Title: PREPARATION OF POROUS KERATIN NANO-PARTICLES FROM HUMAN HAIR AS A CARRIER FOR ENCAPSULATING ANTICANCER DRUG PACLITAXEL (TAXOL) FOR pH-SENSITIVE TARGETED DRUG DELIVERY

WIMALASIRI V.W [1], DUNUWEERA S.P [1, 2], RAJAPAKSE R.M.G [1, 2]

[1]Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka
[2]Postgraduate Institute of Science, University of Peradeniya, Sri Lanka

Keywords: **Keratin, Nanoparticle, Encapsulation, Taxol, Targeted drug delivery**

I. Abstract

Paclitaxel (Taxol) is a plant based taxane alkaloid which has been in use as a broad spectrum anticancer drug since 1993. Anticancer drugs usually exhibit a variety of side effects, but encapsulation of the drug in a suitable host material minimizes the side effects while improving the effectiveness of the drug due to its slow release only at the target. The objective of this research is to develop a simple, but effective mechanism for preparation of Porous Keratin Nano-Particles (PKNP) using human hair as the raw material. Human hair, a waste product once cut, contains a structural protein, keratin. Preparation of keratin for medical applications is a productive and an attractive way of utilizing waste hair. In this study, PKNP was produced from human hair by dissolving in a basic medium at high temperature followed by re-precipitation in an acidic medium. For PKNP production, preliminary trials were carried out using different NaOH concentrations ranging from 0.10 M to 1.0 M to determine the optimum concentration of NaOH for keratin extraction. Keratin extracted into 0.5 mol dm^{-3} NaOH with 0.5 mol dm^{-3} $NaHSO_3$ as a stabilizer, in a ratio of 15:1, at a temperature of 80 ºC was re-precipitated at room temperature using conc. hydrochloric acid. This PKNP was then characterized using Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Analyzer (EDX), Fourier Transform Infrared Spectroscopy (FT-IR), Particle Size Analyzer, X-ray Fluorescence (XRF), and X-Ray Diffraction (XRD). The encapsulation of the anti-cancer drug *Paclitaxel* (Taxol) to PKNP and its pH dependency for release of the drug from PKNP was studied using UV-Visible Spectrophotometry at λ_{max} 296.7 nm. The PKNP were stirred with a 1000 ppm solution of Taxol in distilled water for 48 hours and the effectiveness of the encapsulation was evaluated by determining the Taxol concentration remaining in the filtrate using UV-Visible spectroscopy. The encapsulation efficiency of Taxol into PKNP was found to be 56%. The percentage release of Taxol from PKNP during the first 8 hours was <12% in acetate/phosphate buffer at pH 4.0, 5.0, 6.0, 7.0, and 8.0. The maximum release of 71% was observed after 24 hours at pH = 8.0 owing to dissolution of the particles at high pH.

II. Images:

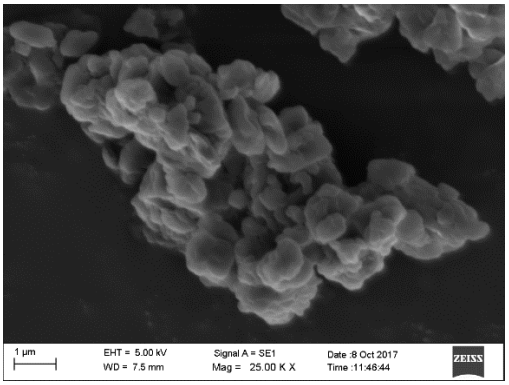


Figure 1: SEM image of extracted keratin sample

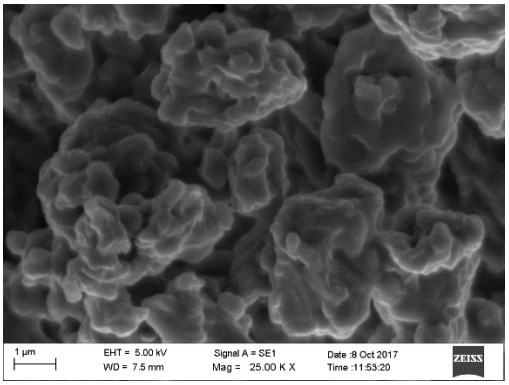


Figure 2: SEM image of Taxol encapsulated keratin sample

III. References:

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WIMALASIRI V.W. successfully completed his B.Sc. Chemistry Special Degree from University of Peradeniya. He is currently employed as a temporary demonstrator in the Department of Chemistry and seeking for graduate admission. He has published one abstract in an international conference during his undergraduate career.

IV. Presenting author details



Full Name: Viranga Wanshanath Wimalasiri
Contact number: +94 71 384 4899 (Mobile)
Twitter account:
Linked In account:
Session name/ number:
Category: Oral Presentation
Passport Number: N5264844