



Supporting Information

for

Cyclodextrins permeabilize DPPC liposome membranes: a focus on cholesterol content, cyclodextrin type, and concentration

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Supporting tables

Table S1: The SRB release values obtained at t_0 , 4 h and 24 h for α -CD-treated liposomes of different CHOL contents and different CD/DPPC molar ratios.

The SRB release value of blank liposomes was 0% at t_0 for the different formulations. Values are expressed as the means of three different measurements \pm SD (* indicates a value of $p < 0.05$ statistically significant. The p values compare the membrane permeability in the presence of CD to that of the respective blank).

Time	DPPC/CHOL (100:10)			DPPC/CHOL (100:25)			DPPC/CHOL (100:50)			DPPC/CHOL (100:100)		
	0 h	4 h	24 h	0 h	4 h	24 h	0 h	4 h	24 h	0 h	4 h	24 h
Blank	0	43.64 \pm 1.84	48.34 \pm 1.73	0	12.60 \pm 1.28	15.01 \pm 1.35	0	3.13 \pm 0.79	4.17 \pm 1.26	0	2.41 \pm 0.70	5.15 \pm 1.35
α-CD/DPPC 1:1	2.20 \pm 0.39*	38.20 \pm 0.97*	42.19 \pm 0.35*	2.16 \pm 0.42*	13.99 \pm 0.72	15.13 \pm 0.40	2.23 \pm 0.53*	2.31 \pm 0.30	3.14 \pm 0.13	1.06 \pm 0.12	2.46 \pm 0.86	5.20 \pm 0.34
α-CD/DPPC 10:1	13.08 \pm 0.38*	40.84 \pm 0.86*	42.76 \pm 1.20*	8.94 \pm 0.82*	19.67 \pm 0.17*	23.85 \pm 1.01*	4.20 \pm 0.39*	9.81 \pm 0.27*	14.48 \pm 0.43*	2.95 \pm 0.25*	4.27 \pm 0.73*	6.85 \pm 0.39*
α-CD/DPPC 100:1	15.00 \pm 0.95*	45.70 \pm 1.63	48.38 \pm 1.87	23.01 \pm 0.73*	40.16 \pm 1.85*	47.80 \pm 0.85*	18.50 \pm 1.23*	34.55 \pm 0.18*	44.48 \pm 1.45*	13.29 \pm 0.12*	30.50 \pm 0.54*	38.06 \pm 0.74*

Table S2: The SRB release values obtained at time t_0 , 4, and 24 h for β -CD-treated liposomes at different CHOL content and different CD/DPPC molar ratios.

The SRB release value of blank liposomes was 0% at t_0 for the different formulations. Values are expressed as the means of three different measurements \pm SD (* indicates a value of $p < 0.05$ statistically significant. The p values compare the membrane permeability in the presence of CD to that of the respective blank.)

Time	DPPC/CHOL (100:10)			DPPC/CHOL (100:25)			DPPC/CHOL (100:50)			DPPC/CHOL (100:100)		
	0 h	4 h	24 h	0 h	4 h	24 h	0 h	4 h	24 h	0 h	4 h	24 h
Blank	0	43.64 \pm 1.84	48.34 \pm 1.73	0	12.60 \pm 1.28	15.01 \pm 1.35	0	3.13 \pm 0.79	4.17 \pm 1.26	0	2.41 \pm 0.70	5.15 \pm 1.35
β-CD/DPPC 1:1	1.90 \pm 0.09*	39.45 \pm 1.03	44.05 \pm 0.16	1.40 \pm 0.25	14.24 \pm 0.37	14.60 \pm 0.59	2.50 \pm 0.32*	2.14 \pm 0.08	5.63 \pm 0.25	1.28 \pm 0.15	0.99 \pm 0.43	7.02 \pm 0.08
β-CD/DPPC 10:1	11.91 \pm 1.28*	35.79 \pm 0.81*	40.85 \pm 0.90*	6.32 \pm 0.20*	18.07 \pm 0.82*	21.45 \pm 0.94*	2.76 \pm 0.28*	2.53 \pm 0.01	7.93 \pm 0.20*	1.75 \pm 0.30*	2.16 \pm 0.01	4.60 \pm 0.24
β-CD/DPPC 100:1	17.10 \pm 0.83*	44.71 \pm 1.23	49.20 \pm 2.02	18.94 \pm 1.48*	38.29 \pm 1.89*	39.78 \pm 1.95*	23.30 \pm 0.63*	36.97 \pm 0.33*	45.85 \pm 1.54*	32.37 \pm 0.90*	52.3 \pm 1.00*	57.71 \pm 0.01*

Table S3: The SRB release values obtained at t_0 , 4, and 24 h for the β -CD derivatives-treated liposomes of different CHOL content and at different CD/DPPC molar ratios.

The SRB release value of blank liposomes was 0% at t_0 for the different formulations. Values are expressed as the means of three different measurements \pm SD (* indicates a value of $p < 0.05$ statistically significant. The p values compare the membrane permeability in the presence of CD to that of the respective blank).

	DPPC/CHOL (100:10)			DPPC/CHOL (100:25)			DPPC/CHOL (100:50)			DPPC/CHOL (100:100)		
Time	0 h	4 h	24 h	0 h	4 h	24 h	0 h	4 h	24 h	0 h	4 h	24 h
Blank	0	43.64 \pm 1.84	48.34 \pm 1.73	0	12.60 \pm 1.28	15.01 \pm 1.35	0	3.13 \pm 0.79	4.17 \pm 1.26	0	2.41 \pm 0.70	5.15 \pm 1.35
RAMEB												
CD/DPPC 1:1	3.20 \pm 0.44*	39.22 \pm 0.53	45.49 \pm 0.19	2.46 \pm 0.11*	13.73 \pm 0.22	16.97 \pm 0.83	3.50 \pm 0.16*	2.09 \pm 0.09	6.38 \pm 0.30	1.06 \pm 0.27	0.97 \pm 0.18	6.34 \pm 0.11
CD/DPPC 10:1	13.32 \pm 0.27*	43.99 \pm 0.65	47.25 \pm 0.06	9.39 \pm 0.64*	19.32 \pm 0.42*	22.72 \pm 1.02*	4.78 \pm 0.09*	8.35 \pm 0.33*	11.04 \pm 0.27*	2.56 \pm 0.37*	1.90 \pm 0.21	3.47 \pm 0.28
CD/DPPC 100:1	28.70 \pm 0.48*	46.06 \pm 1.75	52.76 \pm 1.51*	23.80 \pm 1.77*	38.13 \pm 1.40*	45.24 \pm 1.87*	27.50 \pm 0.82*	43.51 \pm 0.80*	48.46 \pm 0.23*	40.74 \pm 0.46*	52.00 \pm 0.52*	57.07 \pm 0.24*
CRYSMEB												
CD/DPPC 1:1	1.11 \pm 0.53	41.81 \pm 0.16	42.24 \pm 0.28	2.57 \pm 0.17*	13.53 \pm 0.06	16.45 \pm 0.17	1.21 \pm 0.42	2.85 \pm 0.78	5.89 \pm 0.40	1.09 \pm 0.14	1.72 \pm 0.71	6.89 \pm 0.07
CD/DPPC 10:1	5.90 \pm 0.14*	38.18 \pm 0.06	40.21 \pm 0.27	6.09 \pm 0.38*	17.87 \pm 0.01	21.64 \pm 0.31*	1.28 \pm 0.10*	2.92 \pm 0.05	6.64 \pm 0.48*	1.85 \pm 0.72*	0.59 \pm 0.30	3.12 \pm 0.93
CD/DPPC 100:1	18.90 \pm 0.68*	47.07 \pm 1.72	47.55 \pm 0.98	18.41 \pm 1.05*	32.51 \pm 1.35*	36.54 \pm 0.81*	15.70 \pm 0.56*	16.68 \pm 1.70*	26.34 \pm 1.14*	12.92 \pm 0.82*	20.00 \pm 0.71*	20.88 \pm 0.69*
HP-β-CD												
CD/DPPC 1:1	1.36 \pm 0.43	38.30 \pm 0.67	41.45 \pm 0.71	1.12 \pm 0.37	14.78 \pm 0.29	14.28 \pm 1.14	0.98 \pm 0.08	1.66 \pm 0.16	5.77 \pm 0.21	1.26 \pm 0.19	1.64 \pm 0.36	9.56 \pm 0.39
CD/DPPC 10:1	6.86 \pm 0.68*	39.40 \pm 0.22	44.52 \pm 0.63	5.36 \pm 0.76*	15.17 \pm 0.10	20.40 \pm 0.89*	2.61 \pm 0.37*	3.64 \pm 0.29*	3.02 \pm 0.87*	2.18 \pm 0.30*	2.30 \pm 0.25	2.40 \pm 0.51
CD/DPPC 100:1	16.7 \pm 0.48*	45.69 \pm 2.39	49.35 \pm 0.97	17.19 \pm 1.04*	32.90 \pm 0.76*	36.70 \pm 0.24*	13.70 \pm 0.50*	18.27 \pm 0.27*	23.71 \pm 0.91*	6.98 \pm 0.25*	11.00 \pm 0.64*	12.91 \pm 1.65*
SBE-β-CD												

CD/DPPC 1:1	2.58 ± 0.29*	39.58 ± 0.15	42.52 ± 0.48	1.76 ± 0.10*	15.69 ± 0.58	14.08 ± 0.24	1.30 ± 0.45*	2.96 ± 0.42	6.27 ± 0.15	0.73 ± 0.18	1.33 ± 0.32	7.46 ± 1.16
CD/DPPC 10:1	7.11 ± 0.38*	41.52 ± 0.26	45.43 ± 0.41	5.94 ± 0.42*	16.27 ± 0.60	21.59 ± 1.12*	3.21 ± 0.75*	1.98 ± 0.71*	8.35 ± 0.27*	3.04 ± 0.44*	1.03 ± 0.08	3.71 ± 1.11
CD/DPPC 100:1	13.90 ± 0.53*	48.37 ± 1.73	52.70 ± 0.54	16.64 ± 1.62*	28.19 ± 1.06*	31.36 ± 0.74*	11.9 ± 0.18*	20.25 ± 0.70*	21.59 ± 0.80*	10.71 ± 0.07*	13.30 ± 0.87*	14.32 ± 0.21*

Table S4: The SRB release values obtained at time t_0 , 4, and 24 h for γ -CD-treated liposomes at different CHOL content and different CD/DPPC molar ratios.

The SRB release value of blank liposomes was 0% at t_0 for the different formulations. Values are expressed as the means of three different measurements \pm SD (* indicates a value of $p < 0.05$ statistically significant. The p values compare the membrane permeability in the presence of CD to that of the respective blank.)

Time	DPPC/CHOL (100:10)			DPPC/CHOL (100:25)			DPPC/CHOL (100:50)			DPPC/CHOL (100:100)		
	0 h	4 h	24 h	0 h	4 h	24 h	0 h	4 h	24 h	0 h	4 h	24 h
Blank	0	43.64 \pm 1.84	48.34 \pm 1.73	0	12.60 \pm 1.28	15.01 \pm 1.35	0	3.13 \pm 0.79	4.17 \pm 1.26	0	2.41 \pm 0.70	5.15 \pm 1.35
γ -CD/DPPC 1/1	0.60 \pm 0.11	43.49 \pm 0.47	49.66 \pm 0.81	0.74 \pm 0.30	14.81 \pm 0.12	17.07 \pm 0.29	0.15 \pm 0.05	1.50 \pm 0.10	3.25 \pm 0.66	0.13 \pm 0.08	1.00 \pm 0.11	6.04 \pm 0.13
γ -CD/DPPC 10/1	2.57 \pm 0.54*	32.95 \pm 0.88	40.04 \pm 0.59	1.04 \pm 0.81	9.69 \pm 0.34	14.38 \pm 0.70	0.8 \pm 0.12	1.5 \pm 0.65	3.26 \pm 0.73	0.45 \pm 0.23	0.39 \pm 0.20	3.66 \pm 0.90
γ -CD/DPPC 100/1	6.90 \pm 1.56*	39.29 \pm 1.03	40.20 \pm 1.84	2.63 \pm 1.01*	23.18 \pm 0.89*	24.00 \pm 0.81*	2.70 \pm 0.53*	6.04 \pm 0.64*	10.19 \pm 0.26*	1.76 \pm 0.76	3.80 \pm 0.23*	6.01 \pm 0.69*