Engineering of a novel magnetic bi-functional enzymatic nanobiocatalyst for the Highly Efficient Synthesis of Enantiopure (R)-3-quinuclidinol

Qingman Li[a,‡], QihuaJiang[b,‡], PengchengGu[c], Lianju Ma[c,*],YiwuWang[c,*]

[a]The First Affiliated Hospital of Chongqing Medical University, Chongqing 400016, China; lqm5858@163.com

[b]Department of Medicinal Chemistry, School of Pharmacy, Chongqing Medical University, Chongqing400016, PR China; 100877@cqmu.edu.cn

[c]LabTeaching &Management Center of Chongqing Medical University, Chongqing400016, China;

[*]Corresponding author, E-mail: malianjucq@126.com; willwyw@qq.com

Tel: +86 23 6848 5161, Fax: +86 23 6571 3519.

[‡]Qingman Li and Qihua Jiang contributed equally to this work.

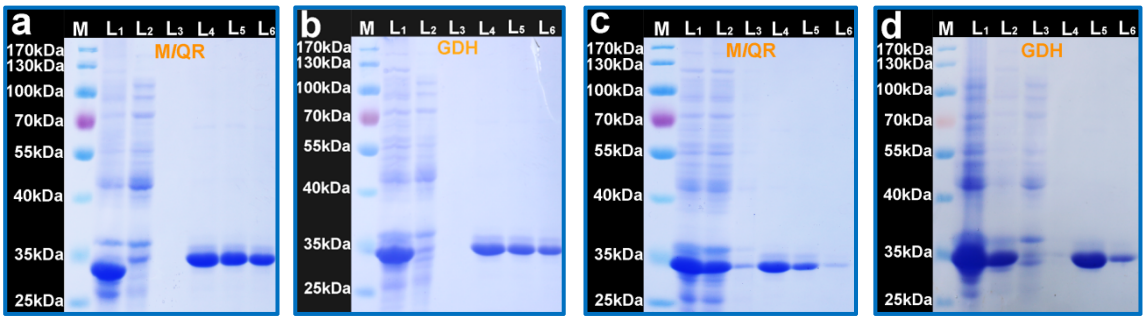

Figure S1. A comparison of the specificity of His_6-tagged M*l*QR and GDH to different carrier. (a, b) Ni@MSN; (c, d) commercially available Ni^{2+}-agarose bead. L_M, protein molecular weight makers; L_1, the cell lysates supernatant; L_2, flow-through fractions, L_3, $L_{4\text{-}6}$, wash and elution fractions with 10 mM and 500 mM imidazole, respectively.

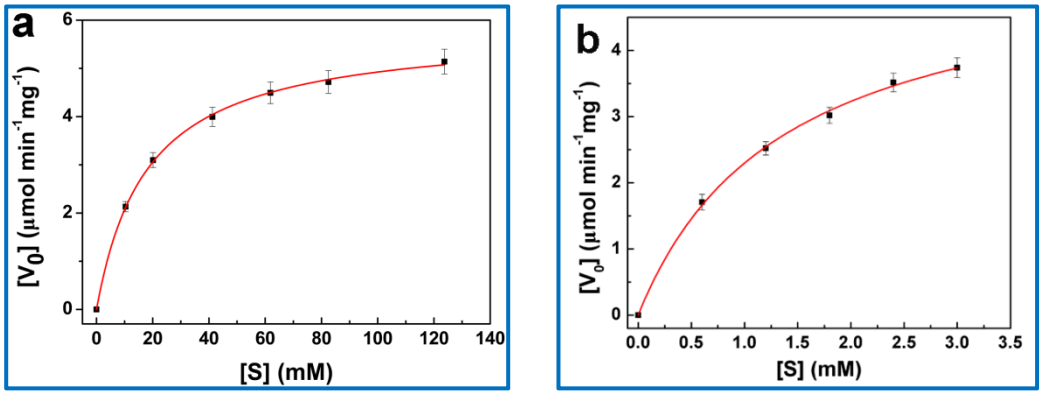

Figure S2 The enzyme kinetics as the effect of substrate concentration on the activity of the bi-functional enzyme MLG. a) ketoreductase (*Ml*QR) in the MLG at varying glucose concentrations in the range of 0.2 to 1.0 mM, b) cofactor regenerating enzyme (GDH) in the MLG at at varying glucose concentrations in the range of 0.2 to 1.0 mM.

Table S1. Porous features of Ni@MSN and MLG-Ni@MSN biocatalysts.

Particles	Surface area (m^2/g)	Pore volume (mL/g)	Pore size (nm)
Ni@MSN	70.6	0.30	16.71
MLG-Ni@MSN biocatalysts	68.1	0.36	21.40

Table S2. Kinetic parameters of the free MLG and the immobilized MLG.

	the free MLG		the immobilized MLG	
	M/QR	GDH	M/QR	GDH
K_m (mM)	12.06	1.62	18.06	1.36
K_{cat} (s^{-1})	4.70	9.85	6.39	5.98 1.6
K_{cat}/K_m ($s^{-1}\cdot mM^{-1}$)	0.39	6.08	0.35	4.38 1.4
V_{max}(μmol s^{-1} mg^{-1})	4.27	8.94	6.32	5.43 1.6