Supplementary Information

Gold nanoclusters for controlled insulin release and glucose regulation in diabetes

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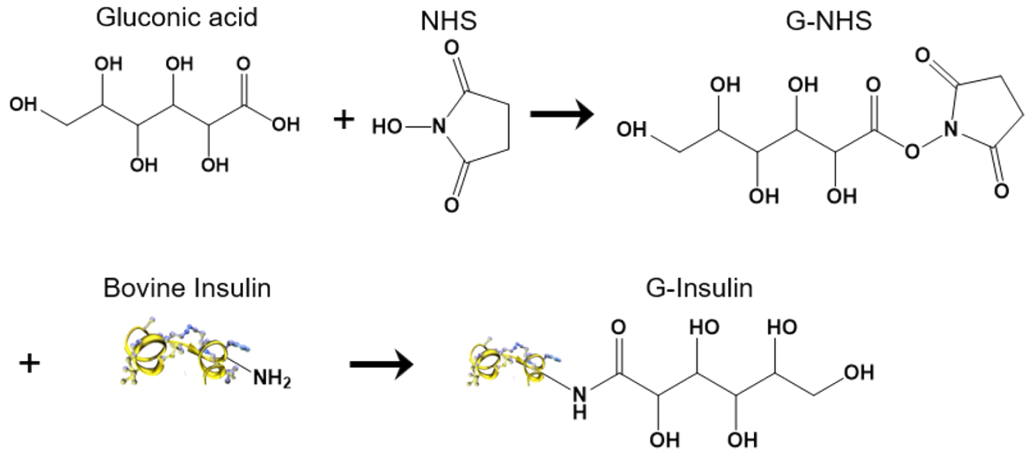

Fig. S1 Preparation process of gluconic acid modified bovine insulin (G-Insulin).

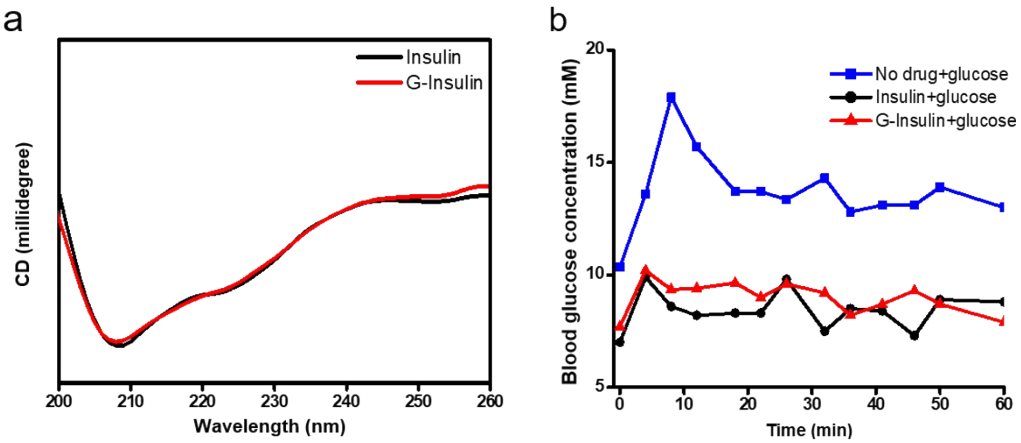

Fig. S2 Gluconic acid modification of insulin (G-Insulin) did not change the structure and bioactivity of pure insulin. (a) CD spectra of pure insulin and G-Insulin. (b) Compare of bioactivity (glucose regulation) of pure insulin and G-Insulin in healthy mice. Drug was intraperitoneally (i.p.) injected into mice for 30 min, then glucose was i.p. injected (t = 0), and the blood glucose of mice was monitored thereafter.

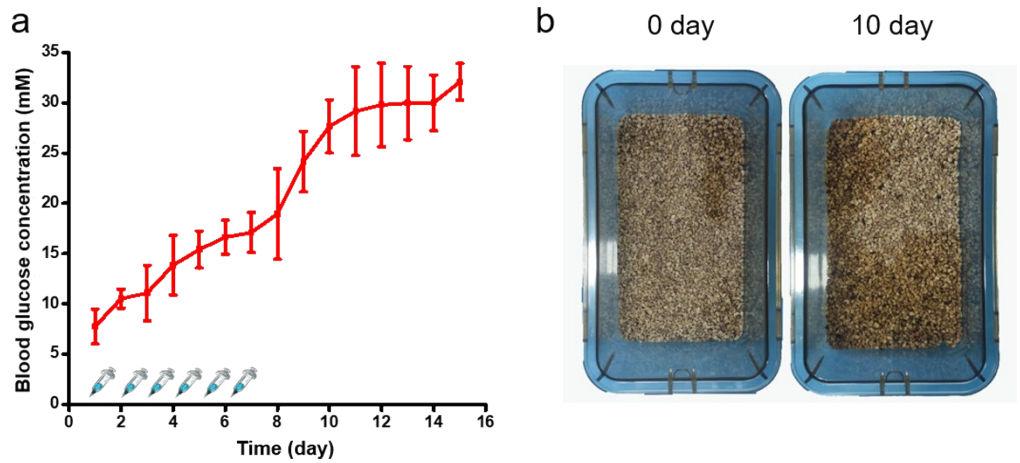

Fig. S3 The induction of type 1 diabetic mouse model using streptozocin (STZ). (a) The glucose changes during the induction of type 1 diabetic mice. The syringes indicated the days of STZ injection. (b) Images of mice cages before and at 10 days after STZ induction.

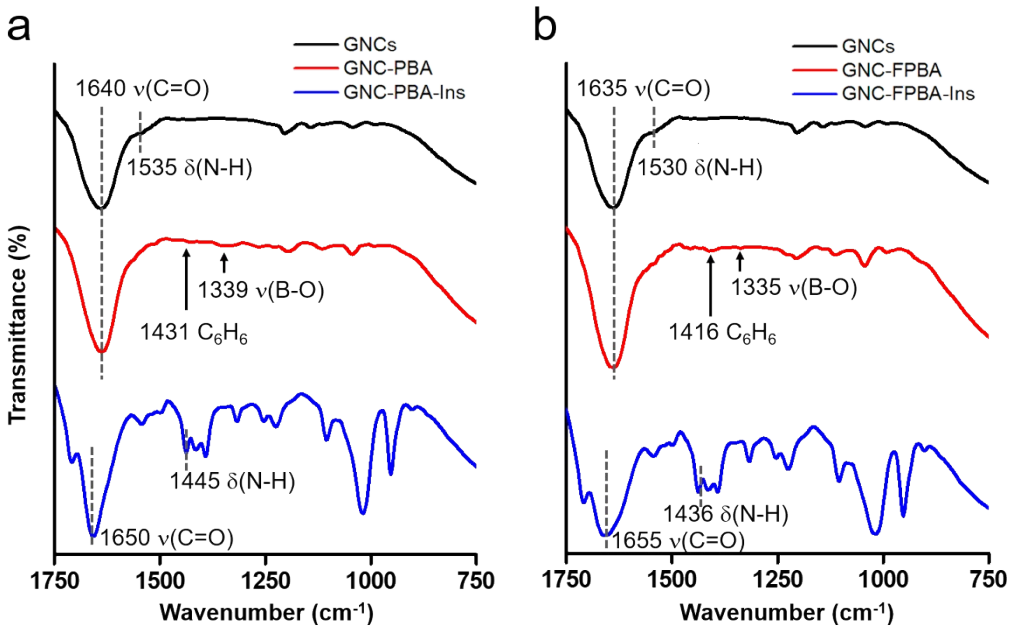

Fig. S4 FTIR high-resolution spectra. (a) During the synthesis of GNC-PBA-Ins complex. (b). During the synthesis of GNC-FPBA-Ins complex.

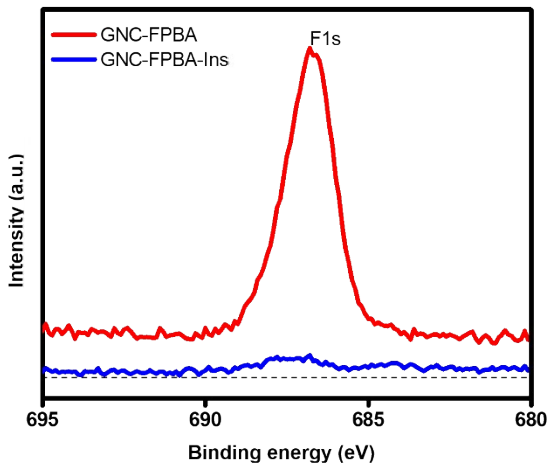

Fig. S5 XPS high-resolution spectra of F1s during the synthesis of GNC-FPBA-Ins complex.

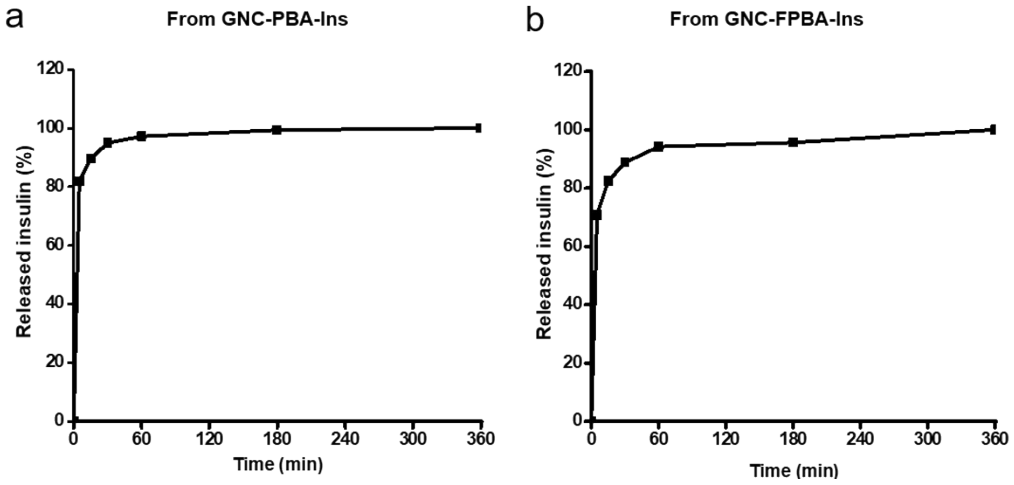

Fig. S6 Insulin release from gold nanoclusters over time. (a) Relative amount of insulin release (%) from GNC-PBA-Ins complex. (b) Relative amount of insulin release from GNC-FPBA-Ins complex.

Table S1 Characteristics of gold nanoclusters by TEM and DLS.

	Size by TEM (nm)	Hydrodynamic size by DLS (nm)	Polydispersity index (PDI)
GNCs	2.8 ± 0.5	5.2 ± 1.7	0.111 ± 0.008
GNC-PBA-Ins	11.1 ± 2.0	131.3 ± 8.4	0.214 ± 0.108
GNC-FPBA-Ins	14.0 ± 3.2	179.4 ± 9.7	0.282 ± 0.071

Table S2 Drug loading capacity of different nanocarriers.

	Loading capacity of insulin	References
GNC-PBA-Ins	848 μmol insulin per g GNCs	
GNC-FPBA-Ins	951 μmol insulin per g GNCs	
MSNs	64 μmol insulin per g MSNs	[1]
Nano-Network	7.9 wt % (13.6 μmol insulin per g chitosan-coated particles)	[2]
	11.4 wt % (19.6 μmol insulin per g alginate-coated particles)	[2]
Nanocapsules	44.6 wt% (76.8 μmol insulin per g particles)	[3]

Supplementary References

1 Y. Zhao, B. G. Trewyn, Slowing, II and V. S. Lin, *J. Am. Chem. Soc.*, 2009, **131**, 8398-8400.

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3 Z. Gu, T. T. Dang, M. Ma, B. C. Tang, H. Cheng, S. Jiang, Y. Dong, Y. Zhang and D. G. Anderson, *ACS Nano*, 2013, **7**, 6758-6766.