-0.138

## Appendix D Indirect cytotoxicity

**Table D1** Indirect cytotoxicity test, the mitochondrial metabolic activity (MTT Assay) of mouse fibroblast L929 cultured for 24h in extracted media at 1 day

Times	Mouse fibroblast L929			
	Control	Post-neutralized chitosan/THC fibers	Post-neutralized and crosslinked chitosan/THC fibers	Post-neutralized and crosslinked Chitosan/THC fibers (washed with glycine)
1	0.882	0.948	1.018	1.053
2	1.011	0.989	1.145	0.891
3	1.186	0.998	0.959	0.892
Average	1.026	0.978	1.041	0.944
SD	0.153	0.027	0.095	0.091

**Table D.2 Indirect cytotoxicity test, the mitochondrial metabolic activity (MTT Assay) of mouse fibroblast L929 cultured for 24h in the extracted media at 7 days**

Times	Mouse fibroblast L929			
	Control	Post-neutralized chitosan/THC fibers	Post-neutralized and crosslinked chitosan/THC fibers	Post-neutralized and crosslinked Chitosan/THC fibers (washed with glycine)
1	0.882	1.215	1.258	1.342
2	1.011	1.298	1.253	1.194
3	1.186	1.102	1.237	1.249
Average	1.026	1.205	1.249	1.262
SD	0.153	0.093	0.011	0.075

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