الآية

بسم الله الرحمن الرحيم

(وَمَا أُوْتِيتُمَ مِنْ العِلْمِ إِلاَ قَلِيلاً)

صدق الله العظيم

Dedication

To my family,

Friends and teachers

Acknowledgments

I would like to first proceed with deep and special thanks to my supervisor, prof. Dr. Nafie. A. Almuslet who was providing his support and his extensive experience to me during this Ph.D. work.

His precious and valuable advices led my steps and enabled us to come up with his humbled Ph.D. research on Leukemia cancer in which I hope to be an addition for those wishing to dig furtherer in this very topic.

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Abstract

In this work Raman and FTIR spectroscopy were used for spectroscopic characterization of leukemia blood samples. Fifteen samples were collected from leukemia patient's types: acute, chronic lymphocytic leukemia and acute chronic myeloid leukemia. The patients were diagnosed by histopathologies in Radiation and Isotopes Center Khartoum (RICK) and Alamal Hospital.

The analysis of the Raman spectra was done for the peaks of proteins: 1240-1310, 1548, 1655 ,3200 ,3700-3500 and 628 cm^{-1}. These bands are attributed to α-helical of amid I, amid II, amid III, N-H bond of amid A and amid VI, respectively. Also the bands at 1120 and 835 cm^{-1} that are representing the strong C-N vibration bond of ribose and the vibration bond of CH_2. Raman shift was recorded at wavenumber 1140 cm^{-1} which represents the stretching vibration of amino acid.

The Raman shifts observed in the wavenumbers 2800, 1446 cm^{-1} and 2921cm^{-1} are attributed to lipids and C-H asymmetric vibration in fatty acid. The Raman shifts observed at 1310 and 1499 cm^{-1} represent the nucleic acid, the band at 779cm^{-1} represent the CH_2 group of nucleic acid. Spectroscopic differences were noticed between normal and cancer samples using FTIR at (2091, 3450 cm^{-1}) for lipids, (1548, 1650 cm^{-1}) for proteins and (1170, 1303 cm^{-1}) for nucleic acids.

The intensities of leukemia samples peaks are increased compared with the intensities of peaks in normal blood samples recorded by FTIR spectrometer with no difference in position of the absorption lines.

When comparing the two techniques, it can be concluded that the Raman spectroscopy has higher resolution and is more precise than FTIR spectroscopy. Both techniques can be used for diagnosis of leukemia blood samples efficiency.

المستخلص

فى هذا العمل تم استخدام مطيافية رامان ومطيافية تحويلات فوريير للاشعة تحت الحمراء للتوصيف الطيفى لعينات من سرطان الدم (اللوكيميا). استخدمت فى هذه الدراسة 15 عينه دم جمعت من مرضى مصابين باللوكيميا النخاعية الحاده والمزمنة, واللوكيميا الليمفاوية الحاده و المزمنة. جمعت العينات من معملى امراض الدم بكل من مستشفى الذره بالخرطوم ومستشفى الامل.

اظهرت نتائج هذا الفحص ان هنالك ازاحات فى طيف رامان الخاص بالروابط ذات الاعداد الموجية 628 ,1240-1310 , 1548, 1655 ,3200 و 3500-3700 سم$^{-1}$ حيث تمثل هذه الروابط الاميدات فى البروتين بانواعها المختلفة. وسجلت ازاحات فى منط قة الطيف ذات العدد الموجى 1140سم$^{-1}$ والتى تمثل الاهتزاز التماثلى لرابطة كربون-اوكسجين فى الاحماض الامينية.

فى الدهون لوحظت ازاحات رامان فى المنط قة 720 ,1446و 2800 سم$^{-1}$. وكانت الرابطة 2921 سم$^{-1}$ فى الدهون المشبعة قد ظهرفيها انزياح وترجع الى الاهتزاز غير المتماثل فى رابطة كربون- هيدروجين. وأيضاً سجلت إزاحات رامان في المنط قة 779سم$^{-1}$ وتمثل الرابطة مجموعة CH_2, والمناطق الطيفية 1499, 1120, 1002و 1310سم$^{-1}$ فى الاحماض النووية.

فى تحويلات فورير للاشعه تحت الحمراء وجدت فرو قات طيفية بين عينات اللوكيميا مـ قارنة بعينة الدم السليمة وكانت فى البروتين عند 1548و 1650سم$^{-1}$, وفى الدهون عند 2091و 3540سم$^{-1}$ و فى الاحماض النووية عند 1170و 1303سم$^{-1}$

نتائج فحص العينات بجهاز تحويلات فورير للاشعة تحت الحمراء اظهرت زياده فى شدة الطيف لعينات سرطان الدم مـ قا رنة بعينة الدم السليمة. ولوحظ ان هنالك تفاوت فى الشده بين العينات المريضة مـ قارنة بالعينة السليمة و لم يكن هنالك اختلاف فى موضع الطيف بالنسبة للعينات المريضة.

عند المـ قارنة بين التـ قانتين, نستخلص ان مطيافية رامان ذات قدرة عالية على تحليل طيف العينات ودـ قة اكبر فى تحديد مكونات المركب ومواضع الروابط المكونة للمركب من مطيافية تحويلات فورير للاشعة تحت الحمراء. كلا التـ قانتين أمكن استخدامها في تشخيص عينات سرطان الدم بكفاءة.

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