



Supplementary material

Article

Multicomponent Antibiofilm Lipid Nanoparticles as Novel Platform to Ameliorate Resveratrol Properties: Preliminary Outcomes on fibroblast Proliferation and Migration

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Data reported as supplementary material:

- **Table S1:** Curve-fitting parameters calculated when considering the *Zero* order model for RSV release studies to 1-octanol.
- **Table S2:** Curve-fitting parameters calculated when considering the *Zero* order model for the RSV release studies to citrate buffer pH 5.5.
- **Table S3:** Curve-fitting parameters calculated when considering the *Zero* order model for the RSV release studies to citrate buffer pH 5.5 containing 0.1% (w/v) of β -CD.
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- **Table S9:** Curve-fitting parameters calculated when considering the *Baker-Lonsdale* model for RSV release studies to 1-octanol.
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Table S1. Curve-fitting parameters calculated when considering the Zero order model for RSV release studies to 1-octanol. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
1	6 h	$k_0 = 0.062 \pm 0.005$ $R^2 = 0.98830$	$k_0 = 0.043 \pm 0.003$ $R^2 = 0.94660$	$k_0 = 0.087 \pm 0.010$ $R^2 = 0.95440$
1a	6 h	$k_0 = 0.065 \pm 0.001$ $t_{lag} = 0.23 \pm 0.22$ $R^2 = 0.99150$	$k_0 = 0.053 \pm 0.003$ $t_{lag} = 0.83 \pm 0.13$ $R^2 = 0.99090$	$k_0 = 0.083 \pm 0.003$ $t_{lag} = -0.21 \pm 0.35$ $R^2 = 0.95740$

Table S2. Curve-fitting parameters calculated when considering the Zero order model for the RSV release studies to citrate buffer pH 5.5. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
1	6 h	$k_0 = 0.066 \pm 0.003$ $R^2 = 0.82946$	$k_0 = 0.051 \pm 0.003$ $R^2 = 0.94947$	$k_0 = 0.029 \pm 0.001$ $R^2 = 0.96763$
1a	6 h	$k_0 = 0.052 \pm 0.007$ $t_{lag} = -1.50 \pm 0.85$ $R^2 = 0.89870$	$k_0 = 0.045 \pm 0.003$ $t_{lag} = -0.39 \pm 0.05$ $R^2 = 0.97025$	$k_0 = 0.033 \pm 0.001$ $t_{lag} = 0.27 \pm 0.06$ $R^2 = 0.99802$

Table S3. Curve-fitting parameters calculated when considering the Zero order model for the RSV release studies to citrate buffer pH 5.5 containing 0.1% (w/v) of β -CD. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
1	7 h	<i>Null</i>	$k_0 = 0.087 \pm 0.006$ $R^2 = 0.55293$	<i>null</i>
1a	7 h	$k_0 = 0.038 \pm 0.007$ $t_{lag} = -9.59 \pm 2.78$	$k_0 = 0.055 \pm 0.003$ $t_{lag} = -3.49 \pm 0.450$	$k_0 = 0.078 \pm 0.010$ $t_{lag} = -3.25 \pm 0.76$

$R^2 = 0.80396$

$R^2 = 0.98101$

$R^2 = 0.90384$

Table S4. Curve-fitting parameters calculated when considering the First order model for the RSV release studies to citrate buffer pH 5.5. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
2	24 days	$k_1 = 1.808 \pm 0.538$	$k_1 = 0.166 \pm 0.005$	$k_1 = 0.131 \pm 0.009$
		$R^2 = 0.62881$	$R^2 = 0.99303$	$R^2 = 0.96714$
2a	24 days	$k_1 = 0.155 \pm 0.013$	$k_1 = 0.162 \pm 0.004$	$k_1 = 0.122 \pm 0.006$
		$t_{lag} = -2.366 \pm 0.338$	$t_{lag} = -0.247 \pm 0.088$	$t_{lag} = -0.862 \pm 0.200$
		$R^2 = 0.96305$	$R^2 = 0.99478$	$R^2 = 0.98930$

Table S5. Curve-fitting parameters calculated when considering the First order model for the RSV release studies to citrate buffer pH 5.5 containing 0.1% (w/v) of β -CD. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
2	26 h	$k_1 = 0.151 \pm 0.009$	$k_1 = 0.106 \pm 0.012$	$k_1 = 0.240 \pm 0.013$
		$R^2 = 0.63674$	$R^2 = 0.87575$	$R^2 = 0.088414$
2	48 h	$k_1 = 0.151 \pm 0.009$	$k_1 = 0.101 \pm 0.012$	$k_1 = 0.240 \pm 0.015$
		$R^2 = 0.87948$	$R^2 = 0.91686$	$R^2 = 0.94788$
2a	26 h	$k_1 = 0.063 \pm 0.008$	$k_1 = 0.070 \pm 0.004$	$k_1 = 0.172 \pm 0.019$
		$t_{lag} = -7.767 \pm 1.684$	$t_{lag} = -3.576 \pm 0.645$	$t_{lag} = -0.980 \pm 0.373$
	$R^2 = 0.94834$	$R^2 = 0.98257$	$R^2 = 0.94651$	
	48 h	$k_1 = 0.058 \pm 0.006$	$k_1 = 0.064 \pm 0.004$	$k_1 = 0.172 \pm 0.027$
$t_{lag} = -8.752 \pm 1.502$		$t_{lag} = -4.322 \pm 0.742$	$t_{lag} = -0.990 \pm 0.523$	
		$R^2 = 0.98359$	$R^2 = 0.98723$	$R^2 = 0.96506$

Table S6. Curve-fitting parameters calculated when considering the Higuchi model for RSV release studies to 1-octanol. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
3	28 h	$k_H = 0.156 \pm 0.006$	$k_H = 0.128 \pm 0.004$	$k_H = 0.166 \pm 0.009$
		$R^2 = 0.95030$	$R^2 = 0.90860$	$R^2 = 0.95960$
3	48 h	$k_H = 0.146 \pm 0.005$	$k_H = 0.124 \pm 0.003$	$k_H = 0.151 \pm 0.007$
		$R^2 = 0.92930$	$R^2 = 0.92140$	$R^2 = 0.87870$
	28 h	$k_H = 0.171 \pm 0.005$	$k_H = 0.145 \pm 0.001$	$k_H = 0.169 \pm 0.005$
		$t_{lag} = 1.659 \pm 0.134$	$t_{lag} = 2.306 \pm 0.379$	$t_{lag} = 0.386 \pm 0.005$

3a	48 h	$R^2 = 0.99510$	$R^2 = 0.99500$	$R^2 = 0.96310$
		$k_H = 0.153 \pm 0.003$	$k_H = 0.134 \pm 0.001$	$k_H = 0.148 \pm 0.002$
		$t_{lag} = 1.089 \pm 0.004$	$t_{lag} = 2.000 \pm 0.001$	$t_{lag} = -0.575 \pm 0.010$
		$R^2 = 0.94750$	$R^2 = 0.97370$	$R^2 = 0.88090$

Table S7. Curve-fitting parameters calculated when considering the Higuchi model for the RSV release studies to citrate buffer pH 5.5. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
3	24 days	$k_H = 0.224 \pm 0.010$	$k_H = 0.210 \pm 0.004$	$k_H = 0.202 \pm 0.002$
		$R^2 = 0.61968$	$R^2 = 0.92706$	$R^2 = 0.98013$
3a	24 days	$k_H = 0.201 \pm 0.001$	$k_H = 0.210 \pm 0.004$	$k_H = 0.201 \pm 0.002$
		$t_{lag} = -3.242 \pm 0.760$	$t_{lag} = -0.029 \pm 0.113$	$t_{lag} = -0.201 \pm 0.099$
		$R^2 = 0.88933$	$R^2 = 0.92394$	$R^2 = 0.98413$

Table S8. Curve-fitting parameters calculated when considering the Higuchi model for the RSV release studies to citrate buffer pH 5.5 containing 0.1% (w/v) of β -CD. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
3	26 h	Null	$k_H = 0.178 \pm 0.005$	$k_H = 0.257 \pm 0.018$
			$R^2 = 0.91968$	$R^2 = 0.47482$
	48 h	Null	$k_H = 0.144 \pm 0.005$	$k_H = 0.160 \pm 0.017$
			$R^2 = 0.76296$	$R^2 = 0.19041$
3a	26 h	$k_H = 0.147 \pm 0.009$	$k_H = 0.166 \pm 0.005$	$k_H = 0.199 \pm 0.025$
		$t_{lag} = -9.641 \pm 1.978$	$t_{lag} = -2.326 \pm 0.843$	$t_{lag} = -2.629 \pm 1.430$
		$R^2 = 0.90983$	$R^2 = 0.96329$	$R^2 = 0.70826$
	48 h	$k_H = 0.121 \pm 0.005$	$k_H = 0.130 \pm 0.006$	$k_H = 0.126 \pm 0.011$
		$t_{lag} = -17.133 \pm 2.585$	$t_{lag} = -8.784 \pm 3.550$	$t_{lag} = -10.880 \pm 3.330$
		$R^2 = 0.94388$	$R^2 = 0.88910$	$R^2 = 0.83860$

Table S9. Curve-fitting parameters calculated when considering the Baker-Lonsdale model for RSV release studies to 1-octanol. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
4	28 h	$k_{BL} = 6 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $R^2 = 0.89340$	$k_{BL} = 4 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $R^2 = 0.85960$	$k_{BL} = 7 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $R^2 = 0.95420$
	48 h	$k_{BL} = 6 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $R^2 = 0.91100$	$k_{BL} = 4 \cdot 10^{-5} \pm 2 \cdot 10^{-5}$ $R^2 = 0.88950$	$k_{BL} = 7 \cdot 10^{-5} \pm 2 \cdot 10^{-5}$ $R^2 = 0.94440$
4a	28 h	$k_{BL} = 8 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $t_{lag} = 2.087 \pm 0.387$ $R^2 = 0.98570$	$k_{BL} = 5 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $t_{lag} = 2.709 \pm 0.090$ $R^2 = 0.98940$	$k_{BL} = 9 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $t_{lag} = 1.067 \pm 0.003$ $R^2 = 0.99600$
	48 h	$k_{BL} = 8 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $t_{lag} = 2.040 \pm 0.343$ $R^2 = 0.98040$	$k_{BL} = 5 \cdot 10^{-5} \pm 1 \cdot 10^{-5}$ $t_{lag} = 2.652 \pm 0.111$ $R^2 = 0.98610$	$k_{BL} = 8 \cdot 10^{-5} \pm 2 \cdot 10^{-5}$ $t_{lag} = 0.908 \pm 0.055$ $R^2 = 0.97110$

Table S10. Curve-fitting parameters calculated when considering the Baker-Lonsdale model for the RSV release studies to citrate buffer pH 5.5. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
4	24 days	$k_{BL} = 2.1 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $R^2 = 0.85420$	$k_{BL} = 2 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $R^2 = 0.98690$	$k_{BL} = 1.5 \cdot 10^{-4} \pm 2 \cdot 10^{-5}$ $R^2 = 0.94180$
4a	24 days	$k_{BL} = 2 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.651 \pm 0.001$ $R^2 = 0.94800$	$k_{BL} = 1.9 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.204 \pm 0.280$ $R^2 = 0.98700$	$k_{BL} = 1.3 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.437 \pm 0.180$ $R^2 = 0.97790$

Table S11. Curve-fitting parameters calculated when considering the Baker-Lonsdale model for the RSV release studies to citrate buffer pH 5.5 containing 0.1% (w/v) of β -CD. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
4	26 h	$k_{BL} = 1.3 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $R^2 = 0.92450$	$k_{BL} = 1 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $R^2 = 0.99510$	$k_{BL} = 1.7 \cdot 10^{-4} \pm 2 \cdot 10^{-5}$ $R^2 = 0.92140$
	48 h	$k_{BL} = 1 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $R^2 = 0.90720$	$k_{BL} = 1 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $R^2 = 0.99420$	$k_{BL} = 1 \cdot 10^{-4} \pm 2 \cdot 10^{-5}$ $R^2 = 0.79390$
4a	26 h	$k_{BL} = 1.1 \cdot 10^{-4} \pm 3 \cdot 10^{-5}$ $t_{lag} = -1.004 \pm 0.232$ $R^2 = 0.96700$	$k_{BL} = 1 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.030 \pm 0.228$ $R^2 = 0.99510$	$k_{BL} = 1.9 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = 0.188 \pm 0.102$ $R^2 = 0.92900$
	48 h	$k_{BL} = 1 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -1.125 \pm 0.262$ $R^2 = 0.97290$	$k_{BL} = 1 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.048 \pm 0.224$ $R^2 = 0.99430$	$k_{BL} = 1 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -1.367 \pm 0.529$ $R^2 = 0.85450$

Table S12. Curve-fitting parameters calculated when considering the Hixon-Crowell model for RSV release studies to 1-octanol. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
5	28 h	$k_{hc} = 1.9 \cdot 10^{-4} \pm 2 \cdot 10^{-5}$ $R^2 = 0.98520$	$k_{hc} = 1.3 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $R^2 = 0.99170$	$k_{hc} = 3.0 \cdot 10^{-4} \pm 9 \cdot 10^{-5}$ $R^2 = 0.86820$
	48 h	$k_{hc} = 1.9 \cdot 10^{-4} \pm 2 \cdot 10^{-5}$ $R^2 = 0.97160$	$k_{hc} = 1.3 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $R^2 = 0.96670$	$k_{hc} = 2.4 \cdot 10^{-4} \pm 4 \cdot 10^{-5}$ $R^2 = 0.84290$
5a	28 h	$k_{hc} = 1.8 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.749 \pm 0.148$ $R^2 = 0.99020$	$k_{hc} = 1.3 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.164 \pm 0.270$ $R^2 = 0.9919$	$k_{hc} = 1.7 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -3.166 \pm 0.516$ $R^2 = 0.93600$
	48 h	$k_{hc} = 1.8 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.839 \pm 0.077$ $R^2 = 0.97640$	$k_{hc} = 1.2 \cdot 10^{-4} \pm 1 \cdot 10^{-5}$ $t_{lag} = -0.617 \pm 0.275$ $R^2 = 0.96860$	$k_{hc} = 1.6 \cdot 10^{-4} \pm 2 \cdot 10^{-5}$ $t_{lag} = -3.485 \pm 0.003$ $R^2 = 0.91100$

Table S13. Curve-fitting parameters calculated when considering the Hixon-Crowell model for the RSV release studies to citrate buffer pH 5.5. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
5	24 days	$k_{hc} = 0.056 \pm 0.007$	$k_{hc} = 0.043 \pm 0.001$	$k_{hc} = 0.031 \pm 0.002$
		$R^2 = 0.59389$	$R^2 = 0.98505$	$R^2 = 0.95725$
5a	24 days	$k_{hc} = 0.034 \pm 0.003$	$k_{hc} = 0.042 \pm 0.002$	$k_{hc} = 0.027 \pm 0.001$
		$t_{lag} = 0.120 \pm 0.010$	$t_{lag} = 0.0150 \pm 0.007$	$t_{lag} = 0.040 \pm 0.008$
		$R^2 = 0.95243$	$R^2 = 0.98692$	$R^2 = 0.98114$

Table S14. Curve-fitting parameters calculated when considering the Hixon-Crowell model for the RSV release studies to citrate buffer pH 5.5 containing 0.1% (w/v) of β -CD. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
5	26 h	$k_{hc} = 0.045 \pm 0.003$	$k_{hc} = 0.037 \pm 0.060$	$k_{hc} = 0.061 \pm 0.005$
		$R^2 = 0.49112$	$R^2 = 0.73342$	$R^2 = 0.51923$
	48 h	$k_{hc} = 0.031 \pm 0.003$	$k_{hc} = 0.024 \pm 0.003$	$k_{hc} = 0.030 \pm 0.004$
		$R^2 = 0.14769$	$R^2 = 0.81635$	$R^2 = 0.0362$
5a	26 h	$k_{hc} = 0.013 \pm 0.002$	$k_{hc} = 0.016 \pm 0.001$	$k_{hc} = 0.044 \pm 0.006$
		$t_{lag} = -16.644 \pm 2.743$	$t_{lag} = -6.570 \pm 1.270$	$t_{lag} = -1.702 \pm 0.550$
	48 h	$R^2 = 0.92214$	$R^2 = 0.96225$	$R^2 = 0.92352$
		$k_{hc} = 0.011 \pm 0.001$	$k_{hc} = 0.013 \pm 0.001$	$k_{hc} = 0.022 \pm 0.006$
		$t_{lag} = -16.779 \pm 2.793$	$t_{lag} = -9.035 \pm 2.082$	$t_{lag} = -5.708 \pm 2.289$
		$R^2 = 0.97062$	$R^2 = 0.95771$	$R^2 = 0.90797$

Table S15. Curve-fitting parameters calculated when considering the Kormeyer-Peppas model for RSV release studies to 1-octanol. Mean \pm SE (n=3).

Kinetic model	Time	NLC	NLC-Su	NLC-Su-R
6	28 h	$k_{KP} = 0.099 \pm 0.011$	$k_{KP} = 0.057 \pm 0.008$	$k_{KP} = 0.177 \pm 0.032$
		$n = 0.659 \pm 0.025$	$n = 0.775 \pm 0.036$	$n = 0.481 \pm 0.046$
		$R^2 = 0.98830$	$R^2 = 0.98990$	$R^2 = 0.96090$
	48 h	$k_{KP} = 0.134 \pm 0.012$	$k_{KP} = 0.086 \pm 0.008$	$k_{KP} = 0.206 \pm 0.031$
		$n = 0.529 \pm 0.002$	$n = 0.614 \pm 0.021$	$n = 0.404 \pm 0.034$
		$R^2 = 0.93110$	$R^2 = 0.94340$	$R^2 = 0.91370$
6a	28 h	$k_{KP} = 0.134 \pm 0.011$	$k_{KP} = 0.112 \pm 0.011$	$k_{KP} = 0.242 \pm 0.042$
		$t_{lag} = 0.872 \pm 0.001$	$t_{lag} = 1.740 \pm 0.001$	$t_{lag} = 0.980 \pm 0.001$
		$n = 0.571 \pm 0.016$	$n = 0.580 \pm 0.026$	$n = 0.386 \pm 0.045$
	48 h	$R^2 = 0.99470$	$R^2 = 0.99960$	$R^2 = 0.9932$
		$k_{KP} = 0.221 \pm 0.015$	$k_{KP} = 0.174 \pm 0.012$	$k_{KP} = 0.326 \pm 0.043$
		$t_{lag} = 1.910 \pm 0.001$	$t_{lag} = 2.500 \pm 0.005$	$t_{lag} = 1.865 \pm 0.001$
		$n = 0.394 \pm 0.012$	$n = 0.425 \pm 0.001$	$n = 0.276 \pm 0.001$
		$R^2 = 0.96330$	$R^2 = 0.97850$	$R^2 = 0.97090$