

FULL PAPERS

5, 10, 15, 20-四 [4-(4'-乙基哌嗪基)苯基]卟啉的合成及其与DNA的相互作用

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摘要 基于卟啉对癌细胞的特殊亲和作用和哌嗪化合物的抗肿瘤、抗病毒作用, 设计并合成了具有哌嗪结构的新型卟啉化合物5, 10, 15, 20-四[4-(4'-乙基哌嗪基)苯基]卟啉 (TEPPPH₂), 其结构经UV-Vis, 元素分析, ¹H NMR等手段证明。采用UV-Vis光谱和荧光光谱研究了TEPPPH₂和小牛胸腺DNA的相互作用模式和结合机理。实验发现, TEPPPH₂能嵌入到DNA的碱基对中, 1个小牛胸腺DNA分子对TEPPPH₂分子的最大结合数n约为88, 结合常数为 $8.4 \times 10^6 \text{ mol} \cdot \text{L}^{-1}$ 。TEPPPH₂与DNA的结合数和结合常数大于已知的四(4-N-甲基吡啶基)卟啉和Ca/sal-his、Ni/sal-aln型席夫碱抗癌药物。

关键词 [5,10,15,20-四\[4-\(4'-乙基哌嗪基\)苯基\]卟啉](#), [小牛胸腺DNA](#), [合成](#), [荧光光谱](#), [紫外-可见光谱](#)

分类号

Synthesis of 5,10,15,20-Tetra[4-(*N*-ethylpiperazinyl)phenyl]porphyrin and Its Interaction with DNA

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Abstract Piperazinyl-porphyrin, 5,10,15,20-tetra[4-(*N*-ethylpiperazinyl)phenyl]porphyrin (TEPPH₂), was synthesized based on the special affinity of porphyrin to cancer cells and the antitumor activity of piperazine compounds. Its structure was characterized by UV-vis and ¹H NMR spectra and elemental analysis. A model for the interaction between TEPPH₂ and calf thymus DNA was built, and the binding mechanism was investigated by UV-vis and fluorescence spectra. The results indicated that TEPPH₂ could intercalate into the base pairs of DNA strongly. One calf thymus DNA molecule could bind 88 TEPPH₂ molecules, and the binding constant *K* is $8.4 \times 10^6 \text{ mol} \cdot \text{L}^{-1}$. The binding number and binding constant of TEPPH₂ with DNA are higher than those of the known anti-tumor drugs, tetrakis(4-*N*-methylpyridyl)porphine and the Schiff bases Ca/sal-his and Ni/sal-aln.

Key words [5](#) [10](#) [15](#) [20-tetra\[4-\(*N*-ethylpiperazinyl\)phenyl\]porphyrin](#) [calf thymus DNA](#) [synthesis](#) [fluorescence spectrum](#) [UV-vis spectrum](#)

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