

## Documents

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**Development of Ultraviolet Spectroscopic Method for the Estimation of Metronidazole Nanoparticles for Periodontal Disease Treatment**

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**Abstract**

In periodontitis treatment, metronidazole (MT) is applied topically to reduce systemic side effects and reach the target site. treatment of periodontitis via sustained MT release. The UV-spectrophotometer analysis was developed and validated to quantify the encapsulated MT according to ICH Q2 (R1) guidelines, which include parameters such as specificity, linearity, accuracy, precision (in the form of repeatability), the limit of detection (LOD) as well as the limit of quantification (LOQ), range, robustness, and ruggedness. Metronidazole nanoparticles (MT-NP) were fabricated at different concentrations (0.15–0.60 mg/mL) using ionic gelation. The encapsulated MT was examined using a UV spectrophotometer, a Nano Zetasizer, Fourier transform infrared spectroscopy (FTIR), and a field emission scanning electron microscope (FESEM). The maximum wavelength (max) was discovered to be 320 nm, and it obeyed Beer's law with a linear relationship ( $R^2 = 0.999$ ) in the range of 2-12  $\mu\text{g/mL}$ . The parameters analyzed met ICH Q2 (R1) standards. MT-NP had a spherical structure and absorption band similar to chitosan empty (CS), with a size of  $308.0 \pm 9.18$  nm, a polydispersity index of  $0.374 \pm 0.37$ ,  $46.6 \pm 0.23$ , and an encapsulation efficiency of  $87.95 \pm 0.07$ . These findings suggest that UV-visible can be a useful tool for the estimation of MT nanoparticles and MT-NP as promising local antibacterial agents to treat periodontitis. © 2023 Malaysian Institute of Chemistry. All rights reserved.

**Author Keywords**

eriodontal disease; local drug delivery; Metronidazole nanoparticle; UV/Vis spectroscopy

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