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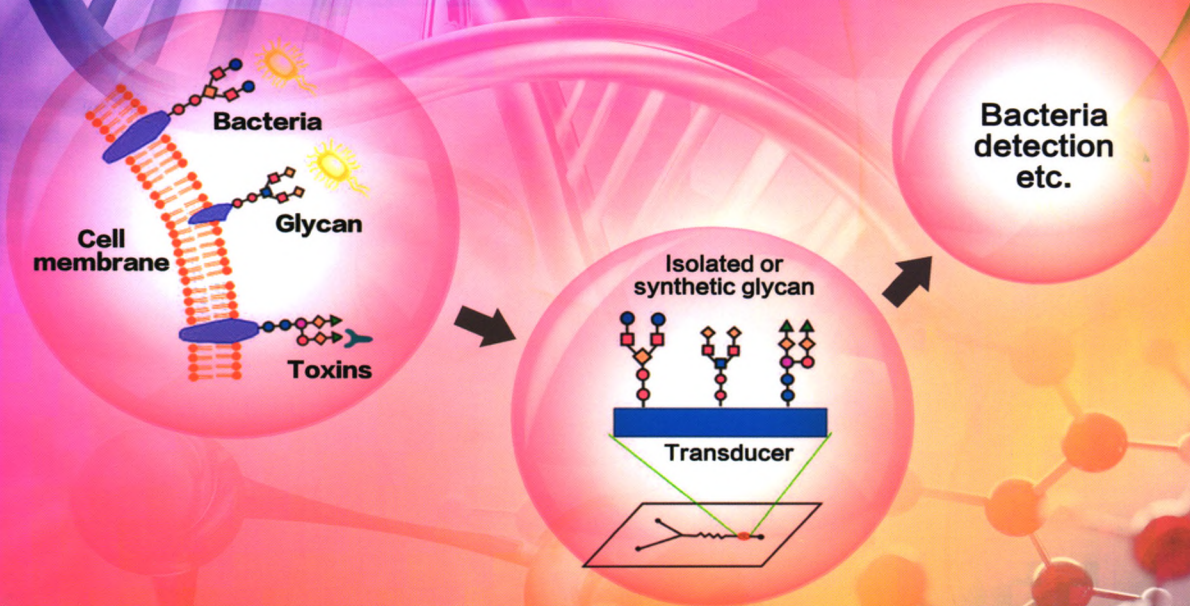
# 分析测试学报



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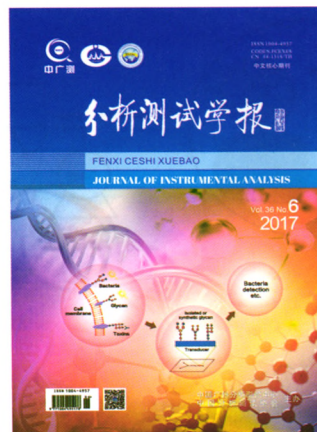
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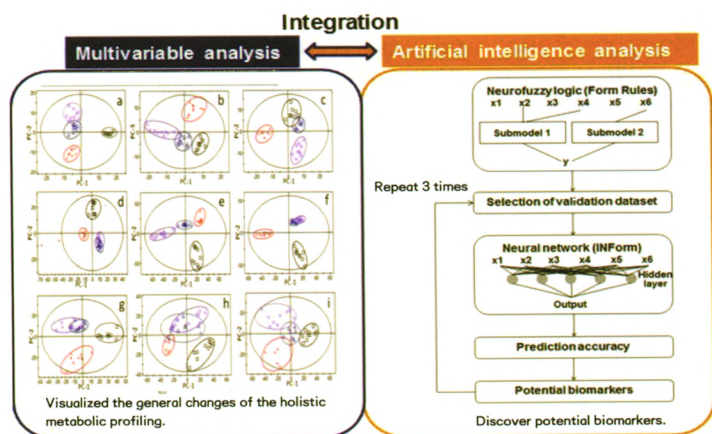
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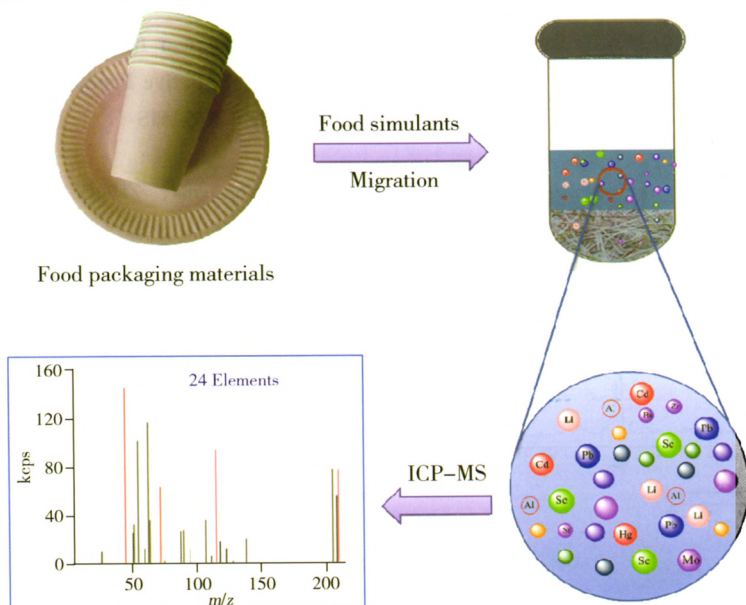


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*J. Instrum. Anal.*, 2017, 36(6): 705 – 710.

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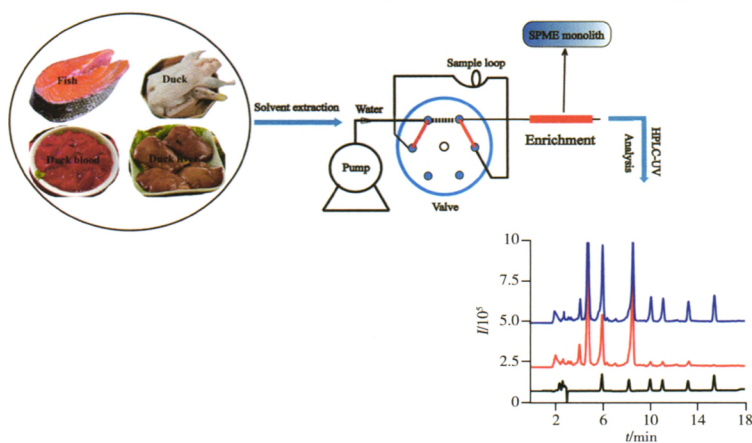


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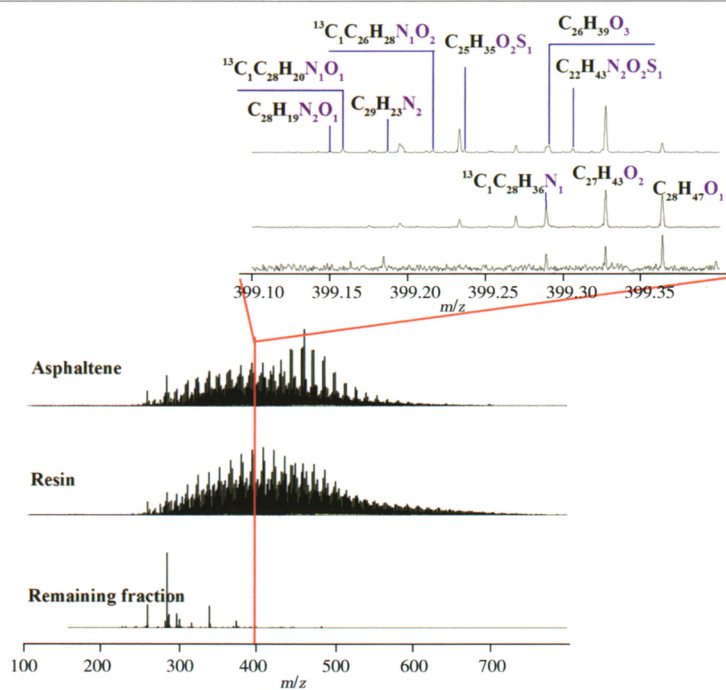


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*J. Instrum. Anal.* , 2017, 36(6) : 718 – 724.

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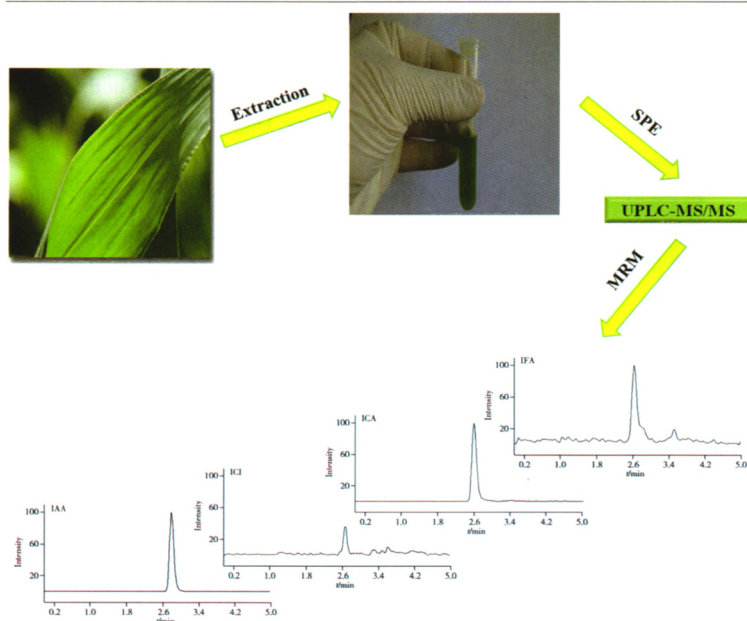


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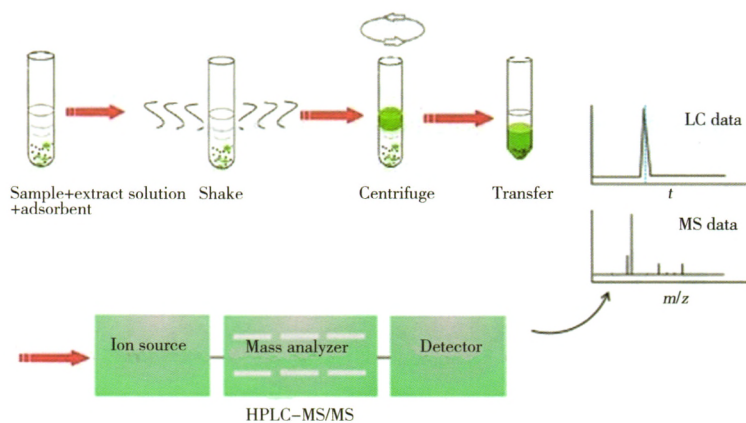


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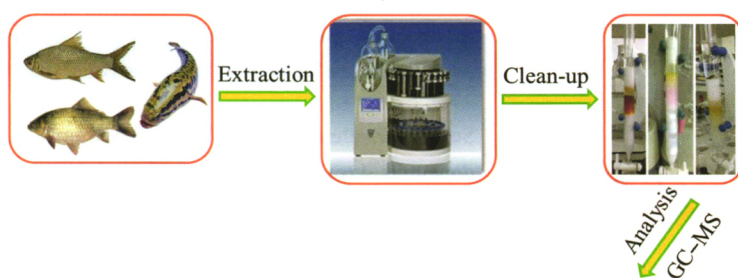
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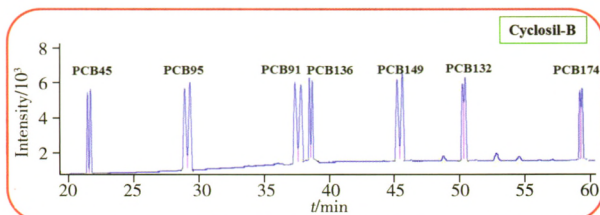
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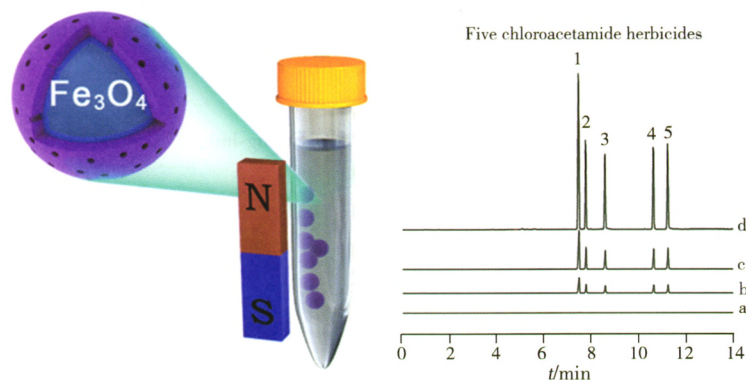


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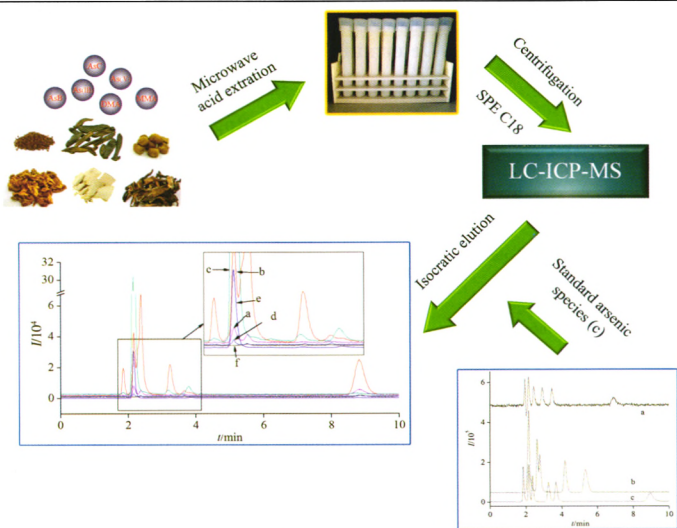
*J. Instrum. Anal.* , 2017, 36(6) : 744 – 749.  
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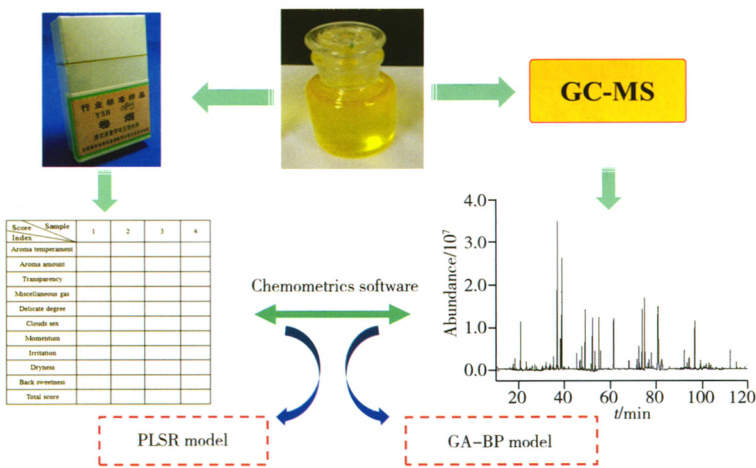


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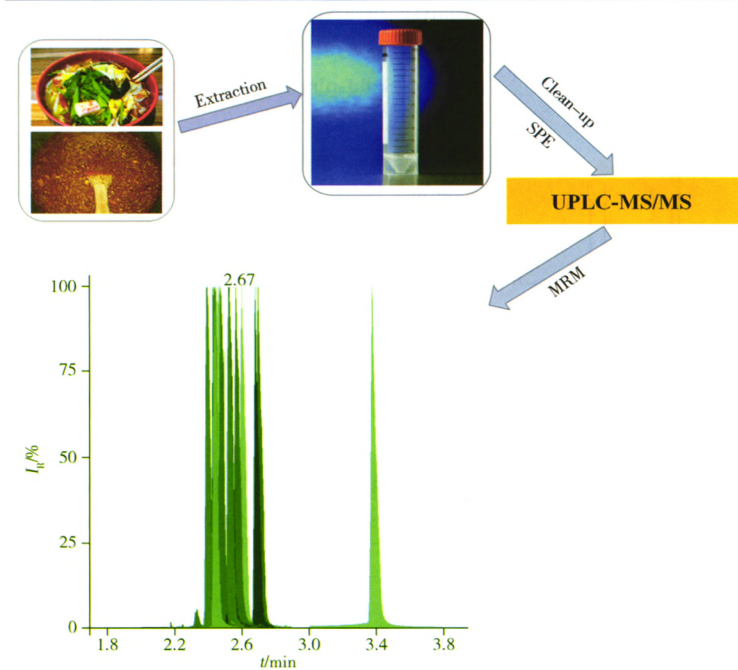
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*J. Instrum. Anal.*, 2017, 36(6): 768 – 772.  
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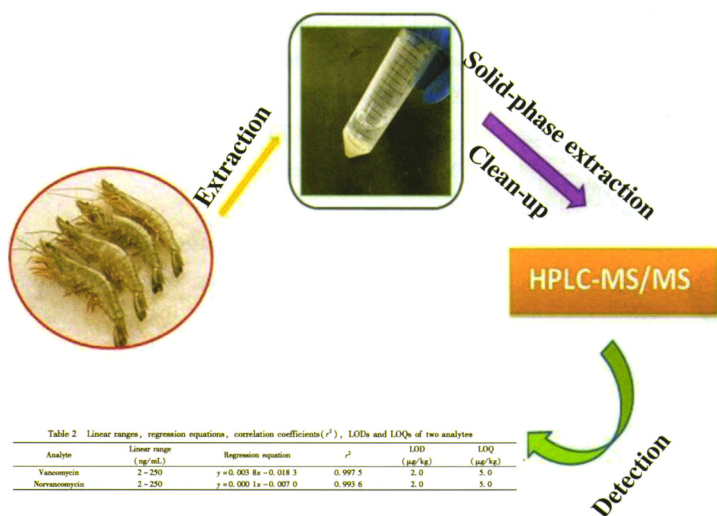


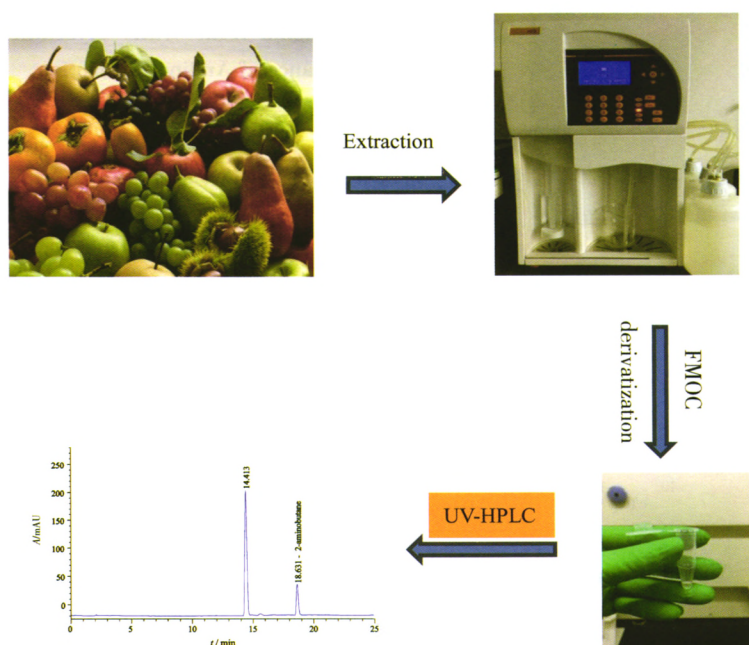
Table 2 Linear ranges, regression equations, correlation coefficients ( $r^2$ ), LODs and LOQs of two analytes

Analyte	Linear range (ng/mL)	Regression equation	$r^2$	LOD (µg/kg)	LOQ (µg/kg)
Vancomycin	2-250	$y = 0.0034x - 0.0183$	0.9975	2.0	5.0
Norvancomycin	2-250	$y = 0.0001x - 0.0070$	0.9936	2.0	5.0

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*J. Instrum. Anal.*, 2017, 36(6): 773 – 777.  
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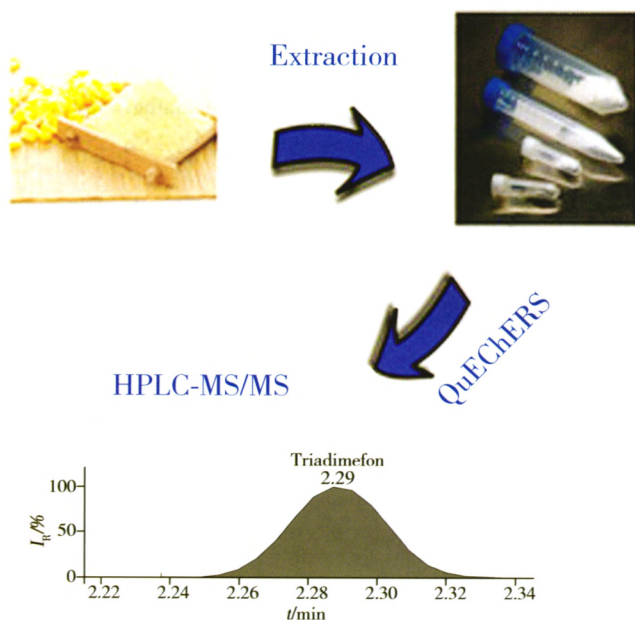


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*J. Instrum. Anal.*, 2017, 36(6): 778 – 782.  
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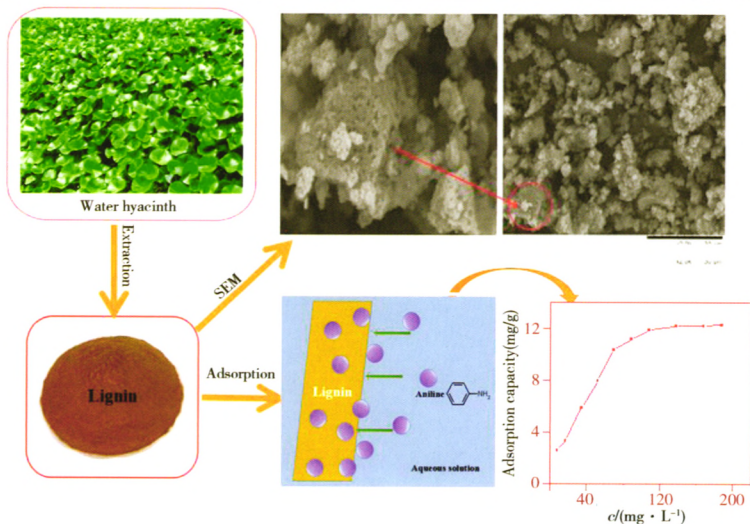




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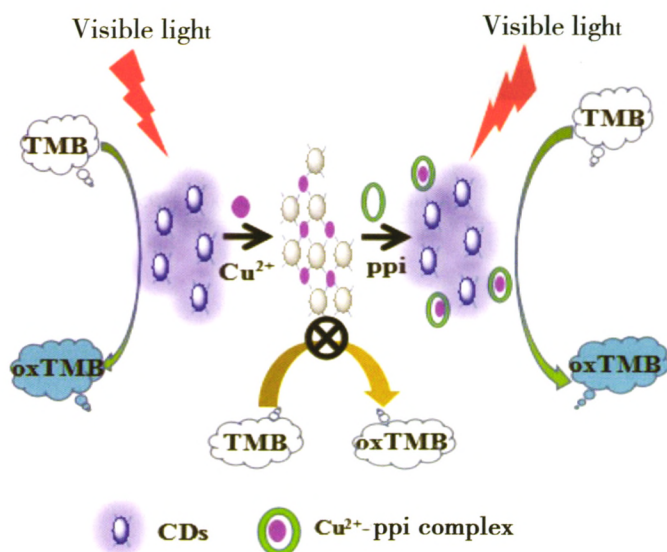
*J. Instrum. Anal.* , 2017, 36(6) : 783 – 787.  
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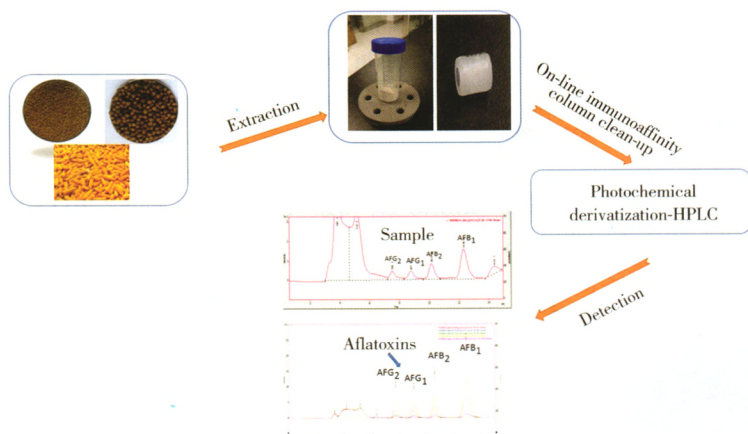
*J. Instrum. Anal.* , 2017, 36(6) : 788 – 793.  
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*J. Instrum. Anal.* , 2017, 36(6) : 794 – 799.  
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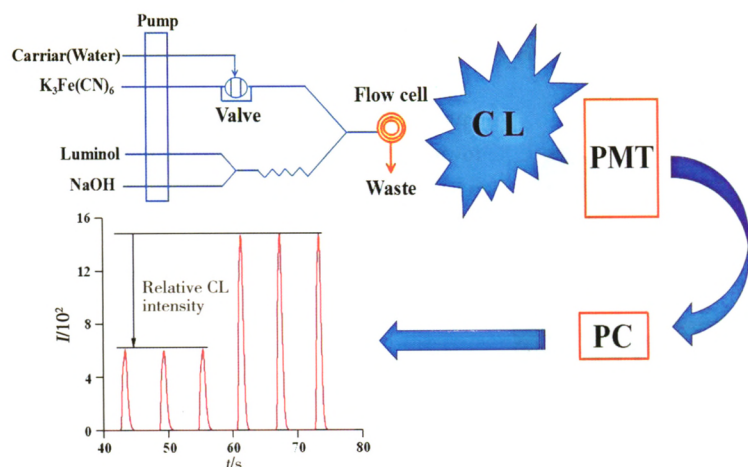


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*J. Instrum. Anal.* , 2017, 36(6) : 800 – 804.  
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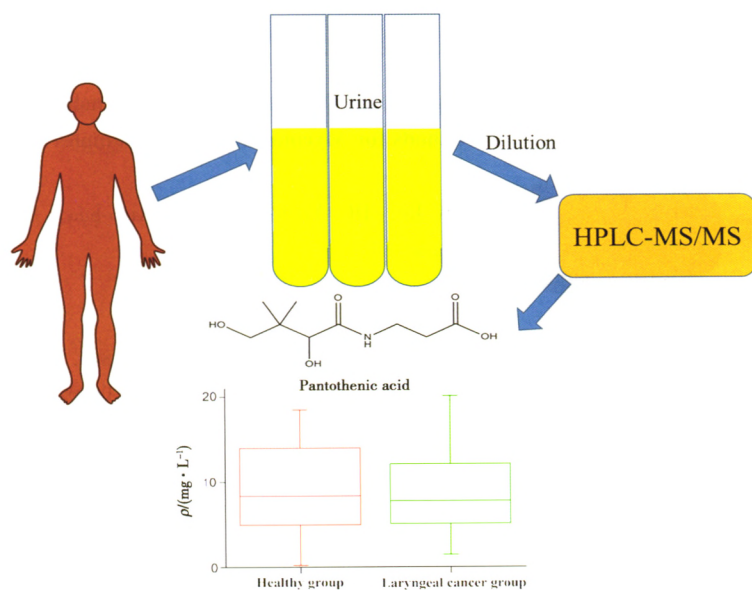
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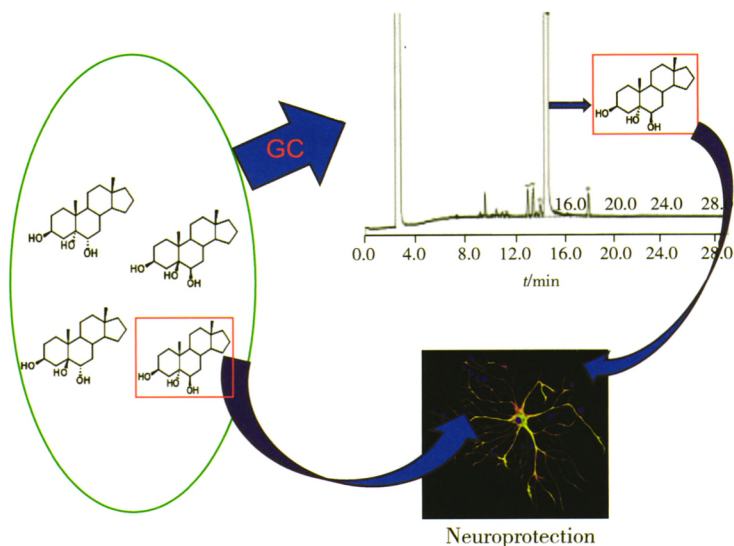
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*J. Instrum. Anal.* , 2017, 36(6) : 809 – 811.  
doi: 10.3969/j. issn. 1004 – 4957. 2017. 06. 019

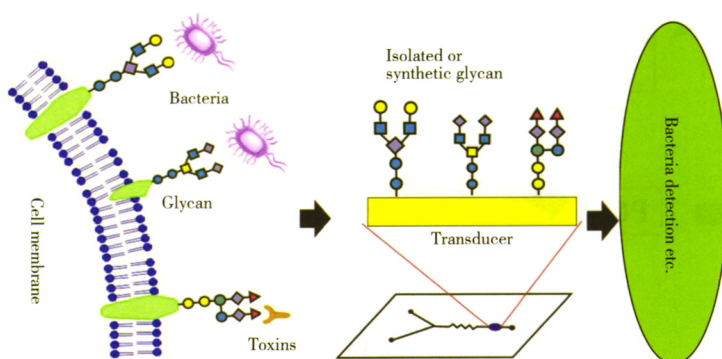


### Separation and Determination of Three Diastereomers in Neuroprotectant 3β, 5α, 6β-Androstriol Bulk Drug

XIE Min-yu, WANG Ya-long, LI Xin-hua, XIONG Li, WEN Hui, HU Hai-yan, ZHANG Jing-xia

*J. Instrum. Anal.*, 2017, 36(6): 812 – 816.  
doi: 10.3969/j.issn.1004 – 4957.2017.06.020

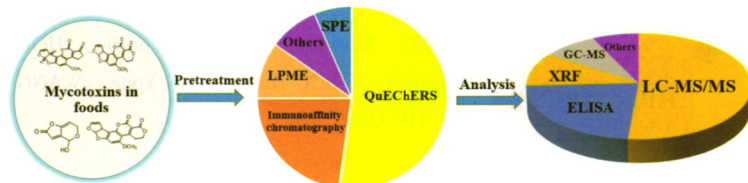
## Review



### Specific Recognition of Pathogenic Bacterium towards Glycan and Its Applications in Analytical Chemistry

CUI Fei-yun, XU Yi, ZHAO Bin, CHE Yulan, LIU Lu-lu

*J. Instrum. Anal.*, 2017, 36(6): 817 – 828.  
doi: 10.3969/j.issn.1004 – 4957.2017.06.021



### Progress on Pretreatment and Analytical Methods for Mycotoxins in Food Samples

TAN Jie, DU Yuan-qi, XIAO Xiao-hua, LI Gong-ke

*J. Instrum. Anal.*, 2017, 36(6): 829 – 840.  
doi: 10.3969/j.issn.1004 – 4957.2017.06.022

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