Technical Note

Optimization of CE-ICP-MS/MS method for investigation of the liposome–cisplatin nanosystems and their interactions with transferrin

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Table S1. Compositions of formed liposomes: the molar ratios and weighted amounts of reagents

Formulation		Lipids								Lit.
		DSPE-PEG (2000)	DSPC	HSPC	Chol	DOPC*	DSPG-Na	POPC	DPPC	
S1	Molar ratio	–	–	60	40	–	–	–		[1]
	Weight [g]	–	–	0.0047	0.0012	–	–	–		
S2	Molar ratio	–	–	–	30	–	25	–	45	[2]
	Weight [g]	–	–	–	0.0013	–	0.0028	–	0.0050	
E1	Molar ratio	5	70	–	–	–	25	–	–	[3]
	Weight [g]	0.0014	0.0055	–	–	–	0.0019	–	–	
E4	Molar ratio	5.3	–	56.3	38.4	–	–	–	–	[2]
	Weight [g]	0.0015	–	0.0044	0.0011	–	–	–	–	
E6	Molar ratio	10	–	–	36	54	–	–	–	[4]
	Weight [g]	0.0028	–	–	0.0010	0.0041	–	–	–	
E4_mod1	Molar ratio	5.3	56.3	–	38.4	–	–	–	–	
	Weight [g]	0.0015	0.0045	–	0.0011	–	–	–	–	
E4_mod2	Molar ratio	3	–	31.3	65.7	–	–	–	–	
	Weight [g]	0.0015	–	0.0044	0.0033	–	–	–	–	
E6_mod1	Molar ratio	10	–	–	36		–	54	–	
	Weight [g]	0.0028	–	–	0.0010		–	0.0041		

** DOPC was used as a substitute of 1,2-dioleoyl-sn-glycero-3-phosphoethanolamine (DOPE)*

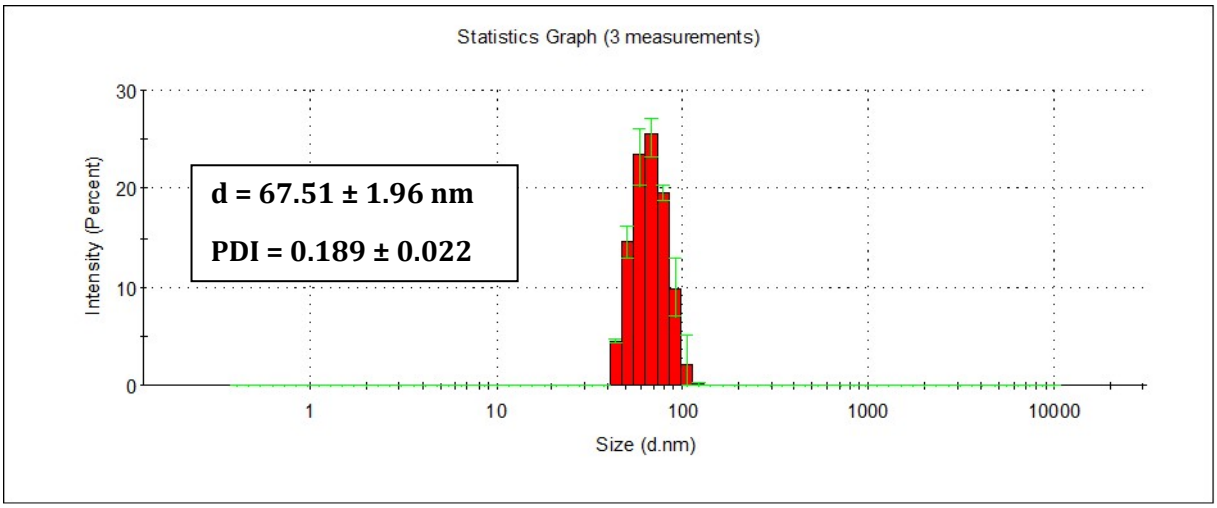

Fig. S1. DLS analysis of E6 liposomes' sample diluted 200 times in incubation solution. Inset shows calculated mean values (n = 3) of hydrodynamic diameter (d) and polydispersity index (PDI)

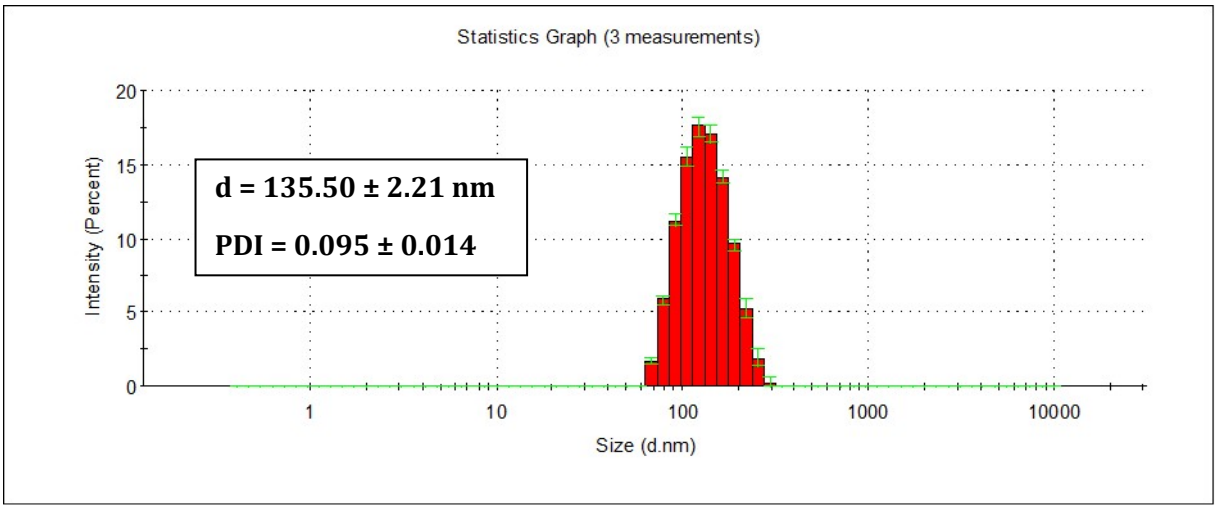

Fig. S2. DLS analysis of E4 liposomes' sample diluted 200 times in incubation solution. Inset shows calculated mean values (n = 3) of hydrodynamic diameter (d) and polydispersity index (PDI)

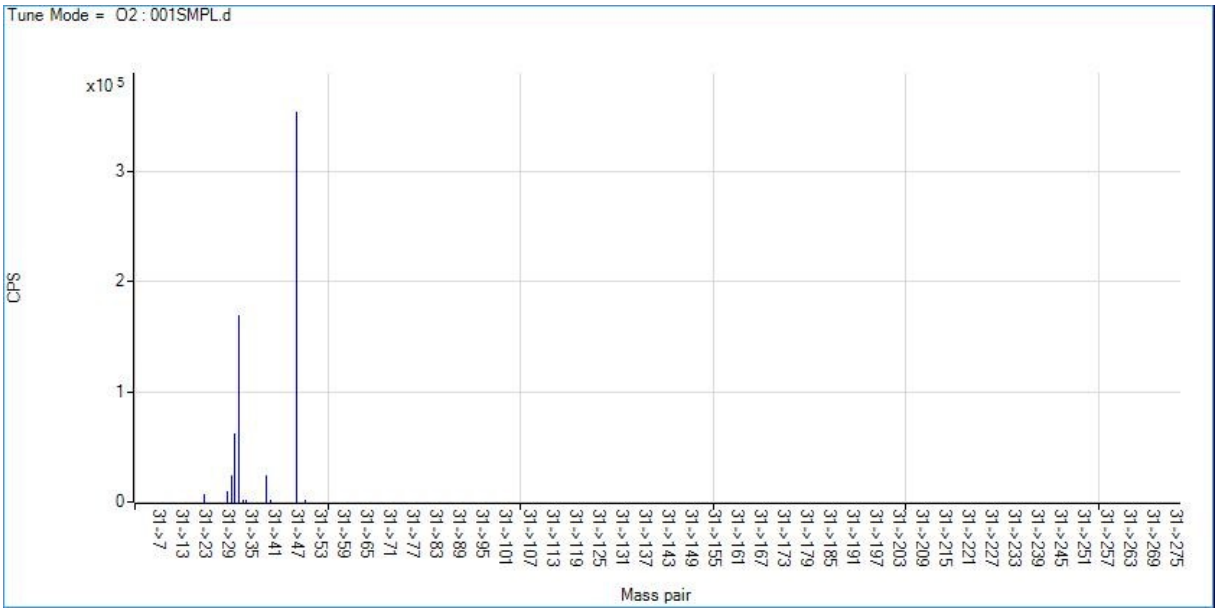

Fig. S3. Product ion of *m/z* equal 31 ($^{31}P^{+}$ → $^{31}P^{16}O^{+}$), oxygen used as reaction/collision gas

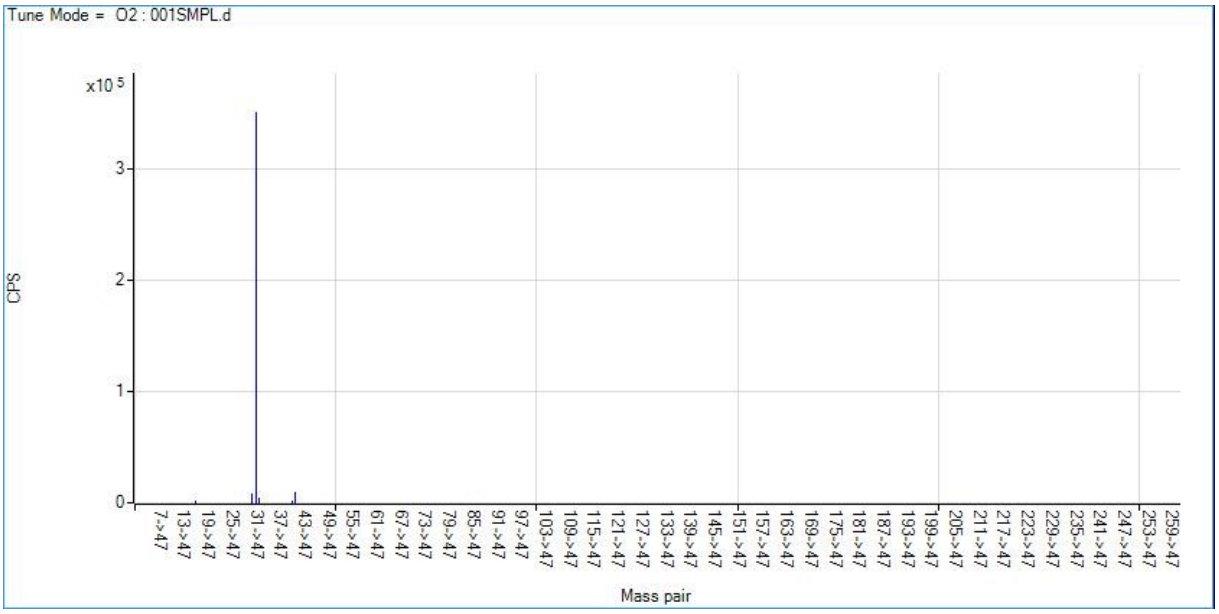

Fig. S4. Precursor ion of *m/z* equal 47 ($^{31}P^{16}O^{+}$), oxygen used as reaction/collision gas

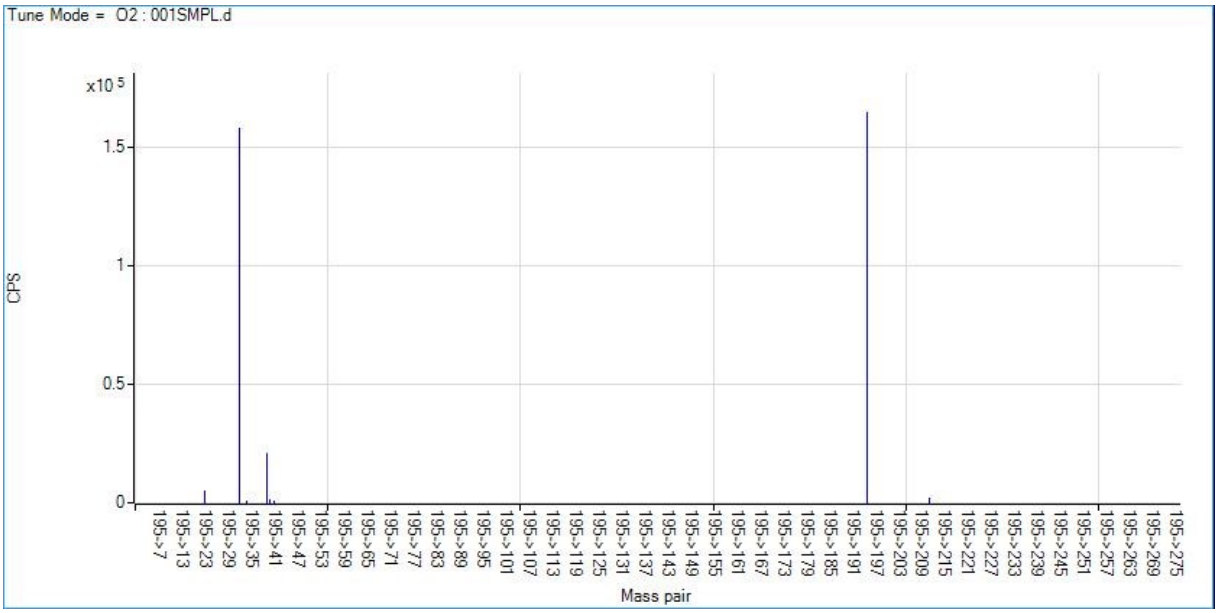

Fig. S5. Product ion of *m/z* equal 195 ($^{195}Pt^{+} \rightarrow {}^{195}Pt^{+}$), oxygen used as reaction/collision gas

The resolution (R) was calculated based on the cisplatin and liposome peaks MTs (t_1 and t_2, respectively) and width at the base (W_1 and W_2, respectively) according to the following Equation (1).

$$R = \frac{2(t_2 - t_1)}{W_1 + W_2} \qquad (1)$$

The symmetry (S) of phosphorus peaks was calculated as the quotient of the differences between the time of the peak's end (t_{II}) and MT (t), and the difference between MT and time of the peak's beginning (t_I) (see the Equation (2) below).

$$S = \frac{t_{II} - t}{t - t_I} \qquad (2)$$

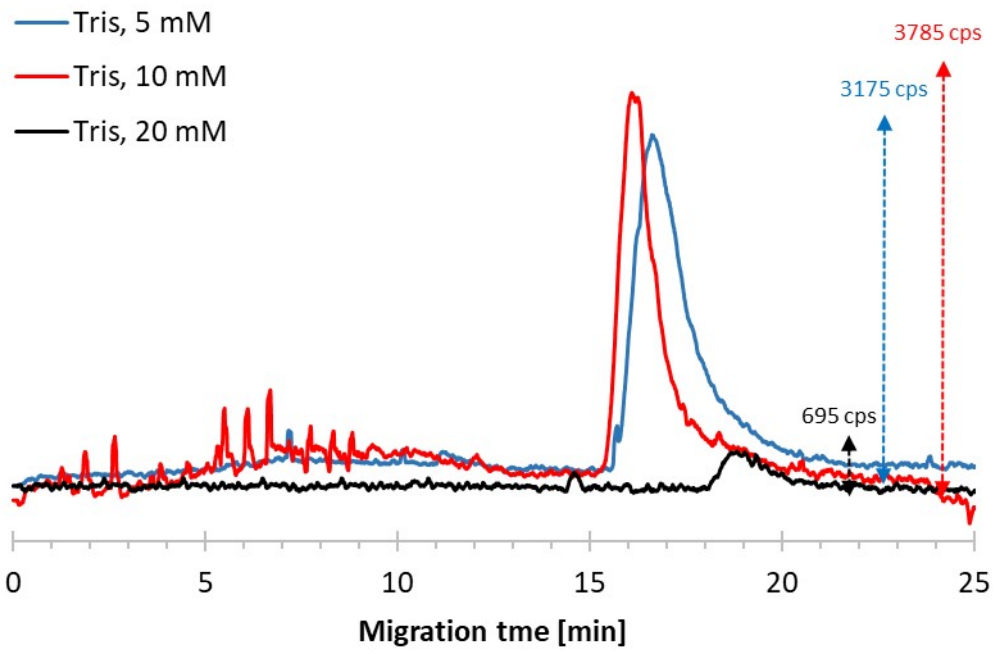

Fig. S6. CE-ICP-MS/MS electropherograms of liposomes samples analysed under various BGE concentration conditions; voltage +15 kV (current ~3 µA), injection: 50 mbar × 7 s, capillary: fused silica, length 70 cm (i.d. 75 µm)

To calculate the limit of detection (LOD) of particular analytes (substrates: cisplatin and not encapsulated liposomes), the ratio of noise (N) to signal (S) intensities was defined and multiplied by 3, and by the concentration (C) of the analyte in the sample (Equation (3)).

$$LOD = 3 \cdot \frac{N}{S} \cdot C \qquad [M] \tag{3}$$

The limit of quantification (LOQ) of particular analytes was calculated as corresponding LOD's triplicate (Equation (4)).

$$LOQ = 3 \cdot LOD \qquad [M] \tag{4}$$

The recovery value was calculated by dividing the average of peaks' areas ($n=3$) corresponding to a $^{31}P^{16}O^{+}$ (not encapsulated liposomes) obtained during the analysis run under optimized conditions ($PA_{optimal}$) by the average of peaks' areas ($n=3$) obtained during the analysis conducted with applied 20 mbar of internal pressure (PA_{20mbar}).

$$Recovery = \frac{PA_{optimal}}{PA_{20mbar}} \cdot 100\% \qquad [\%] \tag{5}$$

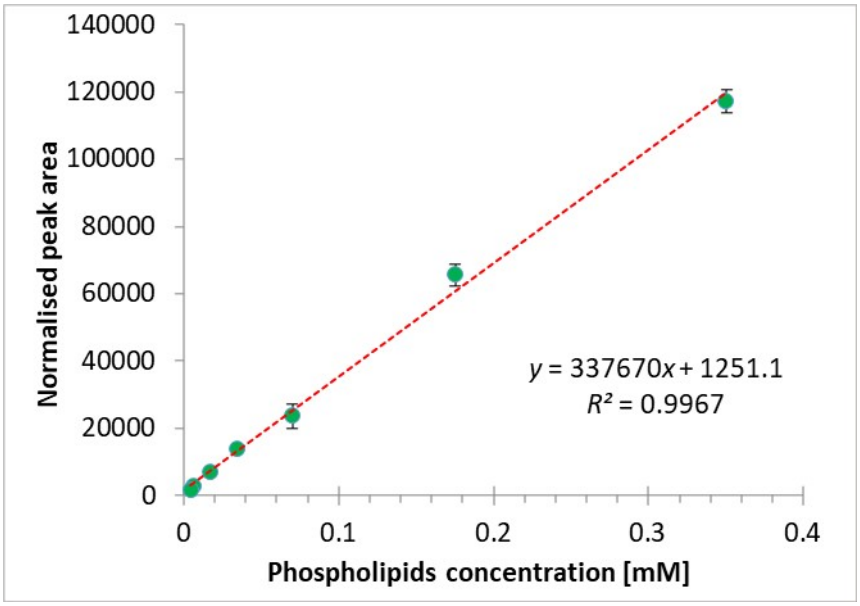

Fig. S7. A phospholipids calibration curve (based on E4 liposomes): the linear range of the optimized CE-ICP-MS/MS method for $^{31}P^{16}O^{+}$ signals quantification

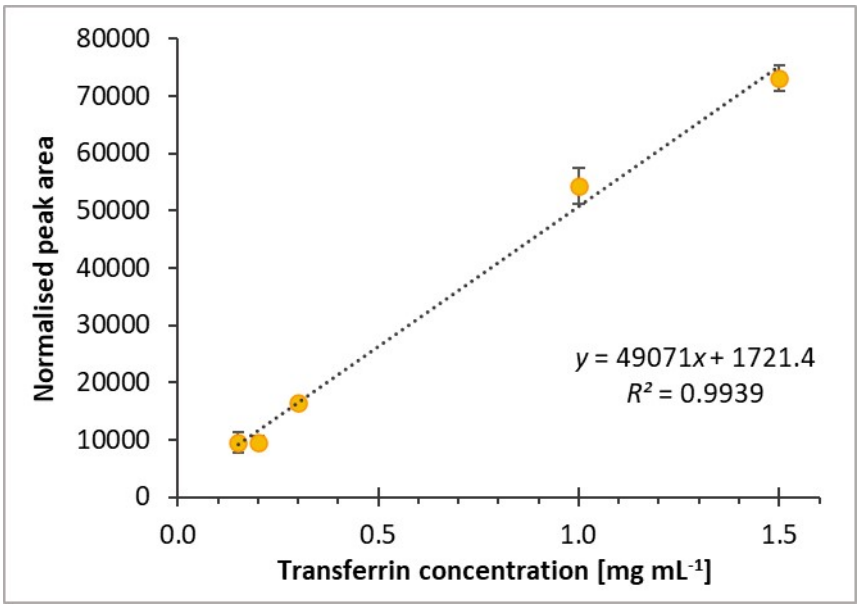

Fig. S8. Transferrin calibration curve: the linear range of the optimized CE-ICP-MS/MS method for $^{32}S^{16}O^{+}$ signals quantification

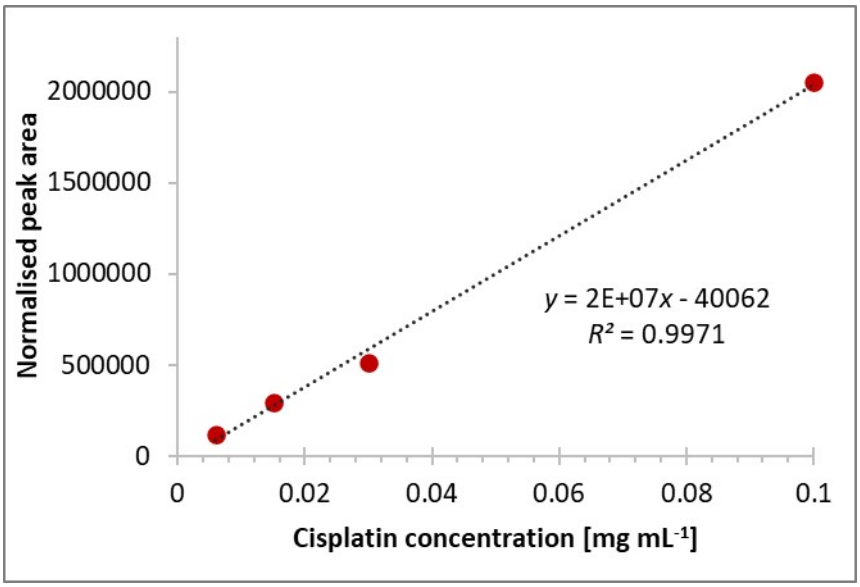

Fig. S9. Cisplatin calibration curve: the linear range of the optimized CE-ICP-MS/MS method for $^{195}Pt^{+}$ signals quantification

References

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