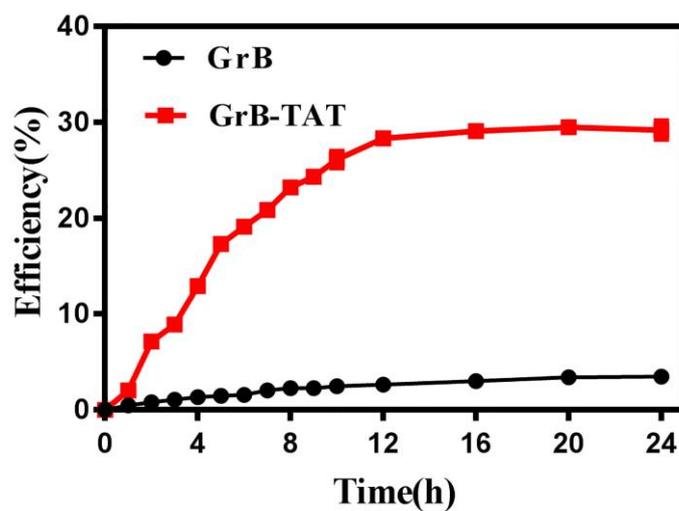
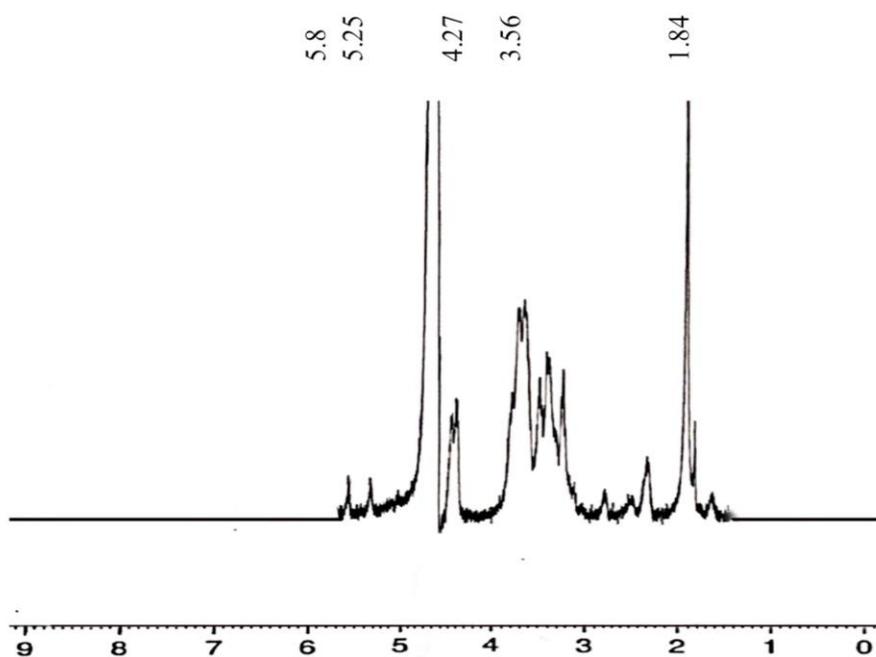


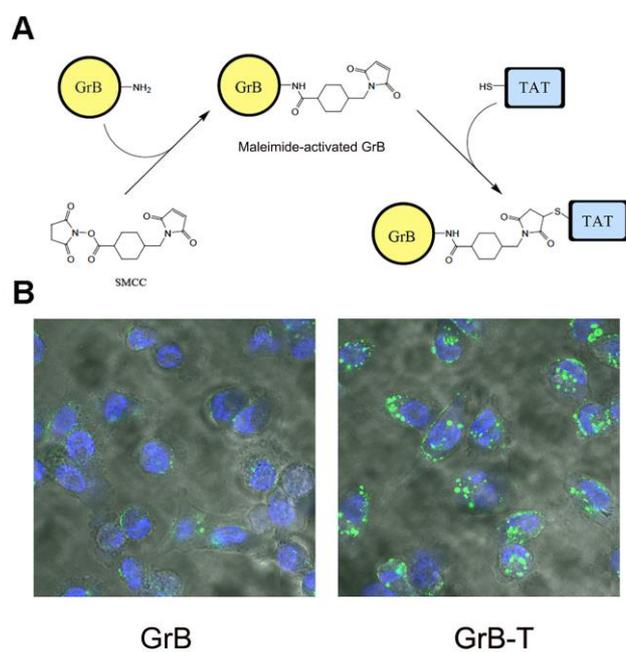
## Supplementary Materials Supplemental Figures



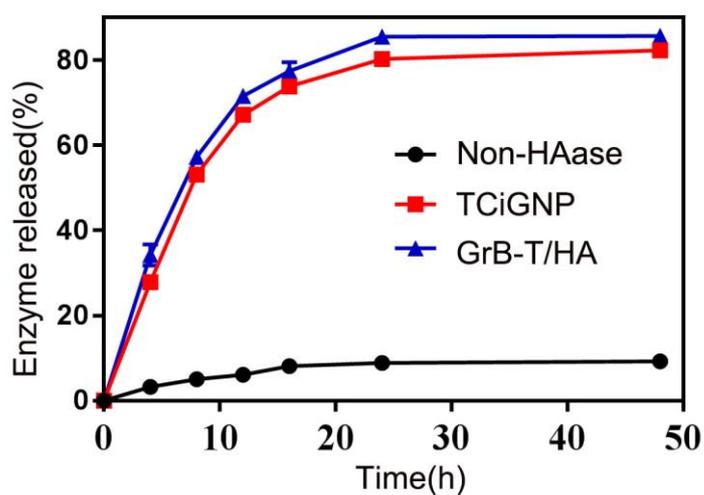
**Figure S1.** Accumulative penetration efficiency of GrB-T labeled with FITC through MDA-MB-231 cells by Transwell assay. The fluorescence intensity in the basolateral compartment was monitored.



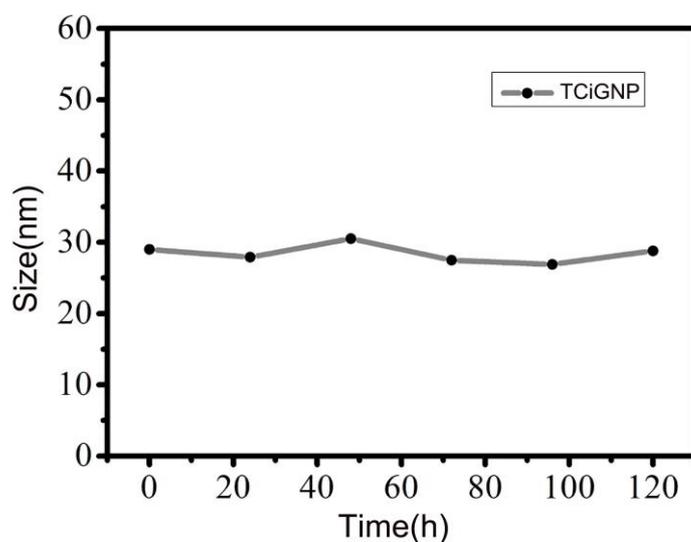
**Figure S2.** <sup>1</sup>H-NMR spectrum of HA-APM



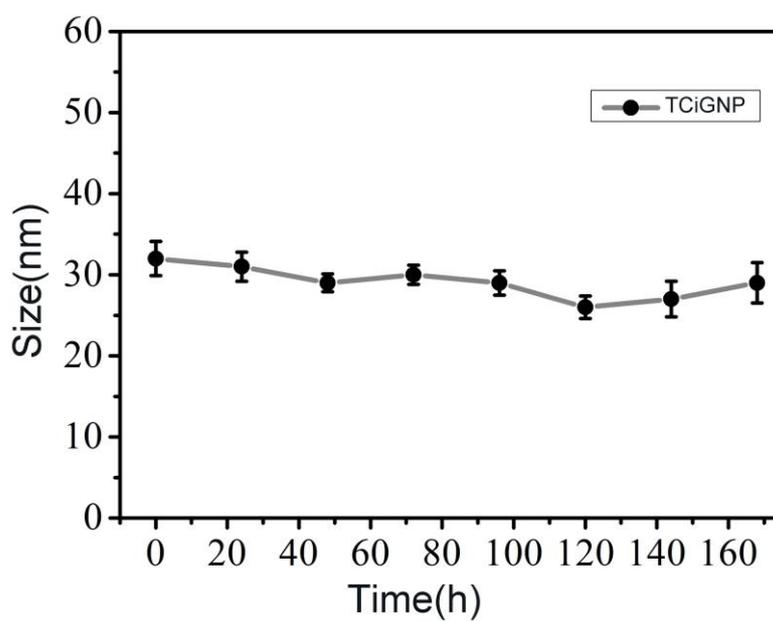
**Figure S3.** (A) Schematic of GrB and TAT connection through SMCC. (B) Uptake of the GrB and GrB-T in MDA-MB-231 cells by fluorescence microscopy. GrB was labeled by FITC and the nuclei were stained by DAPI. Scale bars are 20  $\mu$ m.



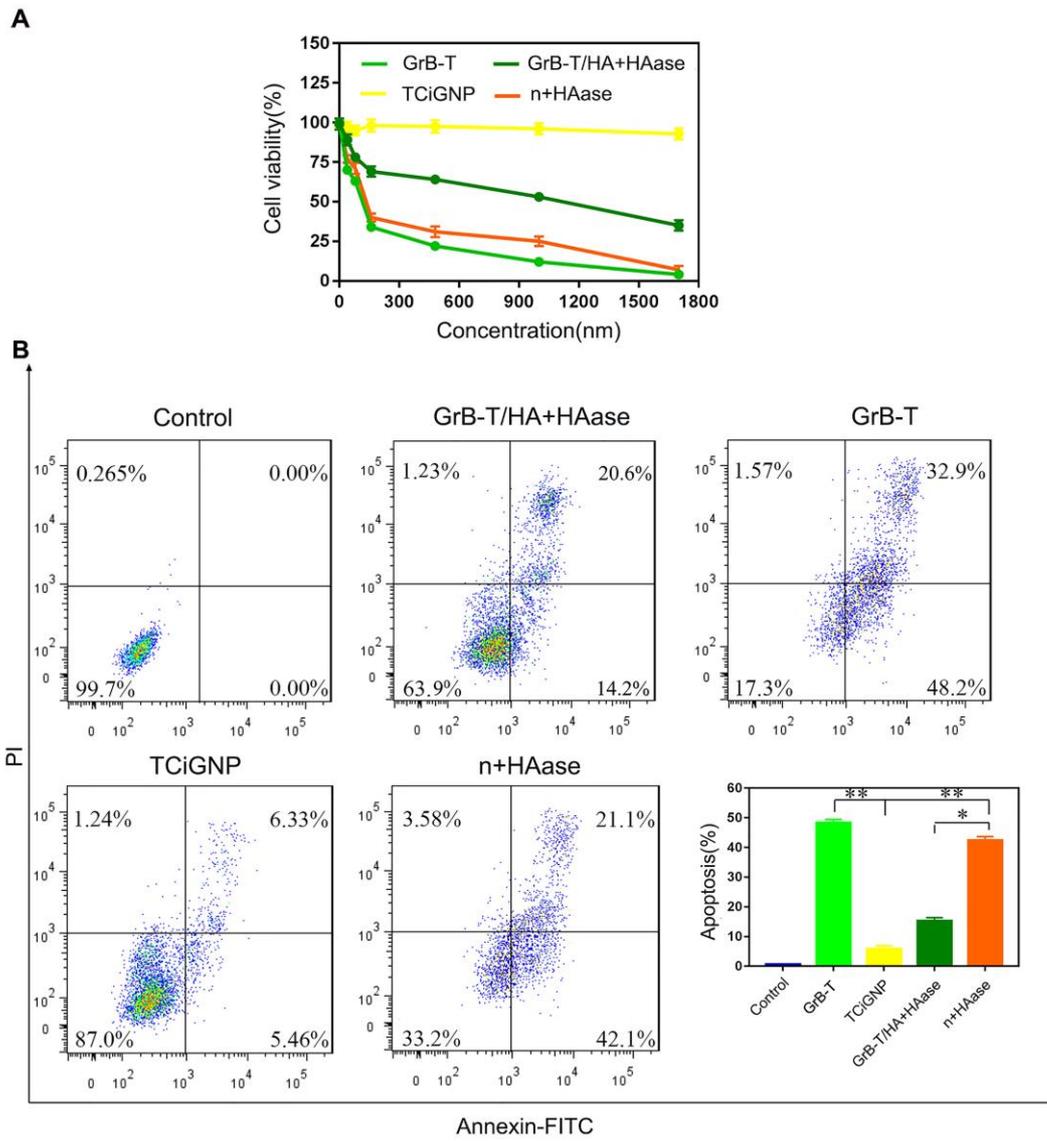
**Figure S4.** GrB-T release from TCiGNPs and GrB-T/HA degraded by Hyaluronidase.



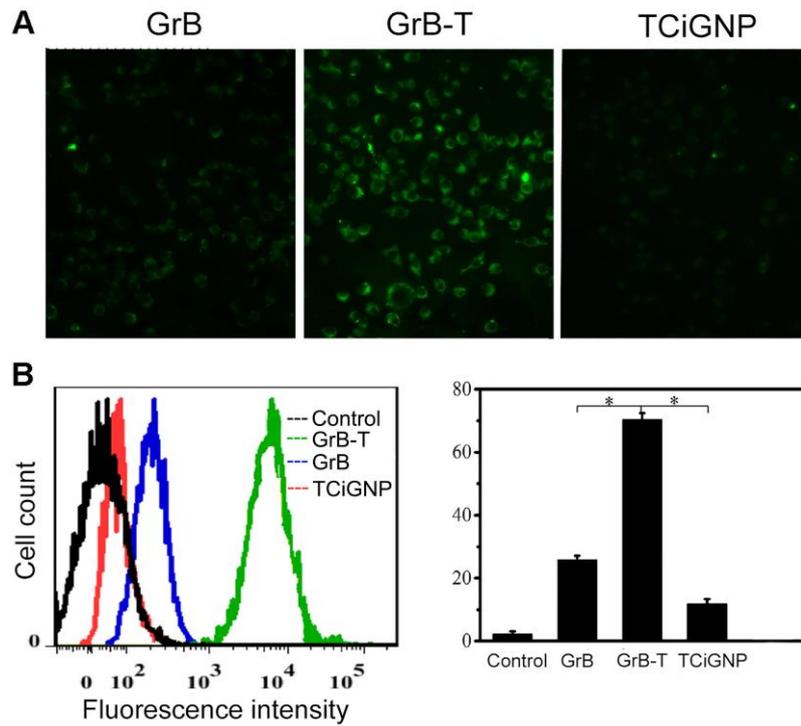
**Figure S5.** Change in particle size of TCiGNPs incubated for 5 days in PBS at 37°C over time.



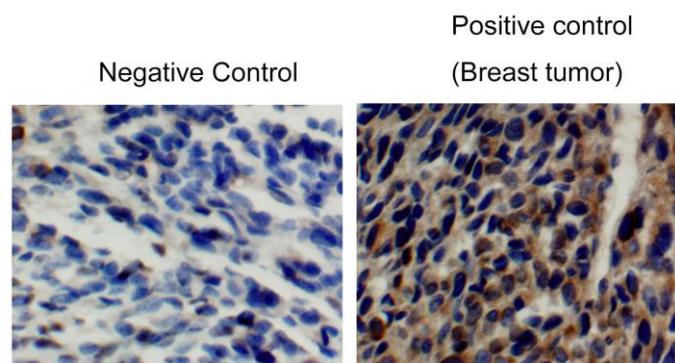
**Figure S6.** Change in particle size of TCiGNPs incubated for 7 days at 37°C in serum.



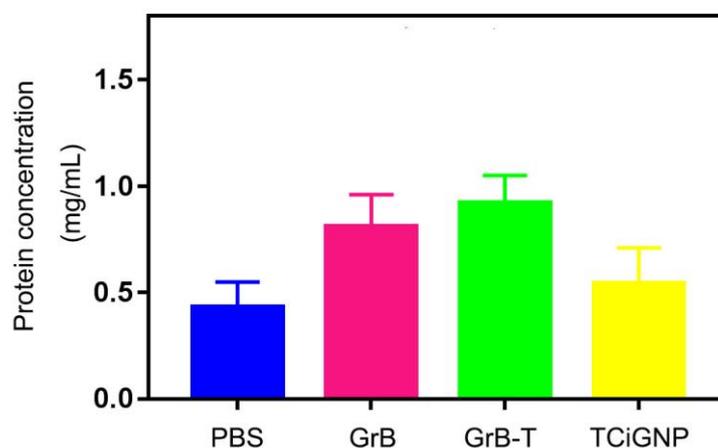
**Figure S7.** (A) Viability of U87 cells treated with different GrB formulations detected by resazurin . (B) U87 Cell apoptosis detected by flow cytometry. \*P<0.05,\*\*P<0.01.



**Figure S8.** Uptake of the GrB, GrB-T and TCiGNPs in J774A.1 cells by fluorescence microscopy(A) and flow cytometry(B). \*P<0.05.



**Figure S9.** Immunohistochemistry analysis of PDL-1 expression in the tumor tissue . Normal nude mouse tissue was used as a negative control.



**Figure S10.** Quantitative measurements of serum proteins adsorbed by TCiGNP and native GrB after incubation with mouse whole serum.

Treatment	Cell line	IC50(nm)	IC50(nm) GrB	Apoptosis (%)	Survival time (Day)
GrB/VEGF <sub>121</sub> <sup>[48]</sup>	MDA-MB-231	500	2300	---	---
GrB-SPIONs <sup>[49]</sup>	H1339	---	---	10 (5 $\mu$ g/mL)	39.17
GrB-SPIONs <sup>[49]</sup>	U87	---	---	8(5 $\mu$ g/mL)	31.7
GrB-CPRPs <sup>[50]</sup>	A549	20.7	>100	8.01(7.5nm)	48
TCiGNP	MDA-MB-231	131	1750	41.6(100nm/L)	>62
TCiGNP	U87	146	2200	42.1(100nm/L)	---

**Table S1.** Comparison of GrB IC50, apoptosis, and survival time between TCiGNPs and other reported particles.