Editorial

Cherenkov or cerencov phenomenon in medical applications

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Now a day, the phenomenon of Cherenkov or Cerencov radiation has opened new horizons in medical applications. Cherenkov radiation is named after the 1958 Physics Nobel Prize laureate, Pavel Cherenkov, who shared the award with Ilya Frank and Igor Tamm, for being the first to prove empirically and justify this light. This luminescence of light occurs when a charged particle passes through a dielectric medium with a velocity greater than the phase velocity of light in the medium. The illuminated light on a cone around the particle path has a continuous spectrum that is proportional to the inverse wavelength squared. Whenever that happens, a blue or violet glow occurs. The average magnitude and intensities of the emitted wavelengths are tightly dependent on the material properties.

Cherenkov luminescence production in biological tissue is a complicated process, Cherenkov radiation undergoes several interactions before escaping the tissue and eventually reaching the detector device and analyzers. The optical properties of the tissue components determine the propagation of light. These are the scattering and absorption coefficients whoever the tissue inhomogeneity causes refractive index by reflection of the light. As a whole the most biological tissues are characterized by strong optical scattering and weak absorption. Thus they could be considered as diffusive. In any optical imaging modality, these interactions are the biggest question. Since they strongly limit both the spatial resolution (mainly regard to scattering and discontinuity of the refractive index) and the sensitivity (regard to absorption). Refraction at the interface between tissue and air may also seriously affect the total number of detected light photons. This is predominantly critical for Cherenkov luminescence imaging, where the signal is already weak at production and the emission is on a broad spectrum, over which the optical properties of detection devices are crucial.

In recent years Cherenkov light emerged as an inventive imaging modality in radiation therapy, which can visualize the extent of the treatment field and radiation dose on the patient surface intend in the nature of the relationship between energy deposition from ionizing radiation and the production of Cherenkov radiation. Cherenkov imaging is now clinically available to track the course of radiation therapy as a treatment verification tool for real time prevent of incident or accident in course of radiotherapy.

Cherenkov light could enable dosimetry of molecular radiation therapy. The relationship between the dose delivered to tissue and the emitted Cherenkov light intensity is linear- a necessity for dosimetry based on Cherenkov light. The other requirement would be ensuring that measured optical signal by adequate sensitive devices. "Using Cherenkov light could provide a more accurate and cost-effective alternative to existing dosimetry techniques for molecular radiation therapy." As a 3D Cherencov light distribution within the tissue, to gain the 3D dose distribution and achieve comprehensive patient-specific dosimetry.

X-ray Cherenkov luminescence tomography is a novel tomographic imaging technology that provides a device for monitoring the biological characteristics of tumor in-vivo with very high energy megavoltage x-rays of clinical linear accelerator (LINAC) as the radiation source.

The title of this study was assessed by the PubMed search engine under 3 subject as follow: 1- Cerencov & Cherenkov radiation in radiotherapy, 2- Cerencov & Cherenkov radiation in medical imaging, and 3- Cerencov & Cherenkov. The PubMed survey from 2006 to 2023 years is given in figure. So, it seems that for over 15 years this phenomenon has been a hugely interesting and investigating area for all medical modalities.

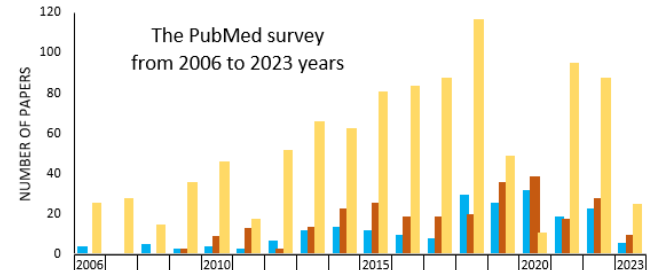
It concluded that the production of attractive devices will have demonstrated the utility of this imaging supports in the medical field in a wide range.

Acknowledgments

None.

Conflicts of Interest

None.



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Subject3	26	28	15	36	46	18	52	66	63	81	84	88	117	49	11	95	88	25