UNIVERSITI TEKNOLOGI MARA

CYTOTOXICITY EVALUATION OF A TEMPERATURE-SENSITIVE POLY(*N*-ISOPROPYLACRYLAMIDE) NANOGEL ON CELL VIABILITY, *IN VITRO*.

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ABSTRACT

Poly(*N*-isopropylacrylamide) (polyNIPAM) is one of the most established smart polymers which has potential as a carrier for drugs targeting the skin. The current work concern the biocompatibility of such material with the skin cells since they are directly in contact upon application and may induce unwanted reactions. Initially, the polyNIPAM of nanometre scale particles were synthesized by using a single-step surfactant-free emulsion polymerization. The resulting particles were characterised based on their particle size, size distribution, zeta potential, morphology as well as their behaviour with respect to changes in surrounding temperatures. The polyNIPAM and its monomer were dosed on 3T3 L1 fibroblast skin cells, *in vitro* and their effects on the cell viability were determined by MTT assay. The results suggested that the nanoparticles at variant studied concentrations (i.e. 1, 5, 10 and 15% w/v) demonstrated insignificant cytotoxic response to 3T3 L1 cells. IC_{50} value was not obtained from the growth inhibitory (GI) percentage, as the polyNIPAM nanogel was not able to inhibit 50% of the population. Therefore, it can be suggested that the polyNIPAM particles are biocompatible at 15% w/v concentrations or below for fibroblast cells.

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CHAPTER 1

INTRODUCTION

Nanotechnology is an emerging technology that has potential to be used in various fields, including foods, medical, and cosmeceuticals. Nanomaterials, developed using nanotechnology, are measured in nanometre scale that is commonly known to be equal to about one-billionth of a meter. However, nanomaterials are much more than just miniaturisation. These nanomaterials can have different chemical, physical, or biological properties than their conventionally-scaled counterpart materials used in many products.

Polymeric nanoparticles are submicron size entities, often ranging from 10 – 1000 nm in diameter and are assembled from a wide variety of biodegradable and non-biodegradable materials. In pharmaceuticals, the polymeric nanoparticles are mostly investigated as carriers for drug delivery for various routes of administration including parenteral, oral, nasal and topical. Indeed, polymeric nanoparticles allow therapeutic agents to be encapsulated, covalently attached or adsorbed onto such nanocarriers for the enhancement of drug delivery. By virtue of its small size, polymeric nanoparticles can be targeted to specific cells and locations in the body. Thus, polymeric nanoparticles may overcome stability issues for certain drugs and minimize drug-induced side effects.