Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.
This journal is © The Royal Society of Chemistry 2022

Fluorescence detection of milk allergen β-lactoglobulin based on aptamer and WS_2 nanosheets

Chengyi Hong,[a] Jingjing Wang,[a] Yuying Wang,[a] Zhiyong Huang,[a] Hongfen Yang,[c]* Dan Yang,[d] Ren Cai,[b]* and Weihong Tan[b]

a. College of Ocean Food and Biological Engineering, Fujian Provincial Key Laboratory of Food Microbiology and Enzyme Engineering, Jimei University, Xiamen, 361021, China.

b. Molecular Science and Biomedicine Laboratory, State Key Laboratory for Chemo/Bio-Sensing and Chemometrics, College of Chemistry and Chemical Engineering, College of Biology College of Material Science and Engineering, and Collaborative Research Center of Molecular Engineering for Theranostics, Hunan University, Changsha, 410082, China.

c. University of Texas at Austin, Austin, TX 78712, USA.

d. RMIT University, Melbourne, Australia.

* Corresponding author.
E-mail address: cairen@hnu.edu.cn;yanghf88@gmail.com.

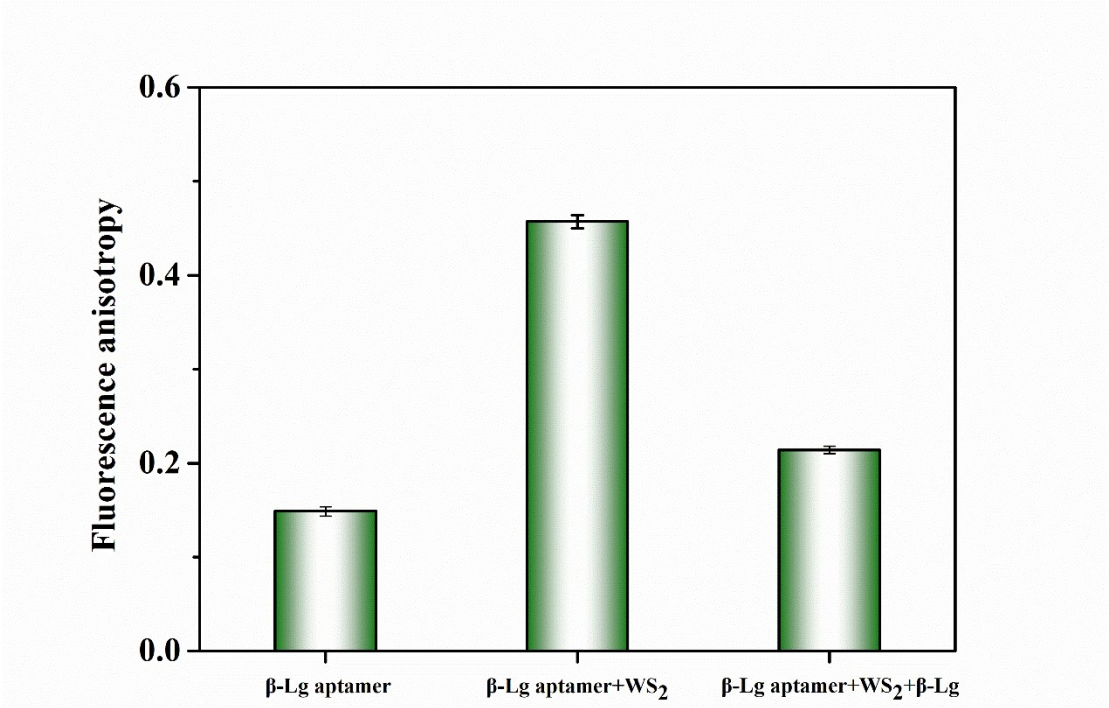

Fig. S1. The change of fluorescence anisotropy after FAM labeled β-Lg aptamer (50 nmol/L) interacted with WS_2 nanosheet (200 μg·mL^{-1}) and target β-Lg (60 μg·mL^{-1}).

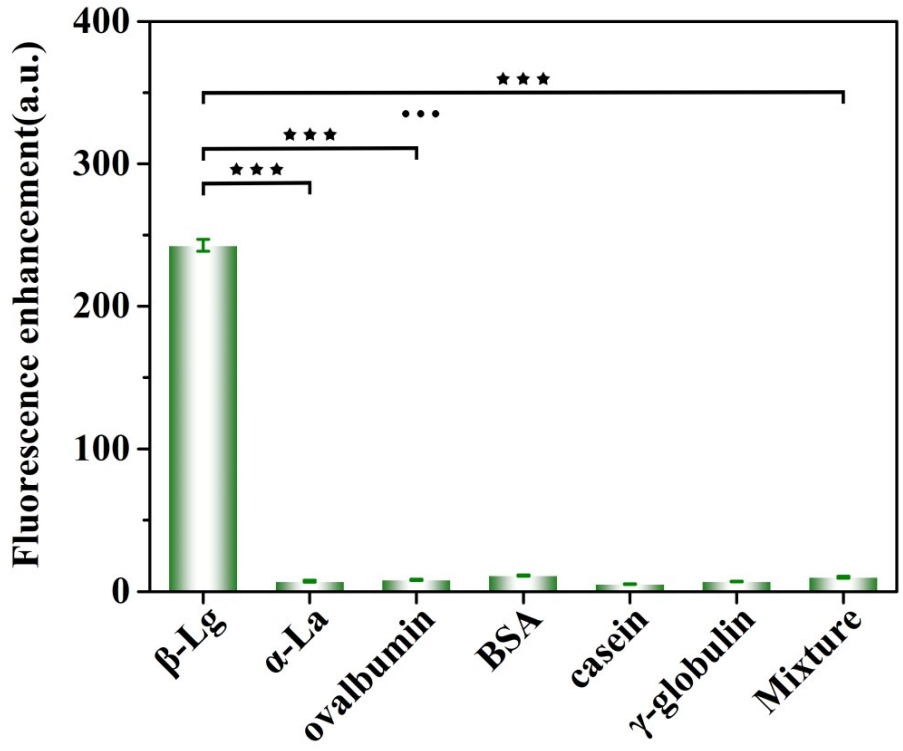

Fig. S2. The fluorescence enhancement of β-Lg (80 μg·mL^{-1}) and other interfering proteins (80 μg·mL^{-1}). Asterisks indicate statistically significant differences ($p<0.001$).

Supporting Tables

Table S1 Comparison of different methods for detection of β-Lg.

Methods	Detection range ($\mu g \cdot mL^{-1}$)	LOD ($\mu g \cdot mL^{-1}$)	Ref
HPLC	20-560	7	[S1]
LC-MS	0.48-31.25	0.2	[S2]
HPLC	0.4-60	0.06	[S3]
Antibody-based ELISA	0.03125-8	1.96×10^{-3}	[S4]
Antibody-based ELISA	0.078-10	0.114	[S5]
Surface Plasmon Resonance	0.49-1000	0.164	[S6]
Electrochemical method	530-1.1160×10^{4}	270	[S7]
Electrochemical method	1×10^{-5}-1	7×10^{-6}	[S8]
Electrochemical method	1×10^{-5}-0.1	5.7×10^{-6}	[S9]
Fluorescence	2.5×10^{-4}-0.05	3.7×10^{-5}	[S10]
Fluorescence	0.1-100	0.0204	This work

Table S2 Comparison of fluorescence assay results with commercial ELISA in five different milk samples.

Milk Samples	methods	detection result ($\mu g \cdot mL^{-1}$)	calculated concentration ($g \cdot L^{-1}$)	standard concentration ($g \cdot L^{-1}$)	RSD (%)
Sample 1	This work	88.27	4.41	4.56	2.8
	ELISA	90.16	4.51		3.1
Sample 2	This work	82.31	4.12	3.96	3.9
	ELISA	80.79	4.04		4.3
Sample 3	This work	75.66	3.78	3.84	3.7
	ELISA	73.25	3.66		4.9
Sample 4	This work	72.58	3.63	3.60	2.6
	ELISA	70.97	3.55		3.5
Sample 5	This work	68.03	3.40	3.48	2.7
	ELISA	69.89	3.49		3.2

Table S3 Determination of β-Lg in infant formula.

Samples	Spiked (μg·mL^{-1})	Found (μg·mL^{-1})	Recovery (%)	RSD (%)
1	1	0.987	98.7%	3.9
2	10	10.35	103.5%	3.7
3	100	98.14	98.1%	2.4

References

[S1] L. I. Boitz, G. Fiechter, R. K. Seifried and H. K Mayer, *J. Chromatogr. A*, 2015, **1386**, 98-102.

[S2] J. Ji, P. Zhu, F. Pi, C. Sun, J. Sun, M. Jia, C. Ying, Y. Zhang and X. Sun, *Food Control*, 2017, **74**, 79-88.

[S3] Y. Ren, Z. Han, X. Chu, J. Zhang, Z. Cai and Y. Wu, *Anal. Chim. Acta*, 2010, **667**, 96-102.

[S4] S. He, X. Li, J. Gao, P. Tong and H. Chen, *Food Chem*., 2017, **227**, 33-40.

[S5] J. Orcajo, M. Lavilla and I. Martínez-de-Marañón, *Anal. Chim. Acta*, 2019, **1052**, 163-169.

[S6] J. Ashley, R. D'Aurelio, M. Piekarska, J. Temblay, M. Pleasants, L. Trinh, T. L. Rodgers and I. E. Tothill, *Biosensors*, 2018, **8**, 32.

[S7] O. Surucu and S. Abaci, *J. Food. Meas. Charact*., 2020, **14**, 11-19.

[S8] S. Xu, B. Dai, W. Zhao, L. Jiang and H.Huang, *Anal. Chim. Acta*, 2020, **1120**, 1-10.

[S9] Q. Qiu, X. Ni, T. Liu, Z. Li, X. An and X. Chen, *Analyst*, 2021, **146**, 6808-6814.

[S10] M. Shi, Y. Cen, M. Sohail, G. Xu, F. Wei, Y. Ma, X. Xu, Y. Ma, Y. Song and Q. Hu, *Microchim. Acta*, 2018, **185**, 1-8.