Mini Review Open Access

Skin Cancer Diagnosis using FT-Raman Spectroscopy

Landulfo Silveira*

Photomedicine Institute, Department of Dermatology and Skin Science, Vancouver Coastal Health Research Institute, The University of British Columbia, British Columbia, Canada

Abstract

Raman scattering has been employed for a while to examine the chemical makeup of biological systems. In the past ten years, Raman scattering has been extensively used in cancer screening, diagnosis, and intraoperative

scattering and surface-enhanced Raman scattering have lately been used in the study of cancer to overcome the weak signal of spontaneous Raman scattering. This study focuses on cutting-edge research on Raman scattering's use to cancer diagnostics and its potential to go from the bench to the bedside.

Clinical oncology still faces many obstacles when it comes to early cancer detection. Skin lesion detection has recently been done using Raman spectroscopy. The use of FT-Raman spectroscopy, a contemporary analytical

analysis performed on all 13 samples could determine the type of tissue.

K d: Raman spectroscopy; Skin cancer; Skin cancer; Histopathologically; Basal cell carcinoma; Clinical oncology

I d c

e biggest problem facing the planet is still cancer. New methods for cancer detection, diagnosis, and intraoperative surgical guidance must be developed immediately. Raman scattering can therefore noninvasively and without labelling detect changes in molecular ngerprints in a cell or tissue that has undergone pathological transformation. Raman spectroscopy may prove to be a useful technique for cancer diagnosis. Nevertheless, because spontaneous Raman scattering has a limited cross section (1030 cm2 per molecule),

***Corresponding author:** Landulfo Silveira, Photomedicine Institute, Department of Dermatology and Skin Science, Vancouver Coastal Health Research Institute, The University of British Columbia, British Columbia, Canada, E-mail: landulfo.silveira@ubc.ca

Received: 01-Mar-2023, Manuscript No: jcd-23-92188, **Editor Assigned:** 04-Mar-2023, Pre QC No: jcd-23-92188(PQ), **Reviewed:** 18-Mar-2023, QC No: jcd-23-92188, **Revised:** 22-Mar-2023, Manuscript No: jcd-23-92188(R), **Published:** 29-Mar-2023, DOI: 10.4172/2476-2253.1000171

Citation: Silveira L (2023) Skin Cancer Diagnosis using FT-Raman Spectroscopy. J Cancer Diagn 7: 171.

however UVA radiation is more frequently linked to damage caused by free radicals.

Free radicals are molecules with unpaired electrons that cause oxidative damage to DNA, proteins, and lipids directly. Reactive oxygen species are the most prevalent kind of free radicals in the body (ROS). DNA's nucleotides and deoxyribosyl backbone have been found to sustain damage by ROS. More speci cally, single strand DNA breakage and oxidised pyrimidine base synthesis are two ways that free radicals (mostly as singlet oxygen or hydroxyl radicals) harm DNA. Tumor development may result from this Genetic damage [4].

In addition to DNA, free radicals also harm cellular proteins and lipids. Enzymatic proteins that are directly oxidised activate pathways that result in the production of new proteins. Both in ammation and cell proliferation may be accelerated by these activities. e phospholipid bilayer of the cell is actively destroyed by lipid peroxidation caused by free radicals. It has been discovered that the build-up of oxidative stress encourages apoptosis through several pathways.

Moreover, exposure to UV radiation can cause immunosuppression, which impairs the capacity of immune cells to detect and destroy cancerous cells. Several biochemical alterations that occur when cancer develops can lead to enhanced angiogenesis and tumour invasion potential. AOs ght against these processes. ey function via a variety of methods that stop these oxidative processes and the resulting DNA and cellular damage. Some have also been demonstrated to work by increasing the expression of genes for ROS-neutralizing enzymes. e skin contains a variety of naturally occurring AOs, and there is a gradient of diminishing concentration of these compounds from the epidermis to the dermis. ese intrinsic skin AOs include nonenzymatic compounds like vitamin C and vitamin E as well as enzymes like glutathione peroxidase and superoxide dismutase [5].

Although the body contains defences against ROS, chronic oxidative stress from UV exposure can overwhelm these defences. Hence, researchers have turned to exogenous AOs. According to preliminary human investigations, people with BCC have lower serum levels of dietary AOs and higher serum markers of oxidative stress. As a result, the e ectiveness of dietary AOs in lowering UVA-induced photocarcinogenesis has been examined.

AOs are reported to protect against skin cancer in numerous animal experiments, some of which go back decades. While some have concentrated on various combinations, some have focused on AO supplementation with a single AO. A considerable decrease in the frequency of malignant and precancerous lesions was observed in hairless mice exposed to UV light when supplemented with vitamin C in the diet. In a di erent experiment, beta-carotene and vitamin E supplements both reduced the number of tumours in mice given a topical carcinogen by 32% and 25%, respectively. Selenium supplementation in the diet before and during UV exposure to mice was demonstrated in another investigation to o er considerable dose-dependent protection against skin cancer [6].

D c

e most prevalent cancer in Americans is nonmelanoma skin cancer (NMSC). NMSC, which encompasses squamous cell carcinoma (SCC) and basal cell carcinoma (BCC), has more cases than breast, lung, prostate, and colon cancer put together. e main risk factor for the occurrence of skin cancer is ultraviolet (UV) exposure. Although public health e orts have had some success in changing the behaviours that promote UV exposure, there is still signi cant exposure from purposeful tanning, using tanning beds, and inadvertent exposure. Because of this, researchers have looked at alternative methods of preventing skin cancer, such as dietary changes that increase the consumption of antioxidants (AOs) [7].

We give a general summary of the role that dietary AOs play in inhibiting carcinogenesis in this review. Several mechanisms of action have been described and have showed promise in laboratory and animal investigations. Four AOs have been thoroughly assessed in the few big, longer-term human investigations that have been conducted. Researchers have recently begun to analyse the dietary consumption of AOs via whole foods. Even though these particular supplements haven

is the two-colour SRS fast histology, which can be employed in the operating room during cancer surgery. e second method involves performing in-situ molecular-based diagnoses using portable rapid Raman imaging techniques, such as handheld Raman spectroscopy or hyperspectral SRS microscopy. e third is a multimodal imaging and spectroscopy system that combines the bene ts of each modality and might provide a more accurate cancer diagnosis.

C c I

None

Ac d

None

References

1. Santos IP, Barroso EM, Schut TCB (2017) Raman spectroscopy for cancer detection and cancer surgery guidance: translation to the clinics. Analyst 142:3025-3047.
2. Jermyn M, Desroches J, Aubertin K (2016) a review of Raman spectroscopy advances with an emphasis on clinical translation challenges in oncology. Physics in Medicine and Biology 61:370-400, 2016.
3. Yue S, Cheng JX (2016) Deciphering single cell metabolism by coherent Raman scattering microscopy. Current Opinion in Chemical Biology 33:46-57.
4. Heterodyne detected nonlinear optical microscopy in a lock-in free manner. Journal of Bio photonics 5:801-807.
5. Functional nanoparticle-based proteomic strategies for characterization of pathogenic bacteria. Analytical Chemistry 80:9612-9621.
6. Nijssen A, Schut TCB, Heule F (2002) Discriminating basal cell carcinoma from its surrounding tissue by Raman spectroscopy. Journal of Investigative Dermatology 119:64-69.
7. Bodanese B, Silveira FL, Zangaro RA, Pacheco MTT, Pasqualucci CA et al (2012) Discrimination of basal cell carcinoma and melanoma from normal skin biopsies in vitro through Raman spectroscopy and principal component analysis. Photomedicine and Laser Surgery 30:381-387.
8. Frank CJ, Redd DCB, Gansler TS, McCreery RL (1994) Characterization of human breast biopsy specimens with near-IR Raman-spectroscopy. Analytical Chemistry 66:319-326.
9. Near-infrared Raman spectroscopy for optical diagnosis of lung cancer. International Journal of Cancer 107:1047-1052.
10.