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APPENDIX I

Particle size distribution data
of liposomes containing protein extract from *Pasteurella multocida*

Particle size distribution data of freshly prepared of 1:0 molar ratio of lecithin to cholesterol liposome.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.67	0.00	0.78	0.00
0.78	0.52	0.91	0.52
0.91	1.11	1.06	1.63
1.06	1.83	1.24	3.45
1.24	2.94	1.44	6.40
1.44	3.89	1.68	10.29
1.68	5.29	1.95	15.59
1.95	6.47	2.28	22.05
2.28	7.46	2.65	29.52
2.65	8.27	3.09	37.79
3.09	8.78	3.60	46.57
3.60	9.21	4.19	55.78
4.19	9.45	4.88	65.23
4.88	8.59	5.69	73.81
5.69	7.28	6.63	81.10
6.63	5.73	7.72	86.83
7.72	4.14	9.00	90.79
9.00	2.56	10.48	93.62
10.48	1.45	12.21	95.07
12.21	0.60	14.22	95.67
14.22	0.12	16.57	95.79
16.57	0.00	19.31	95.79
19.31	0.00	22.49	95.79
22.49	0.17	26.20	95.79
26.20	0.37	30.53	96.33
30.53	0.51	35.56	96.84
35.56	0.58	41.43	97.42
41.43	0.56	48.27	97.98
48.27	0.49	56.23	98.48
56.23	0.39	65.51	98.78
65.51	0.30	76.32	99.16
76.32	0.22	88.91	99.39
88.91	0.17	103.58	99.56
103.58	0.14	120.67	99.70
120.67	0.11	140.58	99.81
140.58	0.09	163.77	99.90
163.77	0.06	190.80	99.96
190.80	0.03	222.28	99.99
222.28	0.01	258.95	100.00
258.95	0.00	301.68	100.00

Particle size distribution data of freshly prepared of 7:2 molar ratio of lecithin to cholesterol liposome.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.67	0.00	0.78	0.00
0.78	0.52	0.91	0.52
0.91	1.12	1.06	1.65
1.06	1.86	1.24	3.50
1.24	2.92	1.44	6.42
1.44	3.89	1.68	10.31
1.68	5.23	1.95	15.54
1.95	6.40	2.28	21.94
2.28	7.42	2.65	29.63
2.65	8.25	3.09	37.61
3.09	8.76	3.60	46.37
3.60	9.02	4.19	55.38
4.19	8.95	4.88	64.34
4.88	8.64	5.69	72.97
5.69	7.45	6.63	80.42
6.63	6.00	7.72	86.42
7.72	4.45	9.00	90.87
9.00	2.96	10.48	93.83
10.48	1.72	12.21	95.54
12.21	0.79	14.22	96.33
14.22	0.22	16.57	96.55
16.57	0.00	19.31	96.55
19.31	0.00	22.49	96.55
22.49	8.00	26.20	96.63
26.20	0.26	30.53	96.89
30.53	0.41	35.56	97.30
35.56	0.49	41.43	97.79
41.43	0.49	48.27	98.28
48.27	0.43	56.23	98.71
56.23	0.37	65.51	99.08
65.51	0.31	76.32	99.38
76.32	0.25	88.91	99.63
88.91	0.18	103.58	99.81
103.58	0.12	120.67	99.94
120.67	0.06	140.58	100.00
140.58	0.00	163.77	100.00

Particle size distribution data of freshly prepared of 1:1 molar ratio of lecithin to cholesterol liposome.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.91	0.00	1.06	0.00
1.06	0.03	1.24	0.03
1.24	0.11	1.44	0.14
1.44	0.27	1.68	0.42
1.68	0.73	1.95	1.15
1.95	1.43	2.28	2.58
2.28	2.43	2.65	5.02
2.65	3.84	3.09	8.86
3.09	5.80	3.60	14.66
3.60	8.41	4.19	23.07
4.19	10.76	4.88	33.83
4.88	12.63	5.69	46.46
5.69	13.85	6.63	60.31
6.63	12.33	7.72	72.64
7.72	10.04	9.00	82.68
9.00	6.82	10.48	89.50
10.48	4.25	12.21	93.75
12.21	2.15	14.22	95.90
14.22	0.72	16.57	96.62
16.57	0.00	19.31	96.62
19.31	0.00	22.49	96.62
22.49	0.00	26.20	96.62
26.20	0.00	30.53	96.62
30.53	0.11	35.56	96.73
35.56	0.33	41.43	97.06
41.43	0.53	48.27	97.59
48.27	0.61	56.23	98.20
56.23	0.55	65.51	98.74
65.51	0.40	76.32	99.15
76.32	0.26	88.91	99.41
88.91	0.19	103.58	99.59
103.58	0.15	120.67	99.75
120.67	0.08	140.58	99.83
140.58	0.08	163.77	99.91
163.77	0.05	190.80	99.96
190.80	0.03	222.28	99.99
222.28	0.01	258.95	100.00
258.95	0.00	301.68	100.00

Particle size distribution data of freshly prepared of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.02%w/v Carboxymethylcellulose

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.52	0.58	0.52
0.58	0.94	0.67	1.47
0.67	1.19	0.78	2.65
0.78	1.22	0.91	3.87
0.91	1.29	1.06	5.16
1.06	1.42	1.24	6.58
1.24	1.61	1.44	8.19
1.44	2.03	1.68	10.22
1.68	2.63	1.95	12.85
1.95	3.49	2.28	16.53
2.28	4.58	2.65	20.93
2.65	5.83	3.09	26.76
3.09	7.21	3.60	33.97
3.60	8.35	4.19	42.33
4.19	9.11	4.88	51.43
4.88	9.50	5.69	60.94
5.69	9.59	6.63	70.53
6.63	8.22	7.72	78.75
7.72	6.48	9.00	85.23
9.00	4.58	10.48	89.80
10.48	2.91	12.21	92.71
12.21	1.60	14.22	94.31
14.22	0.75	16.57	95.06
16.57	0.36	19.31	95.42
19.31	0.26	22.49	95.68
22.49	0.37	26.20	96.05
26.20	0.55	30.53	96.60
30.53	0.69	35.56	97.29
35.56	0.74	41.43	98.02
41.43	0.68	48.27	98.70
48.27	0.54	56.23	99.23
56.23	0.40	65.51	99.63
65.51	0.26	76.32	99.89
76.32	0.11	88.91	100.00
88.91	0.00	103.58	100.00

Particle size distribution data of freshly prepared of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.2% w/v Carboxymethylcellulose.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.59	0.58	0.59
0.58	0.83	0.67	1.42
0.67	0.74	0.78	2.16
0.78	0.46	0.91	2.62
0.91	0.15	1.06	2.77
1.06	0.43	1.24	3.20
1.24	0.52	1.44	3.72
1.44	0.78	1.68	4.50
1.68	1.21	1.95	5.70
1.95	1.90	2.28	7.60
2.28	2.88	2.65	10.49
2.65	4.16	3.09	14.64
3.09	5.80	3.60	20.44
3.60	7.41	4.19	27.85
4.19	8.56	4.88	36.41
4.88	9.02	5.69	45.43
5.69	8.40	6.63	53.84
6.63	6.90	7.72	60.74
7.72	5.19	9.00	65.93
9.00	3.40	10.48	69.33
10.48	2.09	12.21	71.42
12.21	1.17	14.22	72.59
14.22	0.63	16.57	73.22
16.57	0.38	19.31	73.59
19.31	0.34	22.49	73.93
22.49	0.64	26.20	74.57
26.20	0.84	30.53	75.40
30.53	1.08	35.56	76.48
35.56	1.33	41.43	77.80
41.43	1.38	48.27	79.18
48.27	1.32	56.23	80.51
56.23	1.19	65.51	81.69
65.51	1.00	76.32	82.69
76.32	0.78	88.91	83.47
88.91	0.57	103.58	84.04
103.58	0.42	120.67	84.45
120.67	0.38	140.58	84.83
140.58	0.50	163.77	85.33
163.77	0.79	190.80	86.12
190.80	1.25	222.28	87.37
222.28	1.78	258.95	89.15
258.95	2.14	301.68	91.29
301.68	2.07	351.68	93.35
351.46	1.67	409.45	95.02
409.45	1.24	477.01	96.26
477.01	0.97	555.71	97.23
555.71	0.94	647.41	98.17
647.41	0.98	754.23	99.15
754.23	0.85	878.67	100.00

Particle size distribution data of freshly prepared of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.5% w/v Carboxymethylchitosan.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.05	0.58	0.05
0.58	0.17	0.67	0.22
0.67	0.44	0.78	0.66
0.78	1.12	0.91	1.78
0.91	1.88	1.06	3.66
1.06	2.76	1.24	3.42
1.24	3.83	1.44	10.25
1.44	4.93	1.68	15.18
1.68	6.16	1.95	21.34
1.95	7.26	2.28	28.60
2.28	8.16	2.65	36.76
2.65	8.75	3.09	45.51
3.09	8.93	3.60	54.44
3.60	8.59	4.19	63.03
4.19	7.78	4.88	70.81
4.88	6.54	5.69	77.34
5.69	5.08	6.63	82.42
6.63	3.56	7.72	85.98
7.72	2.22	9.00	88.19
9.00	1.14	10.48	89.33
10.48	0.45	12.21	89.79
12.21	0.14	14.22	89.92
14.22	0.09	16.57	90.02
16.57	0.32	19.31	90.34
19.31	0.57	22.49	90.91
22.49	0.75	26.20	91.67
26.20	0.84	30.53	92.50
30.53	0.83	35.56	93.33
35.56	0.77	41.43	94.10
41.43	0.69	48.27	94.79
48.27	0.61	56.23	95.40
56.23	0.52	65.51	95.92
65.51	0.43	76.32	96.36
76.32	0.33	88.91	96.69
88.91	0.22	103.58	96.90
103.58	0.10	120.67	97.01
120.67	0.02	140.58	97.02
140.58	0.00	163.77	97.02
163.77	0.00	190.80	97.02
190.80	0.00	222.28	97.02
222.28	0.00	258.95	97.02
258.95	0.00	301.68	97.02
301.68	0.00	351.68	97.02
351.68	0.00	409.45	97.03
409.45	0.04	477.01	97.07
477.01	0.20	555.71	97.27
555.71	0.56	647.41	97.83
647.41	1.07	754.23	98.89
754.23	1.11	878.67	100.00

Particle size distribution data of freshly prepared of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.02% w/v Carboxymethylchitosan.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.56	0.58	0.56
0.58	1.02	0.67	1.57
0.67	1.30	0.78	2.87
0.78	1.36	0.91	4.23
0.91	1.44	1.06	5.67
1.06	1.56	1.24	7.24
1.24	1.76	1.44	8.99
1.44	2.14	1.68	11.14
1.68	2.72	1.95	13.85
1.95	3.53	2.28	17.38
2.28	4.56	2.65	21.94
2.65	5.73	3.09	27.67
3.09	6.98	3.60	34.65
3.60	8.02	4.19	42.67
4.19	8.66	4.88	51.33
4.88	8.84	5.69	60.17
5.69	8.52	6.63	68.69
6.63	7.87	7.72	76.56
7.72	6.14	9.00	82.70
9.00	4.27	10.48	86.97
10.48	2.66	12.21	89.63
12.21	1.45	14.22	91.08
14.22	0.74	16.57	91.82
16.57	0.72	19.31	92.54
19.31	0.82	22.49	93.36
22.49	1.06	26.20	94.42
26.20	1.24	30.53	95.66
30.53	1.25	35.56	96.91
35.56	1.08	41.43	97.99
41.43	0.81	48.27	98.79
48.27	0.57	56.23	99.36
56.23	0.37	65.51	99.73
65.51	0.20	76.32	99.93
76.32	0.70	88.91	100.00
88.91	0.00	103.58	100.00

Particle size distribution data of freshly prepared of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.2% w/v Carboxymethylchitosan.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.34	0.58	0.34
0.58	0.69	0.67	1.03
0.67	1.09	0.78	2.13
0.78	1.64	0.91	3.77
0.91	2.22	1.06	5.99
1.06	2.87	1.24	88.60
1.24	3.60	1.44	12.46
1.44	4.37	1.68	16.83
1.68	5.20	1.95	22.03
1.95	6.00	2.28	28.03
2.28	6.71	2.65	34.74
2.65	7.26	3.09	41.99
3.09	7.58	3.60	49.57
3.60	7.58	4.19	57.15
4.19	7.24	4.88	64.39
4.88	6.61	5.69	71.00
5.69	5.83	6.63	76.83
6.63	4.46	7.72	81.29
7.72	3.10	9.00	84.39
9.00	1.91	10.48	86.30
10.48	1.02	12.21	87.32
12.21	0.46	14.22	87.78
14.22	0.18	16.57	87.95
16.57	0.20	19.31	88.15
19.31	0.38	22.49	88.53
22.49	0.63	26.20	89.16
26.20	0.87	30.53	90.03
30.53	1.01	35.56	91.04
35.56	1.03	41.43	92.07
41.43	0.94	48.27	93.01
48.27	0.80	56.23	93.81
56.23	0.65	65.51	94.46
65.51	0.58	76.32	95.04
76.32	0.59	88.91	95.64
88.91	0.69	103.58	96.33
103.58	0.81	120.67	97.14
120.67	0.88	140.58	98.02
140.58	0.83	163.77	98.84
163.77	0.64	190.80	99.48
190.80	0.38	222.28	99.86
222.28	0.14	258.95	100.00
258.95	0.00	301.68	100.00

Particle size distribution data of freshly prepared of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.5% w/v Carboxymethylcellulose.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.95	0.58	0.95
0.58	1.89	0.67	2.83
0.67	2.81	0.78	5.64
0.78	3.63	0.91	9.27
0.91	4.42	1.06	13.69
1.06	5.16	1.24	18.85
1.24	5.81	1.44	24.66
1.44	6.63	1.68	31.02
1.68	6.78	1.95	37.80
1.95	7.05	2.28	44.85
2.28	7.16	2.65	52.01
2.65	7.11	3.09	59.12
3.09	6.92	3.60	66.04
3.60	6.66	4.19	72.70
4.19	5.90	4.88	78.60
4.88	4.94	5.69	83.54
5.69	3.84	6.63	87.37
6.63	2.72	7.72	90.09
7.72	1.70	9.00	91.80
9.00	0.88	10.48	92.67
10.48	0.28	12.21	92.96
12.21	0.00	14.22	92.96
14.22	0.00	16.57	92.96
16.57	0.00	19.31	92.96
19.31	0.00	22.49	92.96
22.49	0.00	26.20	92.96
26.20	0.00	30.53	92.96
30.53	0.00	35.56	92.96
35.56	0.00	41.43	92.96
41.43	0.00	48.27	92.96
48.27	0.00	56.23	92.96
56.23	0.00	65.51	92.96
65.51	0.00	76.32	92.96
76.32	0.00	88.91	92.96
88.91	0.16	103.58	93.12
103.58	0.34	120.67	93.46
120.67	0.58	140.58	94.04
140.58	0.80	163.77	94.83
163.77	0.93	190.80	95.76
190.80	0.93	222.28	96.70
222.28	0.81	258.95	97.51
258.95	0.61	301.68	98.11
301.68	0.38	351.68	98.50
351.46	0.19	409.45	98.69
409.45	0.10	477.01	98.79
477.01	0.14	555.71	98.93
555.71	0.27	647.41	99.21
647.41	0.41	754.23	99.62
754.23	0.38	878.67	100.00

Particle size distribution data of 3 months storage of 1:0 molar ratio of lecithin to cholesterol liposome.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.91	0.00	1.06	0.00
1.06	0.08	1.24	0.08
1.24	0.19	1.44	0.26
1.44	0.42	1.68	0.69
1.68	0.90	1.95	1.58
1.95	1.58	2.28	3.16
2.28	2.50	2.65	5.66
2.65	3.64	3.09	9.30
3.09	5.08	3.60	14.38
3.60	6.93	4.19	21.34
4.19	8.73	4.88	30.07
4.88	10.26	5.69	40.34
5.69	11.18	6.63	51.51
6.63	11.56	7.72	63.08
7.72	10.18	9.00	73.26
9.00	7.69	10.48	80.95
10.48	5.38	12.21	86.33
12.21	3.27	14.22	89.59
14.22	1.66	16.57	91.26
16.57	0.59	19.31	91.85
19.31	0.08	22.49	91.93
22.49	0.00	26.20	91.93
26.20	0.21	30.53	92.13
30.53	0.53	35.56	92.66
35.56	0.81	41.43	93.47
41.43	0.95	48.27	94.41
48.27	0.94	56.23	95.36
56.23	0.84	65.51	96.19
65.51	0.71	76.32	96.90
76.32	0.60	88.91	97.49
88.91	0.52	103.58	98.02
103.58	0.48	120.67	98.50
120.67	0.44	140.58	98.94
140.58	0.40	163.77	99.33
163.77	0.32	190.80	99.66
190.80	0.22	222.28	99.88
222.28	0.11	258.95	99.99
258.95	0.01	301.68	100.00
301.68	0.00	351.68	100.00

Particle size distribution data of 3 months storage of 7:2 molar ratio of lecithin to cholesterol liposome.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.91	0.00	1.06	0.00
1.06	0.07	1.24	0.07
1.24	0.18	1.44	0.26
1.44	0.42	1.68	0.68
1.68	0.90	1.95	1.58
1.95	1.59	2.28	3.71
2.28	2.51	2.65	5.68
2.65	3.65	3.09	9.33
3.09	5.10	3.60	14.43
3.60	7.09	4.19	21.53
4.19	9.01	4.88	30.54
4.88	10.66	5.69	41.20
5.69	11.61	6.63	52.81
6.63	11.94	7.72	64.75
7.72	10.42	9.00	75.17
9.00	7.67	10.48	82.84
10.48	5.24	12.21	88.08
12.21	3.06	14.22	91.13
14.22	1.44	16.57	92.58
16.57	0.38	19.31	92.95
19.31	0.00	22.49	92.95
22.49	0.00	26.20	92.95
26.20	0.00	30.53	92.95
30.53	0.24	35.56	93.20
35.56	0.55	41.43	93.75
41.43	0.73	48.27	94.47
48.27	0.77	56.23	95.24
56.23	0.69	65.51	95.93
65.51	0.57	76.32	96.5
76.32	0.46	88.91	96.96
88.91	0.39	103.58	97.35
103.58	0.36	120.67	97.71
120.67	0.35	140.58	98.05
140.58	0.36	163.77	98.41
163.77	0.36	190.80	98.78
190.80	0.34	222.28	99.12
222.28	0.30	258.95	99.42
258.95	0.24	301.68	99.66
301.68	0.18	351.68	99.84
351.46	0.11	409.45	99.95
409.45	0.05	477.01	100.00
477.01	0.00	555.71	100.00

Particle size distribution data of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposome.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.91	0.00	1.06	0.00
1.06	0.04	1.24	0.04
1.24	0.13	1.44	0.17
1.44	0.31	1.68	0.47
1.68	0.78	1.95	1.25
1.95	1.48	2.28	2.73
2.28	2.46	2.65	5.19
2.65	3.84	3.09	9.03
3.09	5.82	3.60	14.85
3.60	8.47	4.19	23.31
4.19	10.73	4.88	34.04
4.88	12.22	5.69	46.26
5.69	12.66	6.63	58.92
6.63	11.95	7.72	70.87
7.72	9.64	9.00	80.51
9.00	6.47	10.48	86.98
10.48	4.08	12.21	91.06
12.21	2.15	14.22	93.21
14.22	0.82	16.57	94.03
16.57	0.04	19.31	94.07
19.31	0.00	22.49	94.07
22.49	0.00	26.20	94.07
26.20	0.10	30.53	94.17
30.53	0.45	35.56	94.62
35.56	0.75	41.43	95.37
41.43	0.89	48.27	96.26
48.27	0.87	56.23	97.13
56.23	0.75	65.51	97.88
65.51	0.59	76.32	98.46
76.32	0.44	88.91	98.9
88.91	0.33	103.58	99.22
103.58	0.25	120.67	99.48
120.67	0.20	140.58	99.68
140.58	0.15	163.77	99.83
163.77	0.10	190.80	99.94
190.80	0.06	222.28	99.99
222.28	0.01	258.95	100.00
258.95	0.00	301.68	100.00

Particle size distribution data of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.02% w/v Carboxymethylcellulose.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.60	0.58	0.06
0.58	1.08	0.67	1.68
0.67	1.36	0.78	3.03
0.78	1.35	0.91	4.39
0.91	1.38	1.06	5.76
1.06	1.44	1.24	7.20
1.24	1.57	1.44	8.77
1.44	1.92	1.68	10.69
1.68	2.46	1.95	13.15
1.95	3.27	2.28	16.24
2.28	4.33	2.65	20.75
2.65	5.56	3.09	26.32
3.09	6.90	3.60	33.22
3.60	8.05	4.19	41.27
4.19	8.86	4.88	50.14
4.88	9.35	5.69	59.49
5.69	9.35	6.63	69.04
6.63	8.26	7.72	77.30
7.72	6.53	9.00	83.83
9.00	4.60	10.48	88.43
10.48	2.87	12.21	91.29
12.21	1.51	14.22	92.80
14.22	0.64	16.57	93.45
16.57	0.26	19.31	93.71
19.31	0.29	22.49	94.00
22.49	0.57	26.20	94.57
26.20	0.92	30.53	95.49
30.53	1.14	35.56	96.63
35.56	1.11	41.43	97.74
41.43	0.89	48.27	98.63
48.27	0.59	56.23	99.22
56.23	0.33	65.51	99.55
65.51	0.18	76.32	99.73
76.32	0.11	88.91	99.84
88.91	0.07	103.58	99.92
103.58	0.05	120.67	99.97
120.67	0.03	140.58	99.99
140.58	0.01	163.77	100.00
163.77	0.00	190.80	100.00

Particle size distribution data of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.2% w/v Carboxymethylcellulose.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.11	0.58	0.11
0.58	0.38	0.67	0.49
0.67	0.67	0.78	1.17
0.78	0.55	0.91	1.72
0.91	0.34	1.06	2.05
1.06	0.41	1.24	2.47
1.24	0.55	1.44	3.02
1.44	0.88	1.68	3.89
1.68	1.37	1.95	5.26
1.95	2.12	2.28	7.39
2.28	3.16	2.65	10.54
2.65	4.47	3.09	15.01
3.09	6.12	3.60	21.13
3.60	7.6	4.19	28.73
4.19	8.52	4.88	37.26
4.88	8.68	5.69	45.93
5.69	7.88	6.63	53.81
6.63	6.30	7.72	60.11
7.72	4.64	9.00	64.75
9.00	2.98	10.48	67.73
10.48	1.78	12.21	69.51
12.21	0.96	14.22	70.47
14.22	0.48	16.57	70.94
16.57	0.25	19.31	71.20
19.31	0.22	22.49	71.42
22.49	0.47	26.20	71.89
26.20	0.64	30.53	72.53
30.53	0.83	35.56	73.36
35.56	0.97	41.43	74.33
41.43	1.05	48.27	75.38
48.27	1.05	56.23	76.43
56.23	0.99	65.51	77.42
65.51	0.88	76.32	78.30
76.32	0.73	88.91	79.03
88.91	0.54	103.58	79.57
103.58	0.40	120.67	79.97
120.67	0.38	140.58	80.35
140.58	0.53	163.77	80.88
163.77	0.88	190.80	81.76
190.80	1.43	222.28	83.20
222.28	2.14	258.95	85.34
258.95	2.68	301.68	88.02
301.68	2.70	351.68	90.71
351.68	2.34	409.45	93.06
409.45	1.94	477.01	94.99
477.01	1.68	555.71	96.68
555.71	1.52	647.41	98.19
647.41	1.18	754.23	99.37
754.23	0.63	878.67	100.00

Particle size distribution data of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.5% w/v Carboxymethylcellulose.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.94	0.58	0.94
0.58	1.86	0.67	2.80
0.67	2.72	0.78	5.52
0.78	3.47	0.91	8.99
0.91	4.18	1.06	13.17
1.06	4.85	1.24	18.01
1.24	5.45	1.44	23.46
1.44	5.98	1.68	29.45
1.68	6.42	1.95	35.87
1.95	6.77	2.28	42.64
2.28	6.98	2.65	49.62
2.65	7.05	3.09	56.67
3.09	6.95	3.60	63.61
3.60	6.70	4.19	70.32
4.19	6.38	4.88	76.70
4.88	5.50	5.69	82.20
5.69	4.43	6.63	86.62
6.63	3.92	7.72	89.91
7.72	2.21	9.00	92.12
9.00	1.29	10.48	93.41
10.48	0.60	12.21	94.02
12.21	0.16	14.22	94.18
14.22	0.00	16.57	94.18
16.57	0.00	19.31	94.18
19.31	0.00	22.49	94.18
22.49	0.02	26.20	94.20
26.20	0.09	30.53	94.28
30.53	0.12	35.56	94.80
35.56	0.12	41.43	94.53
41.43	0.20	48.27	94.73
48.27	0.23	56.23	94.96
56.23	0.32	65.51	95.28
65.51	0.53	76.32	92.82
76.32	0.80	88.91	96.61
88.91	0.98	103.58	97.60
103.58	0.99	120.67	98.58
120.67	0.78	140.58	99.36
140.58	0.46	163.77	99.82
163.77	0.17	190.80	100
190.80	0.00	222.28	100

Particle size distribution data of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.02% w/v Carboxymethylchitosan.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.38	0.58	0.38
0.58	0.69	0.67	1.07
0.67	0.88	0.78	1.96
0.78	0.97	0.91	2.93
0.91	1.10	1.06	4.02
1.06	1.29	1.24	5.32
1.24	1.60	1.44	6.92
1.44	2.11	1.68	9.03
1.68	2.82	1.95	11.84
1.95	3.57	2.28	15.59
2.28	4.86	2.65	20.46
2.65	6.08	3.09	26.54
3.09	7.33	3.60	33.87
3.60	8.29	4.19	42.16
4.19	8.77	4.88	50.92
4.88	8.74	5.69	59.67
5.69	8.21	6.63	67.88
6.63	7.35	7.72	75.23
7.72	5.51	9.00	80.47
9.00	3.62	10.48	84.36
10.48	2.06	12.21	86.42
12.21	0.95	14.22	87.37
14.22	0.38	16.57	87.75
16.57	0.22	19.31	87.96
19.31	0.43	22.49	88.4
22.49	0.83	26.20	89.23
26.20	1.24	30.53	90.47
30.53	1.50	35.56	91.97
35.56	1.53	41.43	93.51
41.43	1.37	48.27	94.97
48.27	1.10	56.23	95.97
56.23	0.84	65.51	96.81
65.51	0.67	76.32	97.47
76.32	0.60	88.91	98.07
88.91	0.57	103.58	98.65
103.58	0.52	120.67	99.17
120.67	0.39	140.58	99.56
140.58	0.27	163.77	99.84
163.77	0.16	190.80	100.00
190.80	0.00	222.28	100.00

Particle size distribution data of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.2% w/v Carboxymethylchitosan.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.34	0.58	0.34
0.58	0.69	0.67	1.03
0.67	1.07	0.78	2.10
0.78	1.59	0.91	3.69
0.91	2.14	1.06	5.83
1.06	2.75	1.24	8.59
1.24	3.46	1.44	12.05
1.44	4.21	1.68	16.26
1.68	5.03	1.95	21.29
1.95	5.83	2.28	27.12
2.28	6.56	2.65	33.68
2.65	7.15	3.09	40.83
3.09	7.51	3.60	48.34
3.60	7.56	4.19	55.90
4.19	7.28	4.88	36.18
4.88	6.69	5.69	69.87
5.69	5.95	6.63	75.81
6.63	4.59	7.72	80.40
7.72	3.24	9.00	83.64
9.00	2.04	10.48	85.68
10.48	1.13	12.21	86.82
12.21	0.57	14.22	87.38
14.22	0.32	16.57	87.70
16.57	0.32	19.31	88.02
19.31	0.47	22.49	88.49
22.49	0.67	26.20	89.15
26.20	0.84	30.53	89.99
30.53	0.94	35.56	90.92
35.56	0.95	41.43	91.87
41.43	0.88	48.27	92.75
48.27	0.74	56.23	93.49
56.23	0.57	65.51	94.06
65.51	0.41	76.32	94.48
76.32	0.28	88.91	94.76
88.91	0.21	103.58	94.79
103.58	0.21	120.67	95.18
120.67	0.29	140.58	95.47
140.58	0.43	163.77	95.90
163.77	0.62	190.80	96.52
190.80	0.80	222.28	97.33
222.28	0.90	258.95	98.22
258.95	0.84	301.68	99.06
301.68	0.59	351.68	99.65
351.46	0.35	409.45	100.00
409.45	0.00	477.01	100.00

Particle size distribution data of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposome stabilized with 0.5% w/v Carboxymethylchitosan.

Size Low (μm)	frequency %	Size High (μm)	Cumulative Under %
0.49	0.06	0.58	0.06
0.58	0.18	0.67	0.24
0.67	0.44	0.78	0.68
0.78	1.08	0.91	1.76
0.91	1.80	1.06	3.56
1.06	2.64	1.24	6.12
1.24	3.67	1.44	9.87
1.44	4.73	1.68	14.6
1.68	5.93	1.95	20.53
1.95	7.02	2.28	27.54
2.28	7.92	2.65	35.46
2.65	8.54	3.09	44.00
3.09	8.75	3.60	52.78
3.60	8.53	4.19	61.31
4.19	7.08	4.88	69.11
4.88	6.68	5.69	75.79
5.69	5.34	6.63	81.13
6.63	3.60	7.72	84.73
7.72	2.08	9.00	86.82
9.00	0.95	10.48	87.77
10.48	0.26	12.21	88.03
12.21	0.00	14.22	88.03
14.22	0.05	16.57	88.08
16.57	0.32	19.31	88.40
19.31	0.64	22.49	89.04
22.49	0.91	26.20	89.94
26.20	1.05	30.53	90.99
30.53	1.05	35.56	92.04
35.56	0.93	41.43	92.97
41.43	0.73	48.27	93.7
48.27	0.55	56.23	94.24
56.23	0.44	65.51	94.69
65.51	0.47	76.32	95.16
76.32	0.64	88.91	95.80
88.91	0.87	103.58	96.67
103.58	1.04	120.67	97.72
120.67	1.03	140.58	98.75
140.58	0.79	163.77	99.53
163.77	0.42	190.80	99.95
190.80	0.05	222.28	100.00
222.28	0.00	258.95	100.00

APPENDIX II

Cumulative undersize frequency curve
of liposomes containing protein extract from *Pasteurella multocida*

Figure 60 Cumulative undersize frequency curve of 1:0 molar ratio of egg yolk lecithin to cholesterol liposomes prepared by double emulsion technique.

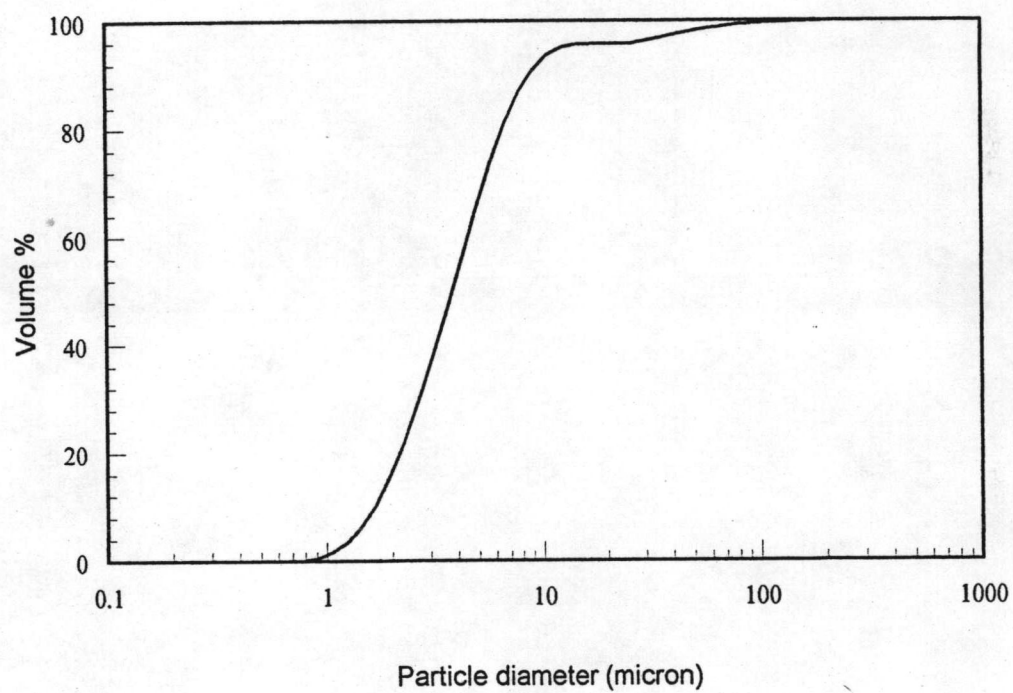


Figure 61 Cumulative undersize frequency curve of 7:2 molar ratio of egg yolk lecithin to cholesterol liposomes prepared by double emulsion technique.

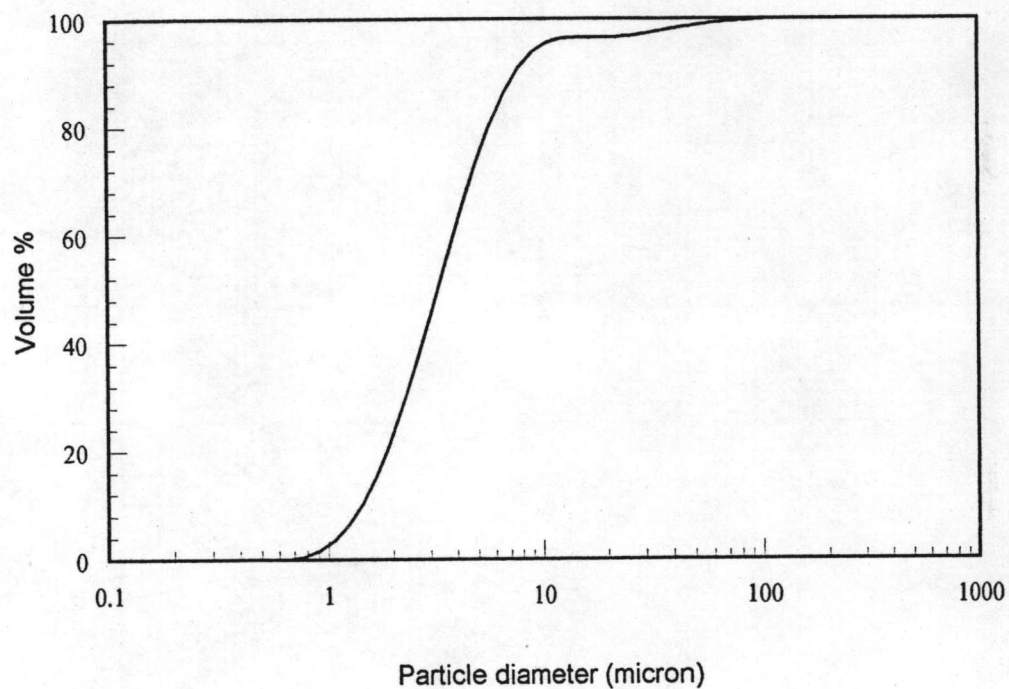


Figure 62 Cumulative undersize frequency curve of 1:1 molar ratio of egg yolk lecithin to cholesterol liposome prepared by double emulsion technique.

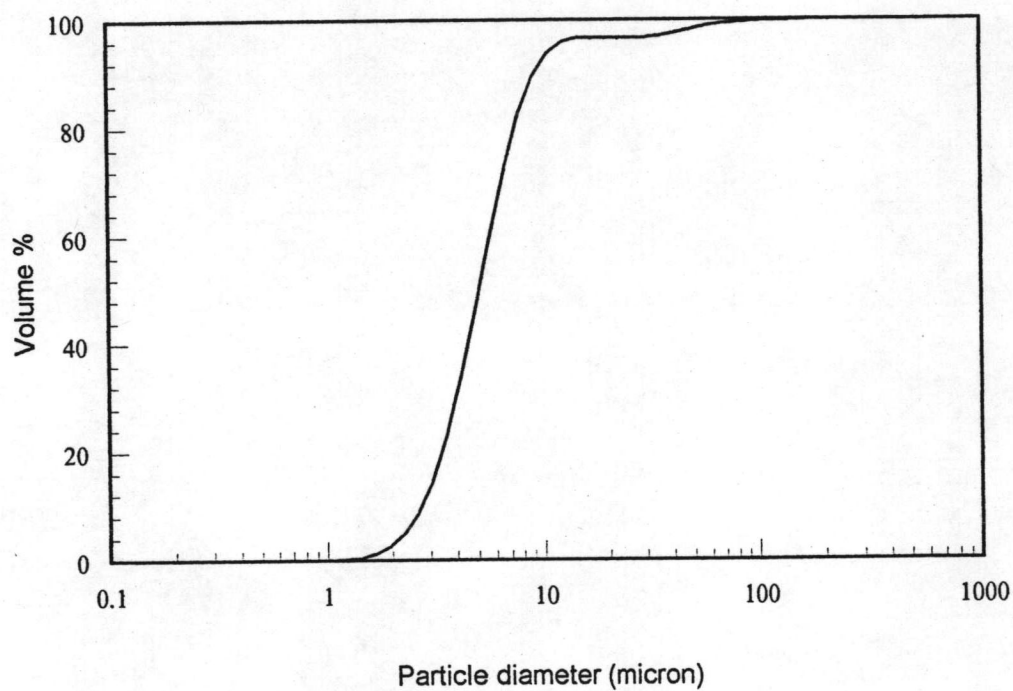


Figure 63 Cumulative undersize frequency curve of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.02% w/v CM-Cellulose, prepared by double emulsion technique.

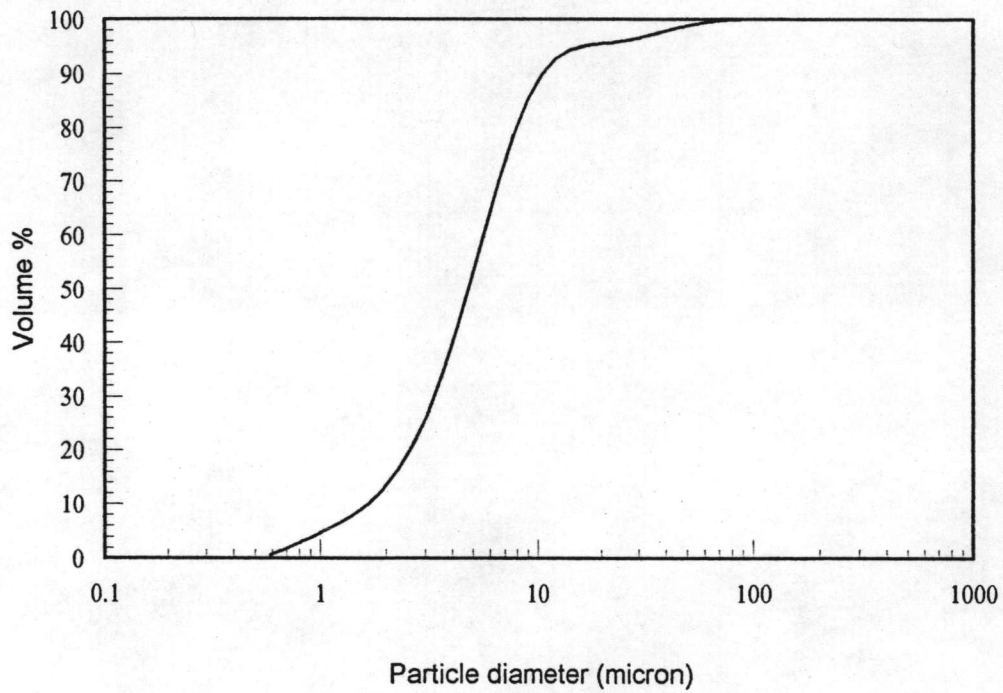


Figure 64 Cumulative size frequency curves of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.2% w/v CM-Cellulose, prepared by double emulsion technique.

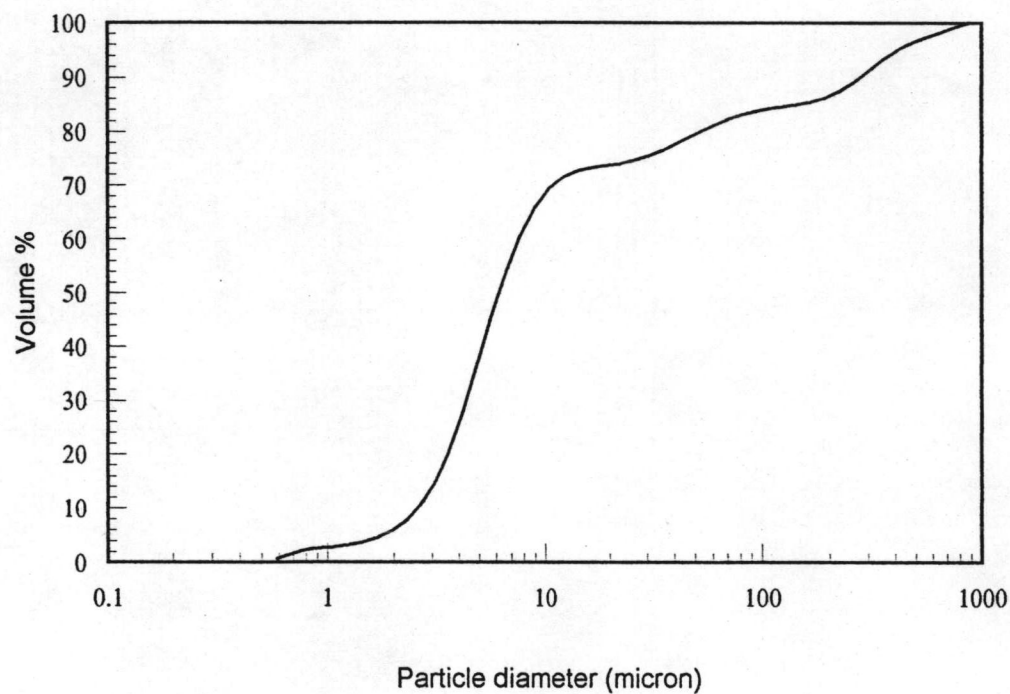


Figure 65 Cumulative size frequency curves of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.5% w/v CM-Cellulose, prepared by double emulsion technique.

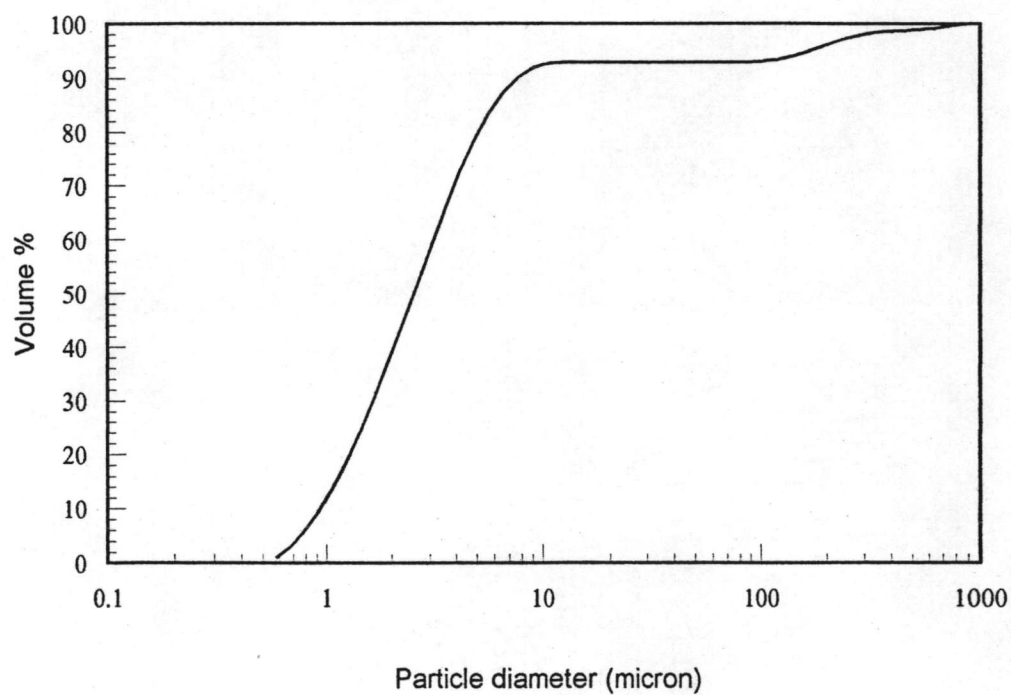


Figure 66 Cumulative undersize frequency curve of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.02% w/v CM-Chitosan, prepared by double emulsion technique.

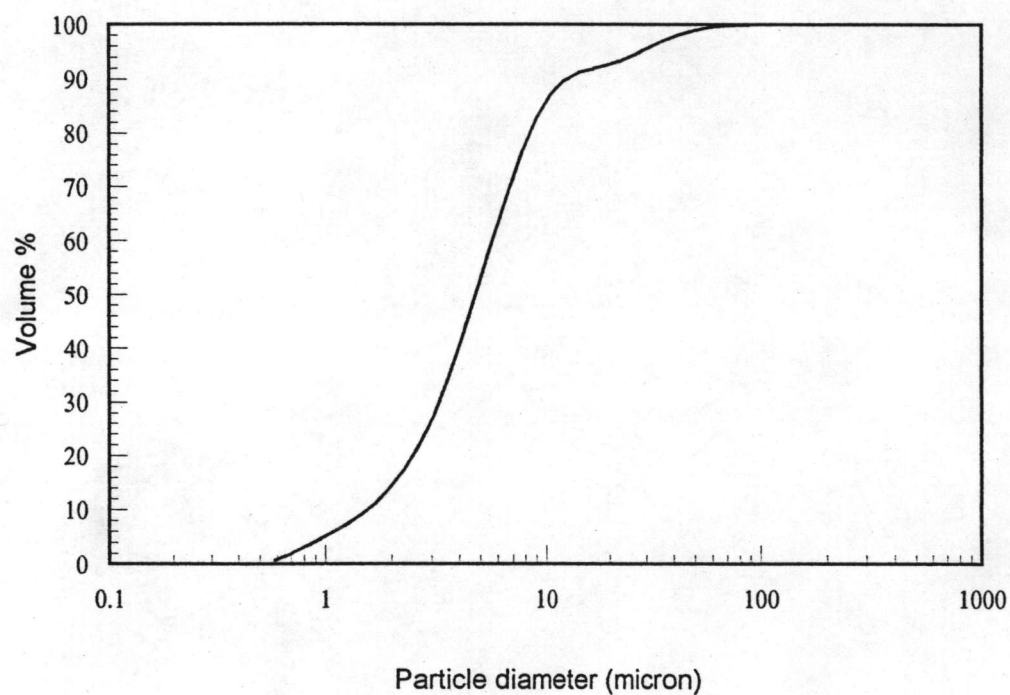


Figure 67 Cumulative undersize frequency curve of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.2% w/v CM-Chitosan, prepared by double emulsion technique.

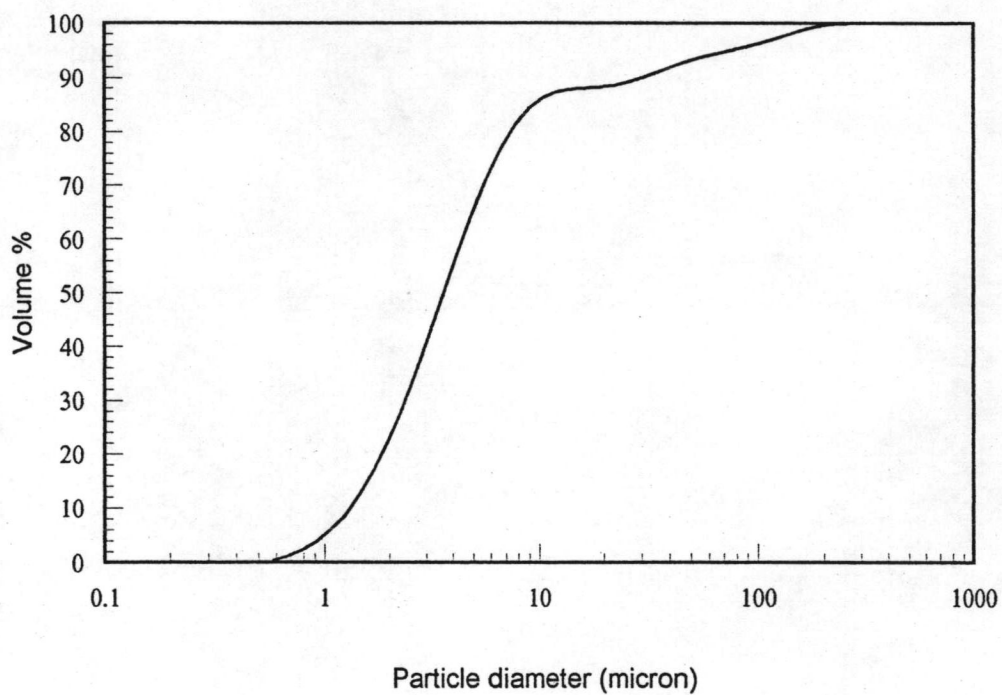


Figure 68 Cumulative undersize frequency curve of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.5% w/v CM-Chitosan, prepared by double emulsion technique.

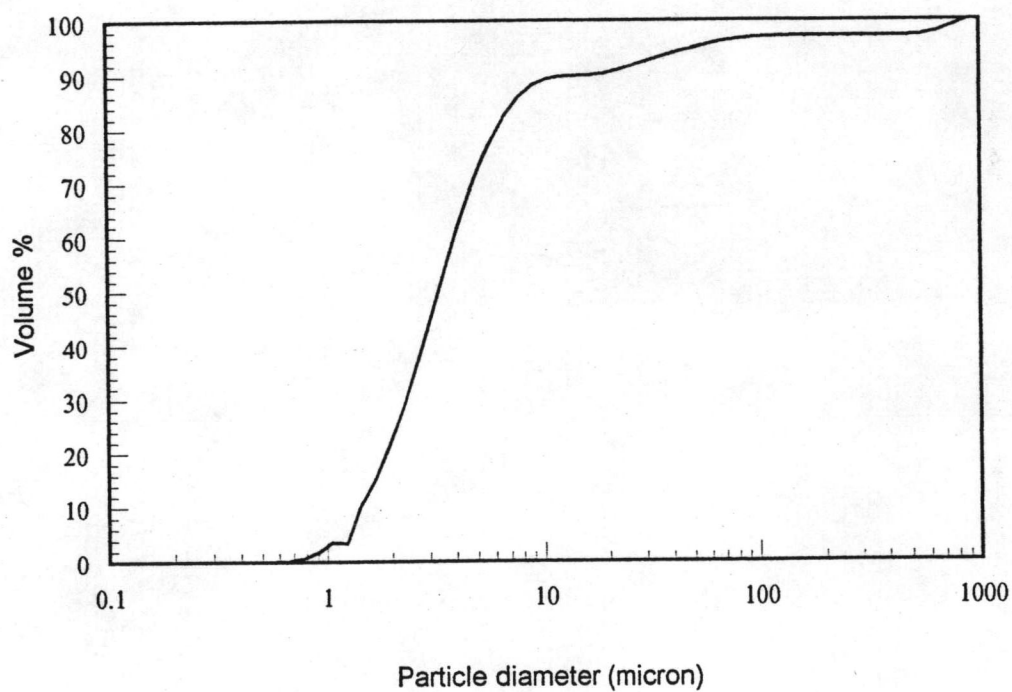


Figure 69 Cumulative undersize frequency curve of 3 months storage of 1:0 molar ratio of lecithin to cholesterol liposome prepared by double emulsion technique.

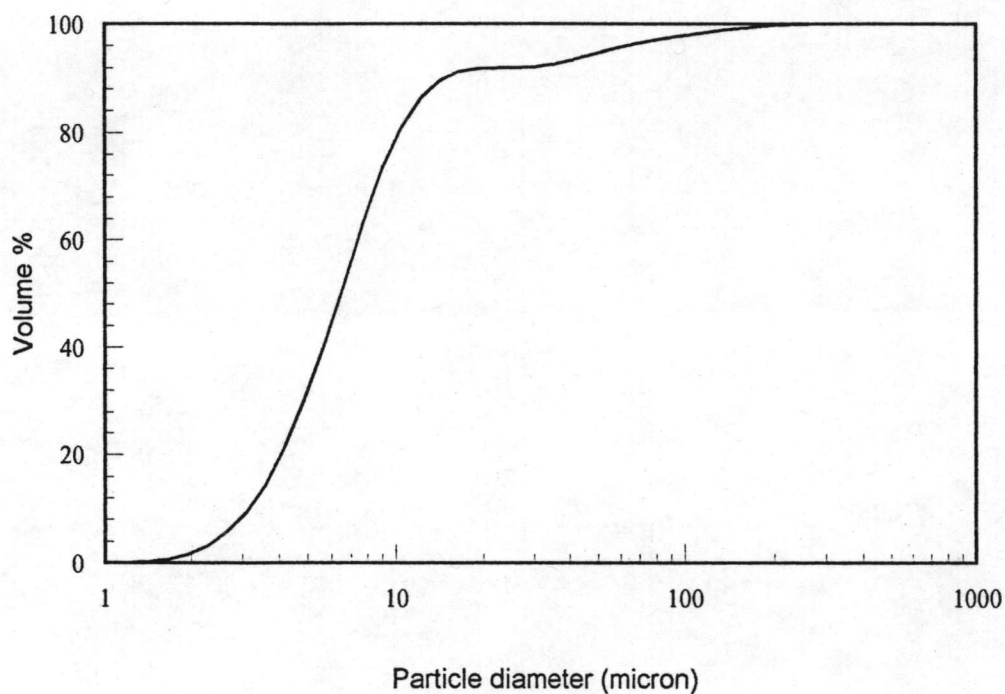


Figure 70 Cumulative undersize frequency curve of 3 months storage of 7:2 molar ratio of lecithin to cholesterol liposome prepared by double emulsion technique.

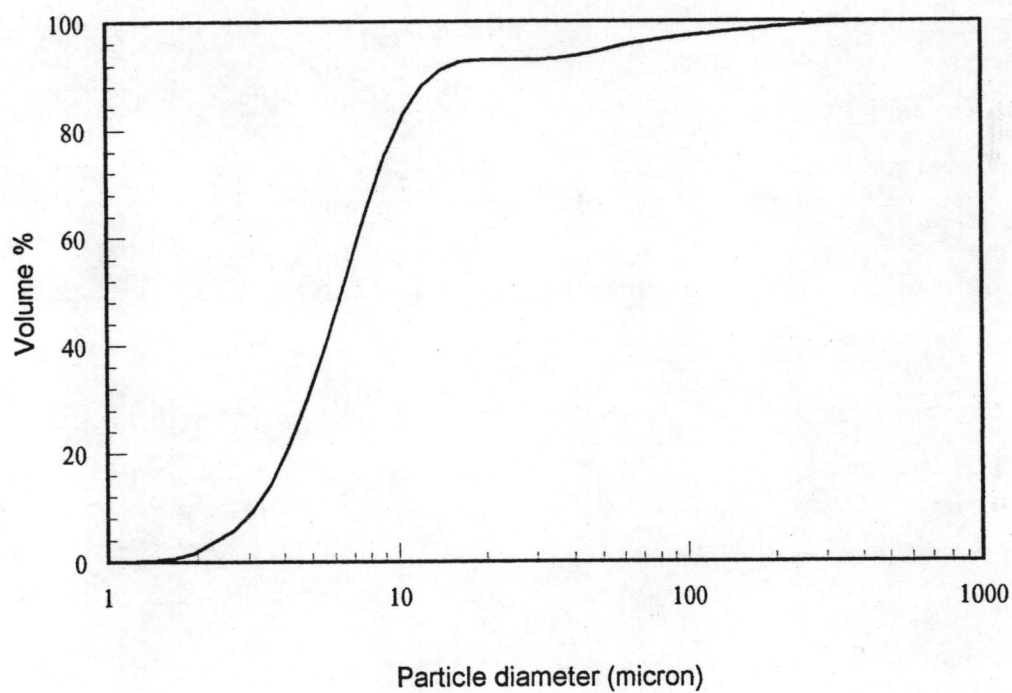


Figure 71 Cumulative undersize frequency curve of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposome prepared by double emulsion technique.

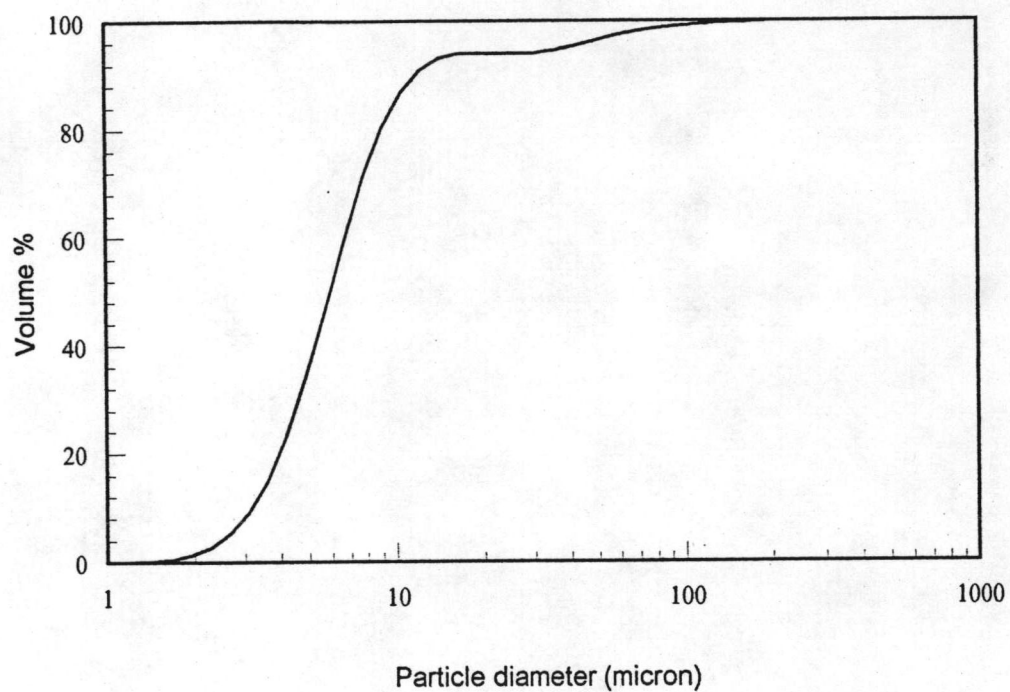


Figure 72 Cumulative undersize frequency curve of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.02% w/v CM-Cellulose, prepared by double emulsion technique.

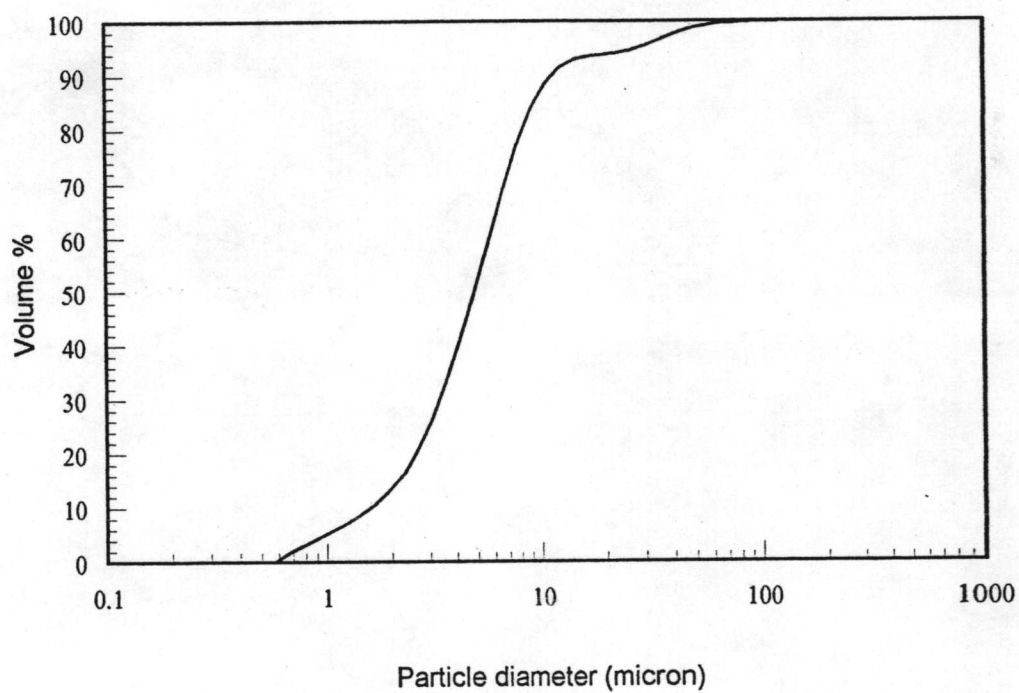


Figure 73 Cumulative undersize frequency curve of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.2% w/v CM-Cellulose, prepared by double emulsion technique.

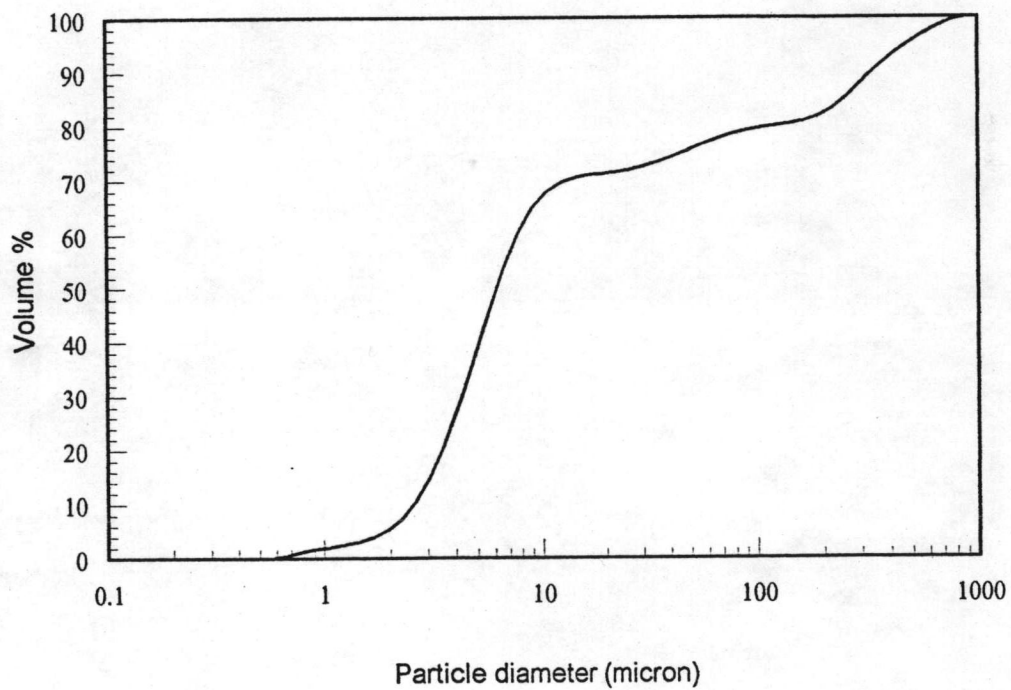


Figure 74 Cumulative undersize frequency curve of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.5% w/v CM-Cellulose, prepared by double emulsion technique.

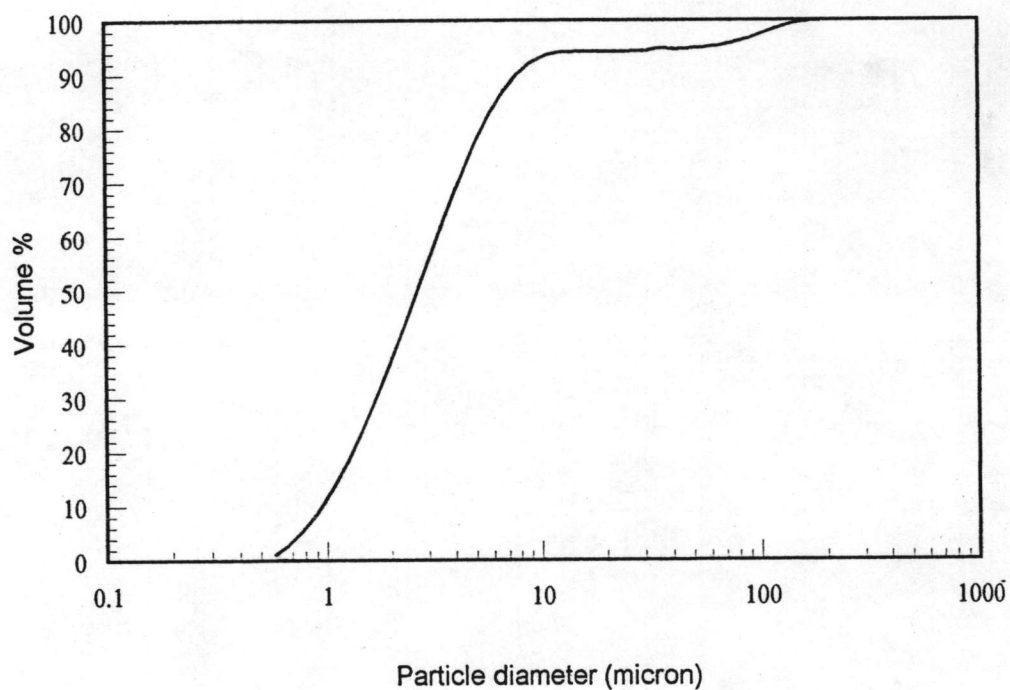


Figure 75 Cumulative undersize frequency curve of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.02% w/v CM-Chitosan, prepared by double emulsion technique.

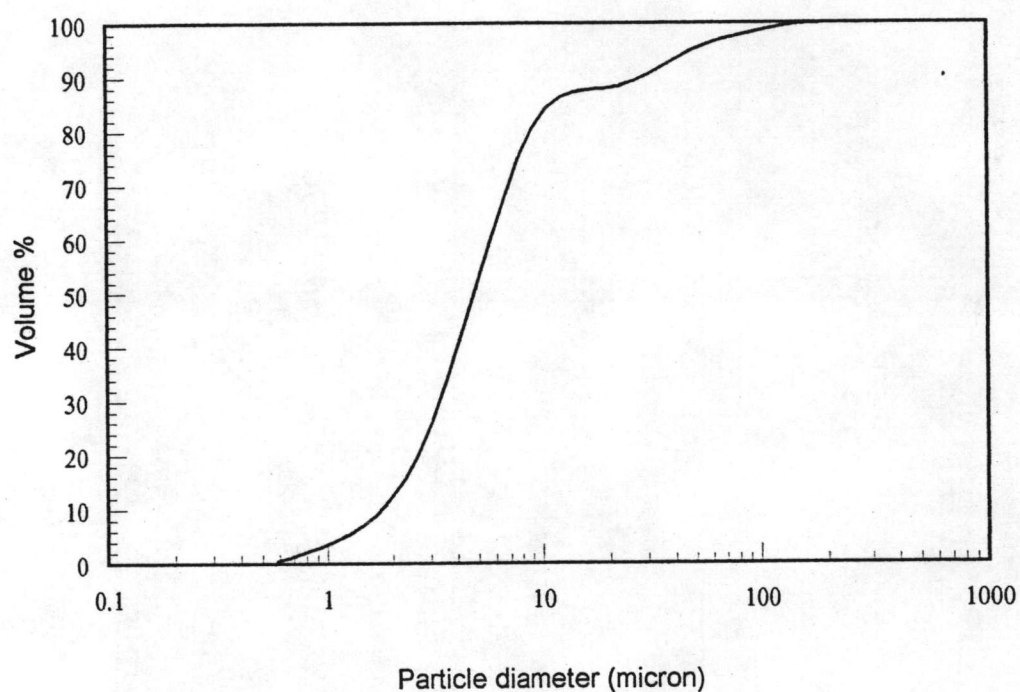


Figure 76 Cumulative undersize frequency curve of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.2% w/v CM-Chitosan, prepared by double emulsion technique.

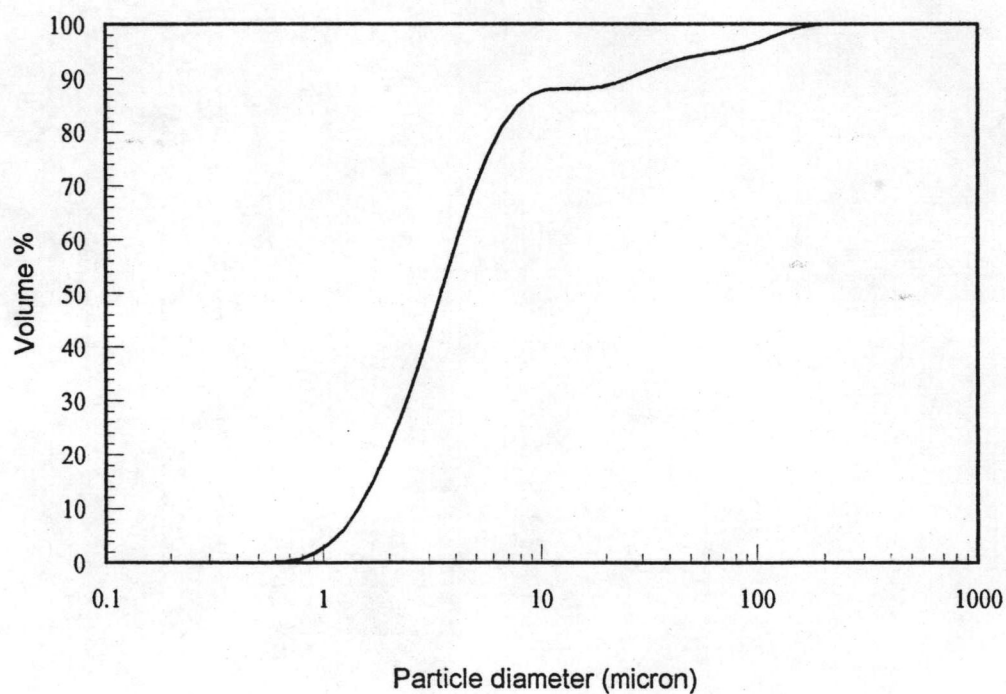
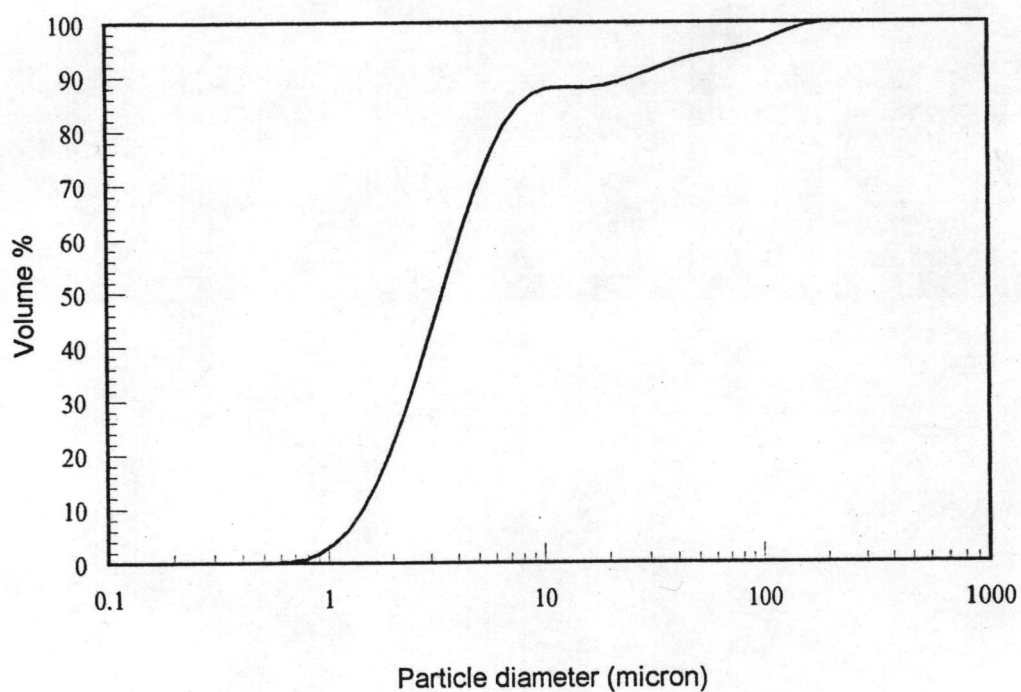


Figure 77 Cumulative undersize frequency curve of 3 months storage of 1:1 molar ratio of lecithin to cholesterol liposomes stabilized with 0.5% w/v CM-Chitosan, prepared by double emulsion technique.



APPENDIX III

Statistical Data

Unpaired t-test for entrapping efficiency of liposomes prepared by double emulsion technique with various molar ratios of egg yolk lecithin to cholesterol

Formulation	t-value	$\alpha_{0.05}$	differentiation
1,2	-4.48	± 3.18	Significant
1,3	-12.03	± 3.18	Significant
2,3	-6.66	± 3.18	Significant

Formulation 1 = 1:0 molar ratio of lecithin to cholesterol liposomes

Formulation 2 = 7:2 molar ratio of lecithin to cholesterol liposomes

Formulation 3 = 1:1 molar ratio of lecithin to cholesterol liposomes

Unpaired t-test for entrapping efficiency of liposomes prepared by double emulsion technique with 1:1 molar ratios of egg yolk lecithin to cholesterol stabilized with various concentration of CM-Cellulose or CM-Chitosan

Formulation	t-value	$\alpha_{0.05}$	differtiation
4,5	-0.48	± 3.18	Non Significant
4,6	+0.55	± 3.18	Non Significant
4,7	+0.35	± 3.18	Non Significant
4,8	+0.52	± 3.18	Non Significant
4,9	+0.18	± 3.18	Non Significant
5,6	+1.01	± 3.18	Non Significant
5,7	+0.94	± 3.18	Non Significant
5,8	+0.93	± 3.18	Non Significant
5,9	+0.64	± 3.18	Non Significant
6,7	-0.30	± 3.18	Non Significant
6,8	+0.03	± 3.18	Non Significant
6,9	-0.37	± 3.18	Non Significant
7,8	+0.29	± 3.18	Non Significant
7,9	-0.13	± 3.18	Non Significant
8,9	-0.36	± 3.18	Non Significant

Formulation 4 = stabilized with 0.02% w/v CM-cellulose

Formulation 5 = stabilized with 0.2% w/v CM-cellulose

Formulation 6 = stabilized with 0.5% w/v CM-cellulose

Formulation 7 = stabilized with 0.02% w/v CM-chitosan

Formulation 8 = stabilized with 0.2% w/v CM-chitosan

VITA

Flight Lieutenant Sukanya Arpornpattanapong was born in September 2nd, 1966 in Nakhonsawan, Thailand. She has graduated Bachelor of Science in Pharmacy from Faculty of Pharmacy, Mahidol University, Bangkok, Thailand since 1989. After graduation, she presented as a pharmacist in Wing 4 Hospital, Nakhonsawan, from 1989 to 1992. In 1992-1994, she worked at Directorate of Medical Services, Royal Thai Air Force, before entering the master course in Pharmaceutical Science in Chulalongkorn University.

