高等学校化学学报 2007 , 28 (3): 445—449 ISSN: 0251-0790 CN: 22-1131/O6

研究论文

胃和结直肠癌的傅里叶变换红外光谱研究

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收稿日期 2006-3-30 修回日期 网络版发布日期 2007-2-28 接受日期

摘要 利用傅里叶变换红外光谱仪及带ATR探头的中红外光纤系统测定了手术切除的胃癌、结直肠癌及相应的正常组织共31对标本粘膜面的反射红外光谱. 结果表明, 与正常组织相比, 癌组织的红外光谱发生明显变化: (1) 与脂类相关的谱带2955, 2920, 2870, 2850和1740 cm^{-1}出现几率明显低于正常组织($P<0.001$), I_{1460}/I_{1400}(I为峰强度)明显降低($P<0.001$), 表明癌组织的脂类相对含量降低; (2) 与蛋白质相关谱带N—H和O—H明显红移($P=0.025$), 表明N—H和O—H的氢键化程度增加, 癌组织的I_{3375}/I_{1460}, I_{1640}/I_{1460}和I_{1550}/I_{1460}明显升高($P<0.01$), 表明癌组织的蛋白质相对于脂类的含量增加, 癌组织的HW_{1550}/I_{1550}(HW为半高宽)明显升高($P=0.036$), HW_{1550}则明显降低($P=0.05$), 表明癌组织中蛋白质的二级结构发生显著变化; (3) 与醣类相关谱带中癌组织的I_{1160}/I_{1460}降低($P=0.002$), 结合组织化学染色, 推测可能是癌组织表面的糖蛋白明显减少造成的, 而I_{1120}/I_{1460}升高($P=0.019$)则可能是癌组织表面的糖原颗粒增加所致. (4) 与核酸相关谱带中癌组织的PO的反对称伸缩振动蓝移($P=0.033$), 表明癌组织中磷酸基团的氢键化程度降低. 研究结果表明, 红外光谱有望成为诊断恶性肿瘤的有力工具.

关键词 胃癌 结直肠癌 红外光谱

分类号 0657 R730.43

Investigations on Gastric and Colorectum Cancer by FTIR Spectroscopy

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Abstract Thirty-one pairs of FTIR spectra of samples, including gastric and colorectal cancer and the corresponding normal tissues, were collected after surgery. FTIR spectra of cancerous tissue were significantly different from those of normal tissues. (1) Alterations of bands related to lipid: 2955, 2920, 2870, 2850 and 1740 cm^{-1} appeared less frequently in malignant tissue($P<0.001$). The ratio of I_{1460}/I_{1400} in malignant tissue decreased significantly($P<0.001$), indicating that the relative quantity of lipid in malignant tissue decreased significantly. (2) Alterations of bands related to protein: in malignant tissue, the band of N—H and O—H shifted to a lower wave number($P=0.025$), suggesting that the degree of hydrogen-bonding of N—H and O—H increased. In malignant tissue, the ratios of I_{3375}/I_{1460}, I_{1640}/I_{1460}, I_{1550}/I_{1460} raised($P<0.01$), respectively. These changes illustrate that the relative quantity of protein to lipid in malignant tissue increased significantly. The ratio of HW_{1550}/I_{1550} increased obviously($P=0.036$), wh

ile HW_{1550} decreased significantly(P=0.05), compared with those of normal tissue. We can conclude that the secondary structure of protein in malignant tissue changed. (3) Alterations of bands related to carbohydrate: in malignant tissue, the ratio of I_{1160}/I_{1460} reduced(P=0.002). It might be due to the lessen of glycoprotein on the surface of malignant tissue, reversely, the ratio of I_{1120}/I_{1460} raised(P= 0.019). The possible reason was that the glucogen grains on the surface of the malignant tissue increased. (4) Alterations of band related to nucleic acid: in normal tissue, the peak of PO antisymmetric vibration was at (1241.61±6.15) cm^{-1}. In malignant tissue, the band shifted toward a higher wave number(P=0.033) due to the decreased hydrogen-bonding of PO. FTIR spectroscopy could be a powerful tool for cancer diagnosis.

Key words Gastric cancer Colorectal cancer FTIR

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