发光学報
CHINESE JOURNAL OF LUMINESCENCE
中文核心期刊
主管：中国科学院
主办：中国科学院长春光学精密机械与物理研究所
中国物理学会发光分会
主编：申德振

发光学报 2014, 35(3) 372-376 ISSN: 1000-7032 CN: 22-1116/O4

发光学应用及交叉前沿

荧光光谱法研究拜复乐与小牛胸腺DNA的作用机理

刘保生, 张丽惠, 李志云, 郭莹
河北大学化学与环境科学学院 药物化学与分子诊断教育部重点实验室, 河北 保定 071002

摘要： 用荧光光谱法研究了拜复乐（MXFX）与小牛胸腺DNA（ctDNA）之间的相互作用。在pH=7.4的Tris-HCl缓冲溶液中，MXFX的荧光激发峰和发射峰分别位于291 nm和462 nm。ctDNA的加入对MXFX的荧光有静态猝灭作用，这种荧光静态猝灭作用是由ctDNA和MXFX结合引起的，作用力为氢键或范德华力，结合常数为1.28×10^5 L/mol（25 ℃）。采用离子强度的影响、碘离子猝灭及溴乙锭竞争作用实验研究了MXFX与ctDNA间的相互作用，结果表明MXFX与DNA的结合是MXFX嵌入到DNA中相邻2个碱基对之间，属于嵌入结合模式。

关键词： 拜复乐 小牛胸腺DNA 荧光光谱法 作用机理

Studies on The Interaction Mechanism Between Moxifloxacin and ctDNA by Fluorescence Spectroscopy

LIU Bao-sheng, ZHANG Li-hui, LI Zhi-yun, GUO Ying
Key Laboratory of Medical Chemistry and Molecular Diagnosis, Ministry of Education, College of Chemistry & Environmental Science, Hebei University, Baoding 071002, China

Abstract: The interaction machanism of moxifloxacin (MXFX) and ctDNA was investigated by fluorescence spectroscopy. In Tris-HCl buffer solution of pH=7.40, the excitation and emission wavelengths of MXFX are 291 nm and 462 nm, respectively. The fluorescence of MXFX can be quenched by adding ctDNA, which is initiated by conjugation reaction between ctDNA and MXFX. The binding constant of this binary system is 1.28×10^5 L/mol (25 ℃), and hydrogen bond or Van der Waals force play an important role on the conjugation reaction between ctDNA and MXFX. In addition, three experiments (effect of ionic strength, quenching experiment of I^-, and the competition of EB) results indicate that the conjugation mechanism can be considered as MXFX embedding into two adjacent base-pairs of ctDNA.

Keywords: moxifloxacin ctDNA fluorescence spectroscopy interaction mechanism
收稿日期 2013-10-23 修回日期 2013-12-17 网络版发布日期
基金项目:
国家自然科学基金（20675024）；河北省重点基础研究项目（10967126D）资助

通讯作者: 刘保生，E-mail：lbs@hbu.edu.cn
作者简介: 刘保生（1963-），男, 河北保定人, 研究员, 1992年于河北大学获得硕士学位, 主要从事分子发光学理论与应用的研究。E-mail：lbs@hbu.edu.cn
作者Email: lbs@hbu.edu.cn

本刊中的类似文章
1.水杨醛甘氨酸席夫碱-含氮杂环稀土配合物的合成及其与DNA作用的光谱研究[J]. 2014,35(3): 366-371
2.改进荧光法研究氟洛芬与牛血清白蛋白的相互作用[J]. 2013,34(10): 1380-1385
3.胡椒酸乙酯与牛血清白蛋白的相互作用及金属离子的影响[J]. 2012,(11): 1268-1274
4.头孢噻肟钠和氯霉素与牛血清白蛋白相互作用的荧光光谱分析[J]. 2011,32(6): 628-635
5.转铁蛋白载体携带阿霉素的分子间结合作用[J]. 2005,26(5): 669-673

参考文献：

[1] Jiang L L, Hu J H, Chen F, *et al.* Interaction between daunomycin and deoxyribonucleic acid using Ru (phen)$_2$ dppx^{2+} as spectroscopic probe[J]. *Chin. J. Anal. Chem.(分析化学)*, 2007, 35(7):1051-1054 (in Chinese).

[2] Hu R D. Synthesis, Antitumor Activity of Quinolone Compounds Containing Palladium and Study on The Interaction of Phenanthroline Metal Complex with DNA. Hangzhou: Zhejiang University, 2007 (in Chinese).

[3] Liu B S, Yan X N, Yang C, *et al.* Studies on the interaction between norfloxacin and ofloxacin in presence of bovine serum albumin by fluorescence spectrum methods[J]. *J. Hebei Univ.(河北大学学报)*, 2011, 31 (3):262-266 (in Chinese).

[4] Meng J J. Recent progress on application of a new antibiotic moxifloxacin[J]. *J. Microbiology (微生物学杂志)*, 2007, 27(5):98-101 (in Chinese).

[5] Duan Y Q, Min S G. Study of the interaction mechanism between brodifacoum and DNA by spectroscopy [J]. *Spectrosc. Spect. Anal.*(光谱学与光谱分析), 2009, 29(4):999-1003 (in Chinese).

[6] Wu J Z, Yuan L, Wu J F. Synthesis and DNA binding of μ-[2,9-bis(2-imidazo [4,5-f] [1,10] phenanthroline)-1, 10-phenanthroline] bis[1,10-phenanthrolinecopper (Ⅱ)][J]. *J. Inorg. Biochem.*, 2005, 99(11):2211-2216.

[7] Sun Y T. Studies on The Drugs and Their Interaction with Biomacromolecules by Spectral Methods[D]. Changchun: Jilin University, 2009 (in Chinese).

[8] Satyanarayana S, Dabrowiak J C, Chaires J B. Neither delta-nor lambda-tris (phenanthroline) ruthenium (Ⅱ) binds to DNA by classical intercalation[J]. *Biochem.,* 1992, 31(39):9319-9324.

[9] Liu B S, Yan X N, Cao S N, *et al.* Interaction of cefpiramide sodium with bovine serum albumin and the effect of coexistent metal ion on the reaction[J]. *Chin. J. Lumin.(发光学报),* 2012, 33(9):1018-1024 (in Chinese).

[10] Ross P D, Subramanian S. Thermodynamics of protein association reactions:forces contributing to stability[J]. *Biochem.,* 1981, 20(11):3096-3102.

[11] Pasternack R F, Brigandi R A, Abrams M J. Interactions of porphyrins and metalloporphyrins with single-stranded poly(dA)[J]. *Inorg. Chem.,* 1990, 29(22):4483-4486.

[12] Yang M L, Yang P J, Song Y M. Synthesis, characterization and interaction of transition metal complex of rutin with BSA and HSA[J]. *Chin. J. Inorg. Chem.(无机化学学报),* 2005, 21(4):483-489 (in Chinese).

[13] Guo J B, Zhang G W, Chen X X, *et al.* Studies on the interaction between D-(+) catechin and DNA[J]. *J. Anal. Sci.(分析科学学报),* 2008, 24(5):507-511 (in Chinese).

[14] Zhang H S, Wang H, Zhao Y Y. *Molecule Probes and Detection Reagents* [M]. Beijing: Science Press, 2002:330.