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Comparison and analysis of efficient heating of albumen sample in microwave at the two different intensities of 2.5 Wcm^{-2} and 3 Wcm^{-2} in presence of suitable support at the microwave frequency of 2450 MHz

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The use of microwave is growing enormously due to its volumetric heating method. Volumetric heating method is a pollution free technique which is used for heating the complete volume of the continuous liquids, semi-solids, etc. Microwave energy has a wide range of applications which encompasses everything from heating, thawing to material processing and drying. Heating/warming of albumen is a very usual and regular practice in our food industry and microwave heating can be efficiently used for this purpose due to its selective, rapid, controlled and uniform heating. This work has been carried out to compare the efficient heating of 1-D albumen sample placed on a layer of metallic and composite supports at two different intensities of 2.5 Wcm^{-2} and 3 Wcm^{-2} processed in microwave at the microwave frequency of 2415 MHz with the support thickness of 1.5 mm. An introductory study has been carried out to find the power absorption within the albumen sample for the different cases by plotting the average power vs. sample thickness diagram. It is observed in the study that microwave power absorption is elevated for the consecutive R1 and R2 modes of significant magnitude for the suitable support thickness. It is found that the efficient heating of albumen is signalized by the large heating rate with the uniform temperature distribution within the albumen samples (minimal thermal runaway). Also the heating at the intensity of 2.5 Wcm^{-2} is compared to the heating intensity 3 Wcm^{-2}. On basis of the comparisons and investigations suitable supports, support thickness, intensity of the heating is recommended as the most ideal heating conditions for albumen samples.

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PLGA nanoparticle and DV1 peptide mediated targeting of CXCR4 receptors

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Modern nanotechnology is an emerging field offering a dynamic tool for research in therapeutics. PLGA (Poly (lactide-co-glycolide)) based nanoparticles offer an attractive option as *in vivo* drug delivery vehicle due to their biocompatibility, efficient cellular uptake, rapid lysosomal escape and sustained drug release. PLGA nanoparticles can be employed for targeted delivery of therapeutics by use of various surface ligands. Various studies have reported DV1 peptide ligand (derived from vMIPII) to possess a high binding affinity for chemokine receptor CXCR4 and significant antiviral activity in inhibiting the replication of CXCR4-dependent HIV-1 strains. Therefore, we aimed to target CXCR4 using Avidin-PLGA nanoparticles tagged with biotinylated DV1 peptide ligand. Avidin-PLGA nanoparticles were prepared by double emulsion solvent evaporation technique and size characterization done by Transmission Electron Microscope (particle diameter 50-200 nm). Surface functionality of nanoparticles for avidin groups was ascertained by tagging them with Biotin-FITC conjugate and subsequently treating U87MG cells with Biotin-FITC tagged NP and untagged NP followed by nanoparticle uptake analysis by confocal microscope. For specific targeting of CXCR4 receptors, targeted nanoparticles (Peptide-Avidin PLGA NP) were prepared by tagging biotinylated DV1 peptide onto the surface of avidin PLGA nanoparticles. Untagged nanoparticles were used as control nanoparticles (Avidin PLGA NP). A significantly enhanced uptake of targeted nanoparticles in U87MG cells as compared to Neuro-2a cells as analyzed by confocal microscopy confirm specificity of targeted nanoparticles for CXCR4 receptors. Our results suggest that PLGA NP tagged with DV1 peptide can be used for targeted delivery which can have clinical application.

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