

论文

喇曼光镊分析血红细胞的携氧能力

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摘要:

应用喇曼光镊系统结合气体循环供给装置,收集了不同氧合状态的单个红细胞的喇曼光谱,分析了激光功率对氧合状态分析的影响.选择氧合态和去氧态的对比及区分指标,并运用该指标分析了不同保存时间、不同健康状态红细胞的携氧能力.结果发现:较强功率的激光照射细胞会导致其亚铁血红素凝集特征峰1 248、1 371 cm^{-1} 升高|I1 638/I1 547比值是区分氧合态与去氧态的良好标志|经较长时间保存的红细胞氧合能力增强,但去氧能力没有显著变化|而 α -地中海贫血HbH-CS患者的红细胞氧合能力比正常对照的强,但其去氧能力较差.从而表明喇曼光镊可以快速灵敏地分析红细胞的氧合能力,评价其携氧功能.

关键词: 喇曼光谱 红细胞 携氧能力 单细胞分析

Probing into the Oxygen Carrying Capacity of Red Blood Cells Using Raman Tweezers

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Abstract:

Raman tweezers is used to probe the oxygen carrying capacity of erythrocytes.The effects of laser power on erythrocytes are compared.An indicator for distinguishing oxygenated and deoxygenated erythrocytes is chosen and utilized to analyze the oxygen carrying capacity of erythrocytes from different storage time and different health state.The result shows that strong power of laser led to the bands at 1 248,1 371 cm^{-1} ,the markers of heme aggregation,increasing.The ratio I1 638/I1 547, a well indicator for distinguishing oxygenated state from deoxygenated state,reveals that the oxygen binding capacity of preserved erythrocytes increase as storage time extending,while the deoxidization capacity is not change significantly.Erythrocytes from HbH-CS,an alpha-thalassemia disease,are easier to oxygenate than normal controls,but difficult to deoxygenate.The findings demonstrate Raman tweezers can be a rapid,non-invasive,sensitive technique for analyzing and evaluating the oxygen carrying capacity of erythrocytes.

Keywords: Raman spectroscopy Erythrocyte Oxygen carrying capacity Single-cell analysis

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