Supporting information

EDS result of UCNP:

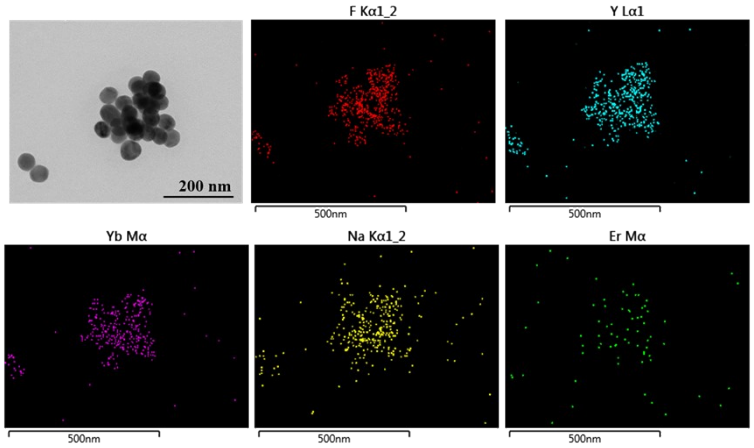

Fig. S1. EDS result of UCNP.

TEM and DLS result of different nanoiposomes:

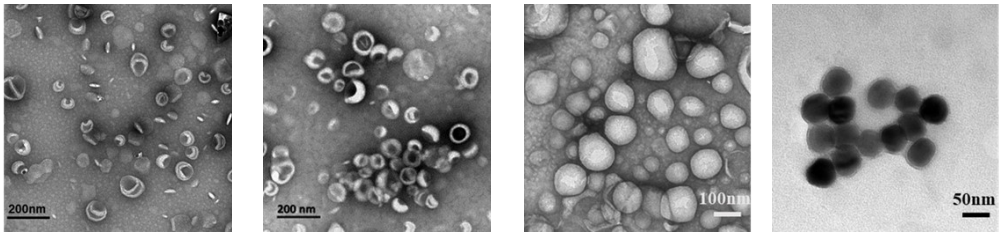

Fig. S2. TEM images of Blank LIP, LIP-RB, LIP-PFOB, LIP@UCNP.

Table S1. Average sizes and polydispersibility coefficients of different nanoliposomes.

	Blank LIP	LIP@UCNP	LIP-PFOB	LIP-RB@UCNP	LIP-RB-PFOB@UCNP
size（nm）	58.61±2.43	55.35±1.05	93.92±5.25	69.18±1.04	246.2±3.6
PDI（%）	28.1±0.6	24.9±0.6	26.0±1.6	25.1±1.8	23.4±0.4

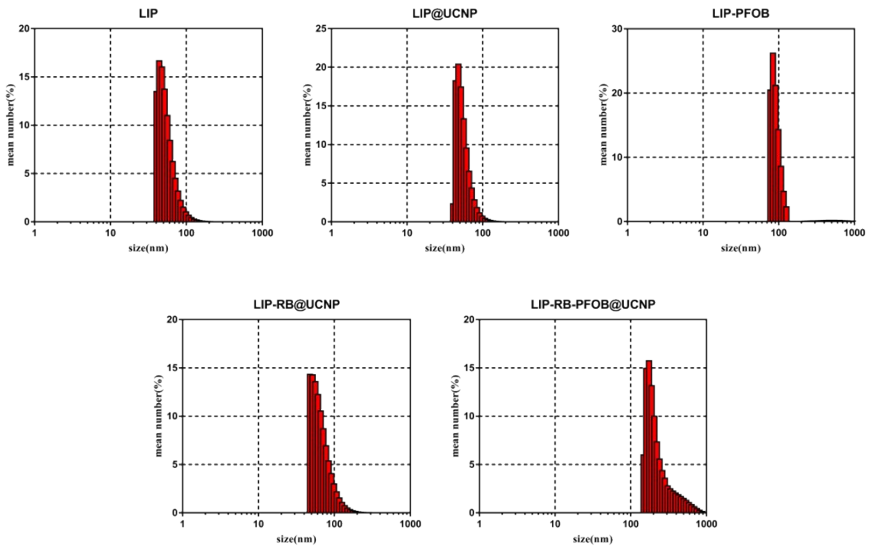

Fig. S3. Particle sizes of different nanoliposomes.

TEM and DLS result of LIP-PFOB@UCNP with different PFOB volume proportion:

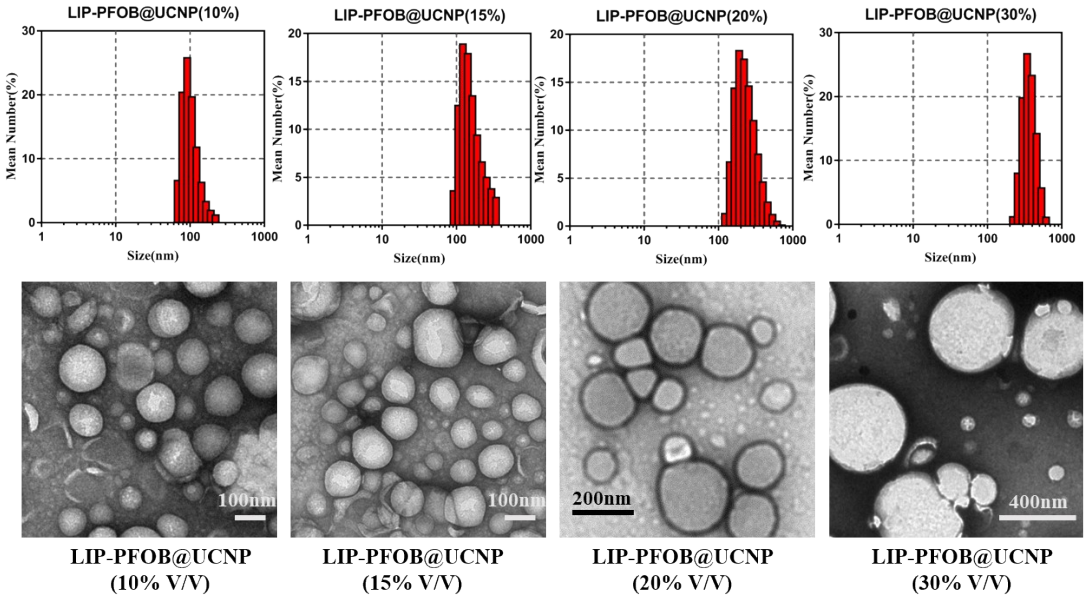

Fig. S4. Particle sizes and morphological structures of LIP-PFOB@UCNP with different PFOB volume proportion.

Encapsulation efficiency and drug loading of RB and UCNP:

Table S2. Encapsulation efficiency and drug loading of RB and UCNP.

	RB	UCNP
Encapsulation Efficiency	33.46 %	9.43 %
Drug Loading	3.35 %	1.57 %

Synthesis route of CREKA-PEG-DSPE:

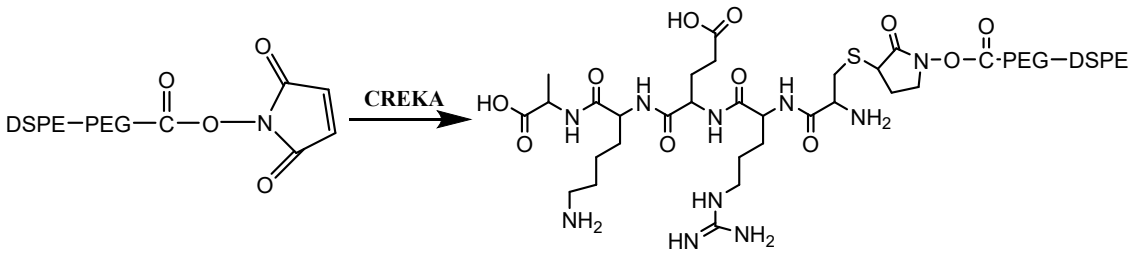

Fig. S5. Synthesis route of CREKA-PEG-DSPE.

DLS, TEM, EDS and stability results of CLIP-RB-PFOB@UCNP:

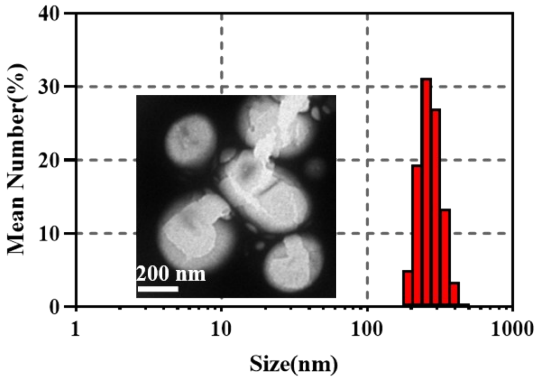

Fig. S6. Particle size and TEM image of CLIP-RB-PFOB@UCNP.

Table S3. Elemental analysis of CLIP-RB-PFOB@UCNP.

Element	Wt%	At%
CK	30.99	56.24
OK	07.26	09.90
FK	17.37	19.93
NaK	05.53	05.24
BrL	03.13	00.85
YL	25.49	06.25
ClK	00.46	00.29
IL	01.60	00.28
ErL	01.65	00.21
YbL	06.51	00.82

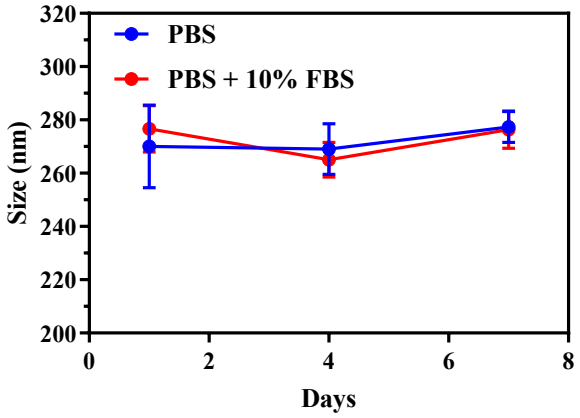

Fig. S7. The size variations of CLIP-RB-PFOB@UCNP in different buffers.

System stability results of RB:

Table S4. Encapsulation efficiency and drug loading of RB in CLIP-RB-PFOB@UCNP.

	Encapsulation Efficiency (%)	**Drug Loading (%)**
Day 1	32.79	3.18
Day 7	28.75	2.80

Table S5. DPBF consumption of CLIP-RB-PFOB@UCNP.

	DPBF consumption after NIR irradiation for 2 min (%)
Day 1	33.37
Day 7	31.45

Release behaviors of RB:

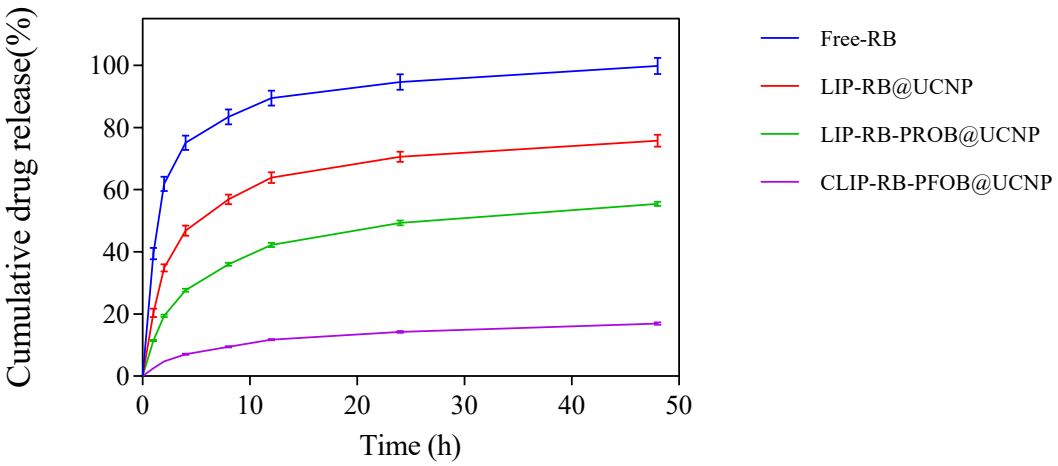

Fig. S8. The release behaviors of free RB, LIP-RB@UCNP, LIP-RB-PFOB@UCNP and CLIP-RB-PFOB@UCNP.

Stability of CLIP-RB-PFOB@UCNP after loading oxygen:

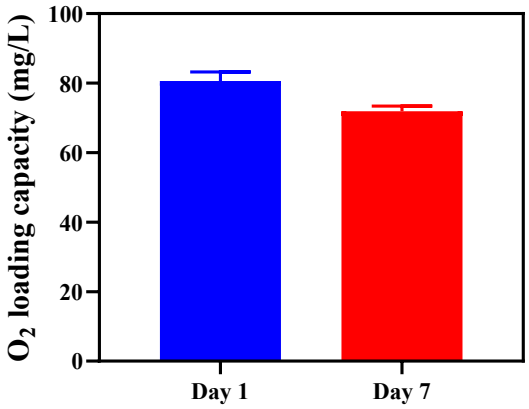

Fig. S9. The O_2 loading capacity of CLIP-RB-PFOB@UCNP.

4T1 cell viability:

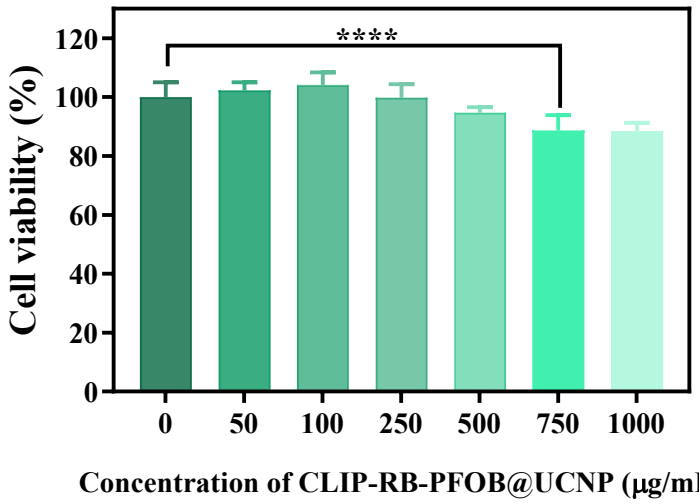

Fig. S10. 4T1 cell viability after incubating with CLIP-RB-PFOB@UCNP for 24 h.